Cotton and Tractor Price Comparisons

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Teachers are always looking for situations in which numerical analyses can be applied to real world situations. We shall present a setting involving cotton production and tractor prices.

One of the authors recently attended an historical display of John Deere tractors. A variety of full-size tractors of various ages were available for inspection; beside each tractor was a sign giving its price when new, together with the average cotton yield and the price for newly harvested cotton at that time. The following table displays these data:

Year	Price of New, Full-Size John Deere Tractor	Average Cotton Yield (pounds per acre)	Price (per pound) of Newly Harvested Cotton
1919	$1150	166	$0.35
1928	$1115	163	$0.18
1933	$1452	212	$0.10
1948	$1253	311	$0.30
1953	$2900	324	$0.32
1958	$4000	466	$0.33
1963	$6500	517	$0.32
1970	$9000	438	$0.22
1977	$23,000	520	$0.52
1984	$67,000	600	$0.59
1992	$95,000	700	$0.55
2007	$121,000	859	$0.56

The huge growth in tractor prices can be attributed to both the general inflationary trend and the increase in size and engineering sophistication. A new tractor in 2007 can do far more work than a tractor from years ago.

What can be deduced from the preceding table? First, we use the yield and commodity price columns to determine the average monetary value of the crop per acre in each year. Multiplying the yield and the price per pound produces this monetary acre yield. Next, we divide this monetary yield into the price of a new tractor. This ratio represents the number of productive acres needed to purchase a new tractor with a single year's cotton crop. For instance, in 1919 the average monetary cotton yield per acre was (166) (\$0.35) or \$58.10. To purchase a \$1150 tractor with that year's crop would require $\frac{\$1150}{\$58.10}$ or 19.8 acres. The following table reports similar results for other years. Of course, a farmer has to pay many expenses with a year's crop, plus hopefully earn some profit. This analysis focuses only on the tractor cost.

Year	Average Monetary Yield (\$ per acre)	Number of Acres Needed to Purchase a New Tractor
1919	\$58.10	19.8
1928	\$29.34	38.0
1933	\$21.20	68.5
1948	\$93.30	13.4
1953	\$103.68	28.0
1958	\$153.78	26.0
1963	\$165.44	39.3
1970	\$96.36	93.4
1977	\$270.40	85.1
1984	\$354.00	189.3
1992	\$385.00	246.8
2007	\$481.04	251.5

Several facets of this table can be noted. For instance, the farm boom years at the end of World War I deteriorated into the farm depression of the 1920's and 1930's. But the most obvious general trend in recent years is the growth in monetary yields, accompanied by a much larger increase in tractor prices. The 1992 and 2007 data reveal that almost ten times as many acres are needed to buy a new tractor than in the 1950's. This explains in large part the rapid growth in farm sizes over that period, a trend made possible by vastly increased number of acres that a tractor could work.

The reader and students are encouraged to identify and examine other agricultural trends suggested by these and other data.

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