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*Cattle Prices*

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Abstract

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BEEF AND OTHER ENTERPRISE ADJUSTMENTS IN THE SOUTHERN PIEDMONT:  
A CONSIDERATION OF MANAGERIAL RESPONSE TO CHANGING  
PRICE RELATIONSHIPS

Neil R. Martin, Jr., James O. Wise, and Wesley N. Musser

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The role of managerial coordination with respect to response to price changes has increased in the 1970's. This paper presents a representative farm organization analysis with emphasis on price changes that have affected enterprises in the Southern Piedmont. Correct price expectations yield substantially higher profits and fewer beef animals.

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Introduction

Agriculture has experienced rather drastic price changes in the 1970's. From 1970-1973 the average annual index of prices received by farmers for all products rose from 110 to 172 while the average annual index of prices paid for items used in production increased from 110 to 146 (U.S. Department of Agriculture). In 1974, the latter continued to increase from 156 on December 15, 1973, to 184 on December 15, 1974, while prices received by the farmers decreased during this period from 185 to 177 (U.S. Department of Agriculture). In addition to these aggregate changes, considerable relative changes have occurred in prices of outputs and inputs. Beef cattle prices have been one of the most variable prices during this period - increasing from \$27.10 per hundredweight in 1970 to \$42.80 in 1973 and declining to \$27.60 on December 15, 1974 (U. S. Department of Agriculture). Shifts in relative input prices also occurred in response to the well publicized changes in energy prices.

From a production economics perspective, these price changes increased the importance of the managerial role of coordination, which Heady defines as formulating expectations and implementing production plans consistent with these expectations (pp. 465-566). In particular, the managerial

responses to price changes have been of increasing importance, surpassing the primary importance of responses to changes in production technology in earlier periods (Bradford & Johnson, P.20). This paper considers the managerial role in enterprise organization as a response to the price changes which have been occurring in the 1970's. A linear programming model was used to estimate returns and optimum enterprise organizations for a representative farm in the Southern Piedmont<sup>1/</sup>, with prices and costs for both 1974 and the early 1970's. Analyses were also made of the effects of partial adjustments to price changes from 1970 - 1974. Adjustments to price expectations beyond 1974 are evaluated. The impact of the decline in beef prices on income and optimum farm organization in a diversified farming system and some implications for future beef production are considered.

#### Model Farm

The linear programming model of the representative farm in the Southern Piedmont is a short-run profit maximization model of enterprise organization. The objective function to be maximized reflects returns over cash expenses.<sup>2/</sup> Activities included in the model are corn, wheat, oats, grain sorghum, first and second crop soybeans, cotton, beef cows, calves finished on winter grazing, stocker calves, farrow to finish hog production, and finishing hogs. Poultry, dairying and other speciality enterprises were excluded because they either did not represent general adjustment opportunities or were not typical of farms in the area.

Production coefficients in the model reflect a high level of management and production efficiency. Yields and price assumptions

for the activities are given in Tables 1 and 2. Other coefficients were developed as part of Regional Project (S-67) which is concerned with the beef industry in the South (Wise).

Fixed resources in the model included 243 acres of openland of which 189 acres were cropland, one man year of resident labor (2500 hours), a tractor, combine, forage harvester, and a compliment of machinery, and livestock facilities for pasture beef and hog systems. Resident labor could be augmented by hired seasonal labor requirements of crop activities. Feed grains could be bought or sold, but forage requirements had to be met by the production of forage activities.

### Results

Optimum enterprise organization for the representative farm model in the early 1970's included three beef production systems, one hog production system, six crops and one pasture activity (Table 3). Products sold included weaned calves, beef yearlings, slaughter cattle, slaughter hogs, cotton, wheat, soybeans, and oats. Home-grown corn, oats, and corn silage provided the feed for the livestock activities. Permanent fescue pasture was the major source of feed for the brood cows. This diversified farm organization produced slightly more than \$18,000 in returns over cash expenses.

The 1974 production year represented a period of substantial change in agricultural prices and costs. The conditions leading to and the implications of this period have been a major topic of discussion and evaluation for all farming interests. Programmed results for the representative farm under conditions of the 1974 production

Table 1. Yield and Price Assumptions, Representative Southern Piedmont Farm Model.

Item	Yield per acre	Price per Unit (\$)	
		1970 <sup>a</sup>	1974 <sup>b</sup>
Corn	60 bu.	1.20	3.31
Wheat	50 bu.	1.30	3.16
Oats	70 bu.	.70	1.30
Grain sorghum	60 bu.	1.25	2.80
Soybeans:			
1st crop	30 bu.	2.75	7.77
2nd crop	22 bu.	2.75	7.77
Cotton:			
lint	500 lb.	.240	.472
seed	816 lb.	.025	.062
Price support	500 lb.	.15	N.A.
725 lb. Good & Choice slaughter cattle	N.A.	.282	.382
688 lb. Good feeder yearlings	N.A.	.280	.226
436 lb. Good & Choice feeder calves	N.A.	.314	.236 <sup>c</sup>
350 lb. Good feeder calf	N.A.	.310	.236 <sup>c</sup>
1200 lb. cull cows	N.A.	.220	.160
210 lb. market hogs	N.A.	.210	.360
450 lb. cull sow	N.A.	.170	.260

<sup>a</sup>Wise.

<sup>b</sup>U. S. Senate Committee on Agriculture and Forestry.

<sup>c</sup>Calf finishing and stocker activities in the 1974 production year required purchase of feeder animals in fall of 1973 when feeder calf price was \$.503 per pound. Calves produced by beef cow activity in 1974 were sold in fall of 1974 at indicated price.

Table 2. Input Price Assumptions, Representative Southern Piedmont Farm Model.

Item	Unit	Price per Unit (\$)	
		1970 <sup>a</sup>	1974 <sup>b</sup>
<u>Seeds</u>			
Corn	lb.	.25	.48
Wheat	bu.	3.25	8.00
Soybeans	bu.	5.40	10.00
Cotton	lb.	.20	.39
Oats	bu.	1.75	3.50
<u>Fertilizer</u>			
Lime	ton	9.00	13.00
5-10-15	ton	42.00	90.00
4-12-12	ton	40.00	81.00
0-10-20	ton	40.00	80.00
Ammonium nitrate	lb. of N.	.085	.227
<u>Feeds</u>			
Cottonseed meal	cwt.	4.80	8.97
Hog supplement (including salt and minerals)	ton	102.00	220.00
Pig starter (including salt and minerals)	ton	122.00	170.00
Salt and minerals	cwt.	2.05	2.75
<u>Other</u>			
Ginning cotton	bale	15.00	25.00
Seasonal hired labor	hr.	1.75	2.00
Interest on operating capital	%	8	9.5

<sup>a</sup>Wise.

<sup>b</sup>U. S. Senate Committee on Agriculture and Forestry.

Table 3. Optimum Farm Organizations, Representative Southern Piedmont Farm Model, 1970 and 1974 Prices.

Item	Unit	Price Situation	
		1970	1974
Income	\$	18,090	38,187
Cotton	Acres	15.0	0
Wheat	Acres	27.0	143.8
Corn	Acres	29.6	32.5
Soybeans	Acres	0	111.3
Oats - Soybeans	Acres	64.4	0
Oats	Acres	29.6	32.5
Stockers	Head	44.3	0
Feeder Calves - Winter Grazing	Head	26.8	0
Beef Cow-Calf	Head	52.4	0
Fescue	Acres	112.1	0
Corn Silage	Acres	13.4	0
Buy Corn	Bushels	0	0
Buy Oats	Bushels	0	411.0
Fed Pigs	Number	0	0
Sows	Number	10.3	13.4



year provided a basis for evaluation of beef and related enterprise adjustments in the Southern Piedmont.

Unrestricted 1974 results for the representative farm are more highly specialized than the optimum 1970 results (Table 3). Beef cattle enterprises and cotton were excluded from the optimum organization. Specializing in wheat, soybeans, oats, corn, and hogs, this farm plan would have returned \$38,000 above cash expense which is over twice as much income as available from the optimum 1970 situation. This result reflects perfectly correct price expectations and would not be expected to be achieved. However, it does serve as a benchmark to measure potential managerial returns in relation to no response or partial adjustment in production plans to price changes in 1974.

An analysis assuming no response to the 1974 price-cost changes was made by forcing the 1970 optimum enterprises on the 1974 price-cost conditions. Returns above cash expense for this solution were \$19,338, 7 percent higher than the optimal 1970 solution but only 50 percent of the optimal 1974 solution.

The analysis of partial adjustments recognizes that just prior to the 1974 production year, farmers in the Piedmont could have reasonably anticipated favorable returns from cotton and beef cow activities. In view of this fact plus the fact that beef cow herds are a relatively inflexible enterprise, a 1974 farm organization was computed with requirements that cotton and beef cow activities be maintained at the 1970 optimum levels.<sup>3/</sup> In this situation returns above cash expenses were \$29,644, almost 23 percent less than the full optimal adjustment (Table 4). Although a more diversified organization than the 1974 optimum results, the partial adjustment solution excluded beef stocker

Table 4. Farm Organizations Representing Partial and No Adjustment to 1970-1974 Price Changes, Representative Southern Piedmont Farm Model.

Item	Unit	No Adjustment	Partial Adjustments <sup>a/</sup>	
			Cotton and Cows Fixed	Cows Fixed
Income	\$	19,338	29,644	31,745
Cotton	Acres	15.0*	15.0*	0
Wheat	Acres	27.0*	117.0	118.7
Corn	Acres	29.6*	23.3	6.7
Soybeans	Acres	.0	72.7	106.0
Oats - Soybeans	Acres	64.4*	0	0
Oats	Acres	29.6*	0	0
Stockers	Head	44.3*	0	0
Feeder Calves - Winter Grazing	Head	26.8*	0	0
Beef Cow-Calf	Head	52.4*	52.4*	52.4*
Fescue	Acres	112.0*	91.1	91.1
Corn Silage	Acres	13.4*	6.0	6.0
Buy Corn	Bushels	0	158.2	1,081.7
Buy Oats	Bushels	0	328.4	313.2
Fed Pigs	Number	.0	0	0
Sows	Number	10.3*	10.7	10.2

\* Activity levels forced in solution at this level.

<sup>a/</sup> Specified enterprises were fixed at their 1970 optimum levels.

and beef calves on winter grazing systems which were included in the 1970 optimum organization.

A second partial adjustment consisted of holding only the beef cow-calf enterprise at its 1970 optimum level. This situation resulted in a return above cash expenses of \$31,745, which was about 64 percent higher than the no response results, but still \$6,442 lower than the optimum situation. As expected, except for the beef cows, this organization contains the same enterprises as the 1974 optimum situation (the difference being that the quantities of wheat, soybeans, corn and hogs are all reduced).

The above results show that reduction in profits from either no change or a partial adjustment in enterprise organization in response to price changes are limited with a diversified farm organization. Although not specifically studied, a specialized beef farmer would have suffered losses from the above price changes. In the case of the organizations in the model, the rather favorable crop and swine prices plus the utilization of home-grown forages for beef feed permitted a slightly higher income than the 1970 optimum.

Although beef cow-calf and cotton were considered as favorable enterprises prior to the 1974 production year, plans for the 1975 production season were made with expectations that inclusion of these enterprises would mean lower net cash returns. However, with a depressed cattle market resulting in low liquidation value of cow herds and/or continued optimism for long run beef prices, most farmers kept or even increased their beef cow herds. Furthermore, the unfavorable returns to 1974 calf finishing and stocker activities caused by the high 1973

fall calf price were no longer expected. Adjustments to these conditions were analyzed by studying a partial and an optimal adjustment to price expectations at the end of 1974.

With the end of 1974 prices and costs and a restriction that beef cows be greater than or equal to 52.4 head (the optimal 1970 level) results for the representative farm would return \$35,232 above cash expense (Table 5). Along with beef cow-calf production, calves finished on winter grazing, fed pigs, wheat, soybeans, corn silage, and fescue pasture were included in this solution.

An unrestrained end of 1974 price-cost solution included no beef cows and slightly less fed pigs, but increased calves on winter grazing, wheat, and soybeans activity levels. This solution returned \$6,000 more than when 52 beef cows were forced into the organization for 1974-1975 (Table 5). Thus, the inclusion of the 1970 level of beef cows reduced net returns by \$115 per cow in one production season. This analysis indicates greatly increased pressure on farmers to reduce or at least stabilize their beef cow herds. If farmers in general reduced beef cows, a more balanced beef price pattern could be expected. However, a parametric programming analysis of the model indicated that a calf price of \$.55 per pound would be required to introduce beef cows into the optimal farm organization. At this price 20 cows would be included in the organization along with sows, wheat and soybeans. Thus, even at this unlikely high price for calves less than one-half the number of cows would be profitable in comparison to the 1970 optimum. Adjustments of the magnitude implied have a very low probability of occurrence in reality and thus continued low returns to the beef industry can be expected.

Table 5. Farm Organizations for 1975 Representing Partial and Optimum Adjustments to End of 1974 Prices and Costs, Representative Southern Piedmont Farm Model.

Item	Unit	Partial Adjustment	Optimum Adjustment
Income	\$	35,232	41,237
Cotton	Acres	0	0
Wheat	Acres	111.5	119.0
Corn	Acres	0	0
Soybeans	Acres	88.3	102.1
Oats - Soybeans	Acres	0	0
Oats	Acres	0	0
Stocker	Head	0	0
Feeder Calves - Winter Grazing	Head	68.0	109.9
Beef Cow-Calf	Head	52.4*	0
Fescue	Acres	95.7	71.6
Corn Silage	Acres	23.2	16.8
Buy Corn	Bushels	2,313.1	2,136.5
Buy Oats	Bushels	0	0
Fed Pigs	Number	304.4	281.1
Sows	Number	0	0

\* Activity level forced in solution at this level.

## Summary

This paper investigated the effects on a representative Southern Piedmont farm of optimal and partial responses to the rather drastic price and cost changes that occurred in 1974. Emphasis was given to the beef enterprise and other enterprises usually related to beef.

Results of the analysis show that the managerial role in a price volatile situation is extremely critical to the maintenance or improvement of income. Incomplete or no response to the price changes resulted in significant losses in income (the extreme being \$18,849, or over half of the optimum).

Further results of the analysis indicated that the cost of making a wrong response to price changes are modified by a diversified farm organization. The price changes that occurred in 1974 resulted in decreased profits or losses to beef enterprises yet overall farm income to the model farm was slightly increased by the inclusion of cash crops and swine. Also evident in this analysis was the cost of maintaining an inflexible organization. The forcing of beef cows into the model situations (all other enterprises responsive to price) resulted in decreased returns in all cases.

The analysis indicated, over all of the price situations studied, that optimum responses involved eliminating the beef cow-calf enterprise and decreasing other beef activities. Such a response by farmers in general has a low likelihood of occurrence because of the non-pecuniary and otherwise inflexible nature of beef enterprises. Adjustments of the magnitude suggested in this analysis have a low probability of occurrence and thus low returns to the beef industry can be expected to continue.

Finally, these results suggest a reorientation of farm management research and extension. With the current price instability, the former emphasis on adjustment to technological change has decreasing relevance to farm managers as compared to adjustment to price changes. Particular areas of research and extension which this research suggests includes formulation of price expectations, and methods for increasing flexibility and diversification in farm organization.

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## Footnotes

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<sup>1/</sup> Southern Piedmont for this paper is defined as the Piedmont Area of Alabama, Georgia and South Carolina.

<sup>2/</sup> Cash expenses as used in this analysis includes: seed, fertilizer and lime, pesticides and herbicides, tractor and equipment operating and repair costs, interest on operating capital, feed, veterinary, marketing and transportation, grinding and mixing feed and miscellaneous expenses.

<sup>3/</sup> Other studies have shown that farm operators are not completely income motivated with respect to the beef enterprise. For example, Musser et.al. demonstrated that the beef enterprise occupies an honorific position in the farm organization. Further, Allison reports that a sizeable portion of farmers in Georgia have increased their beef herds because of "psychological" factors (p. 24).