

is \$196.71 less where one medium tractor replaces only 2 mules. On the other hand man labor is used much more efficiently and accounts primarily for the cost reduction. The amount of man labor required on this farm was reduced slightly over one-fifth--the result of shifting to mechanical power.

No evaluation has been made in this illustration of the possible effects of reducing per acre power costs by obtaining fuller use of mechanical power on a custom basis. The hourly cost of operating tractors and tractor machinery is reduced when it is more fully utilized (tables 2,3;pages 10,11). Many farmers with only 60 acres in crops would have the opportunity of using mechanical power on other farms. Furthermore, it would be possible to eliminate the third mule provided it was possible to trade tractor work for 297 hours use of a mule. This would mean further economies in the use of power, and would result in lower per acre costs. The minimum acreage for successful tractor operation would be somewhat lower if the third mule could be eliminated.

THE EFFECTS OF PRICE LEVEL FLUCTUATIONS ON THE COST OF MECHANICAL AND ANIMAL POWER

The purpose of this section is to illustrate and discuss the effects of price level fluctuations on the cost of mechanical and animal power. To accomplish this the price level for three periods, 1933, 1935-39, and 1943 was used to compute power and labor costs by type of power used for typical farms with 60 and 170 acres in crops.

Fluctuating price relationships have a pronounced effect upon the relative cost of animal and tractor power. Changes in the general price level are usually accompanied by changes in the relative prices of various commodities. Some commodity prices are more volatile than others--that is, certain raw material prices fluctuate more violently than other prices. Feed prices more than doubled from

1933 to 1943 while farm machinery prices increased about 22 per cent, and equipment and supplies increased about 30 per cent, table 14.

Table 14. Index numbers of prices paid by farmers for selected commodities, United States 1/

(1910-14 = 100)

Year	Feed	Farm Machinery	Equipment and Supplies
1933	77	138	103
1935-39	108	152	111
1943	162	169	134

1/ Agricultural prices, U.S.D.A., B.A.E.

The annual cost of keeping a mule is considerably higher in years of relatively high prices as compared with years of low prices. The annual cost of keeping a mule is compared for three different price levels in table 15. At 1933 prices the net annual cost is \$108.73 as compared with \$185.87 at 1943 prices. When the five year average prices that prevailed in the period 1935-39 are used, the annual cost is \$121.74. Feed is the largest single cost item for each of the price situations; however, the relative cost of feed is greater during periods of high prices than of low prices.

Since general price changes have little or no effect upon the amount of work done per mule annually, it may be assumed that per hour cost of mule work varies proportionally with the annual cost of keeping the mule. Mules were worked on an average of 800 hours in the year. The net cost per hour would be 23.2 cents at 1943 prices, 15.2 cents at 1935-39 average prices, and 13.6 cents at 1933 prices. The cost per hour of mule work varies widely depending upon the number of hours worked per year.

Table 15. The average annual cost of keeping a mule in the Northern Coastal Plains Area. 1/

Cost items	Cost at					
	1943 prices <u>2/</u>		1935-39 prices <u>3/</u>		1933 prices <u>4/</u>	
	Dollars	Percent	Dollars	Percent	Dollars	Percent
Corn	83.40	42.0	46.20	35.0	40.80	35.0
Hay (peanut)	60.00	30.0	42.93	33.0	37.41	32.0
Salt	.42		.35		.32	
Shoeing	1.43	1.0	1.17	1.0	1.08	1.0
Veterinary fees	1.79	1.0	1.46	1.0	1.35	1.0
Medicine	.69		.56		.52	
Chore labor	16.80	9.0	7.06	5.0	5.26	4.0
Harness (gear) cost	7.22	4.0	5.89	5.0	5.47	5.0
Total variable cost	171.75	87.0	105.62	80.0	92.21	78.0
Depreciation <u>5/</u>	19.96	10.0	19.96	15.0	19.96	17.0
Interest <u>6/</u>	6.16	3.0	6.16	5.0	6.16	5.0
Total overhead cost	26.12	13.0	26.12	20.0	26.12	22.0
Total cost	197.87	100.0	131.74	100.0	118.33	100.0
Less value of manure	12.00		10.00		9.60	
Net annual cost per mule	185.87		121.74		108.73	

- 1/ Adjusted to average prices for 1943, 5-year average 1935-39 and 1933.
2/ Average of prices reported by months for North Carolina used for corn and hay. Other items based on survey of 61 farms in Northern Coastal Plains Area.
3/ Average of corn and hay prices reported for North Carolina by years 1935 to 1939. Chore labor adjusted on the basis of wage rates reported by B.A.E. for all states. Salt, shoeing, veterinary fees, medicine, and harness cost adjusted on the basis of prices paid by farmers for equipment and supplies, B.A.E. all states for 5 years--1935 to 1939.
4/ Average of corn and hay prices reported for North Carolina for 1933. Chore labor adjusted on the base of wage rates reported by B.A.E. for all states, 1933. Salt, shoeing, veterinary fees, medicine, and harness cost adjusted on the basis of prices paid by farmers for equipment and supplies, B.A.E. all states.
5/ Average purchase price of mules 246.38; years of useful life 12.3.
6/ Interest figured at 5 per cent on one-half of the purchase price of mules.

Tractor cost varies less with changing price levels than workstock cost.

The reason for this is the fact that operating expense items for tractors fluctuate less than the expense items for keeping workstock. Also, variable costs are a smaller proportion of the total cost in the operation of tractors than in the

case of mules.

Since the cost per hour of tractor operation is so closely related to annual use, variations in the cost of operation due to price changes are shown in table 16, by hours used per year. In this cost comparison for different price levels, no attempt was made to adjust the average purchase price of tractors. Obviously, it would be misleading to adjust the purchase price of a late model tractor to that of an old model. Even though there have been increases in the purchase price of tractors, improvements in design and increased capacity in many cases have been off-setting in their effect. Therefore, the variations presented in this illustration for different price levels are due entirely to changes in the operating cost, and not to depreciation and interest.

Table 16. The effect of price level changes on the per hour cost of operating medium-size tractors, by hours used per year. 1/

Hours used per year	Cost per hour at		
	1943 prices	1935-39 prices <u>2/</u>	1933 prices <u>3/</u>
	Dollars	Dollars	Dollars
200	.951	.892	.871
300	.777	.718	.698
400	.703	.647	.627
500	.664	.607	.587
620	.613	.557	.537
910	.535	.479	.459
1210	.500	.444	.424

- 1/ In adjusting for price level changes only the operating costs were adjusted. The average purchase price as reported by farmers, represents prices for different years and was not adjusted for changes in machinery prices; inasmuch as price increases during this period were associated with technical improvements of the tractor, thus reducing the reliability of the possible comparisons.
- 2/ The operating cost was adjusted to the 1935-39 period, by applying the 5-year average index of prices paid for equipment and supplies to the 1943 data.
- 3/ The operating cost was adjusted to the 1933 period by applying the 1933 index of prices paid for equipment and supplies to the 1943 data.

The per acre cost of power and labor varies with the price level, the size of farm, and the type of power used. Price level changes cause greater variations

in per acre cost of power and labor where mules are the main source of power, table 17. When mules were used as the main source of power in the production of 60 acres of crops, the per acre cost for power and man labor at 1933 prices was \$11.34; for the five year average 1935-39, \$13.41; and for 1943, \$23.72. When one tractor was substituted for two mules the per acre power and labor cost was \$11.68 at 1933 prices; \$13.15 for the five year average 1935-39; and \$20.23 for 1943. The variation in per acre cost for power and labor from 1933 to 1943 prices was \$12.38 where mules were used and only \$8.55 where one tractor replaced two of the mules.

Table 17. The effect of price level changes on per acre power and man labor costs for tractors and mules.

Price level	Cost of power and man labor per acre in crops			
	60 acres in crops 1/		170 acres in crops 2/	
	One tractor and one mule	Three mules	One tractor and one mule	Six mules
	Dollars	Dollars	Dollars	Dollars
1933	11.68	11.34	7.37	9.03
1935-39	13.15	13.41	8.41	10.60
1943	20.23	23.72	13.19	18.20

1/ Cropping system shown in table 12, page 31.

2/ Cropping system shown in table 10, page 25.

Price level changes brought about similar variations when applied to farms having 170 acres in crops; however, the per acre cost of power and labor was lower as a result of greater efficiency in the use of power on the larger farms. When six mules were the source of power for the production of 170 acres of crops, the per acre cost of power and labor varied from \$9.03 at 1933 prices to \$18.20 at 1943 prices. When one tractor was substituted for five mules, the per acre costs for power and labor varied from \$7.37 for 1933 to \$13.19 for 1943. Thus, the variation in per acre cost of power and labor due to change in price level where six mules were used was \$9.17 and only \$5.82 where one tractor replaced five mules.

On the farm having 60 acres in crops, which was used to illustrate the minimum size farm suitable for tractor operation, the cost of power and labor at 1933 prices was 34 cents less per acre where mules were used. On the farm having 170 acres in crops, which was used to illustrate the maximum acreage one tractor could handle, the cost of power and labor at 1933 prices was \$1.66 more per acre where mules were used. Thus, it is evident that the farmer must consider size of business along with general price level in determining the type of power that should be used.

MECHANIZATION IN RELATION TO ADJUSTMENTS IN AGRICULTURE

The trend toward mechanization in agriculture may be indicated by (1) the substitution of tractor power for animal power, (2) the use of specialized equipment such as combines and other implements that are associated with tractor use, (3) the use of automobiles and trucks for transportation, and (4) the use of electricity on the farm. This combination of technological improvements is what is usually meant by the broad term mechanization. It is impossible to separate the influence of the different phases of technological improvements as they are all part of the broad impact of mechanization in agriculture. For instance, the tractor at the present time is usually required in conjunction with the use of most specialized items of farm equipment; and since the development of rubber tires and trailer equipment for tractors, it is frequently used for transportation both on and off the farm.

This study has been limited to the use of tractors as a source of power and to the use of tractor equipment. The influence of automobiles and trucks and the use of electric power on adjustments in agriculture are recognized but no detailed attempt was made in this report to separate their influence. In fact, this treat-