

principal changes that are apparent are so complex and closely interrelated that it is extremely difficult to separate the influence of mechanization.

The mechanization of farming has increased the responsibilities of management. More of the farm labor is hired on a cash wage basis on tractor farms than on farms operated with mules. The use of tractor equipment requires more skilled management for the adjustment, repairs, and operation of the equipment. The average wage hand has had very little training in the care of modern machinery, therefore, more supervision is usually required by the management.

CONDITIONS FOR LOWEST PER ACRE COSTS

The combination of crops on an individual farm reflects price and cost relationships and the choice of crops is made with the view of maximizing net income. It is important to obtain the most efficient utilization of power that is possible within the limits of the farm organization and, of course, without reducing the net farm income. The maximum use of the tractor and the complementary machinery is essential for lowest cost operation. This section sets forth an example of a typical cropping system representing the maximum acreage which can be handled with one medium tractor and one mule, table 10.

Table 10. Typical cropping system representing the maximum acreage which can be handled with one medium-size tractor and one mule.

Crop	Acres	Crop	Acres
Tobacco	5	Small grain hay	1
Corn	33	Lespedeza hay	5
Cotton	22	Lespedeza seed	7
Peanuts	37	Cover crops	23
Soybeans for beans	19	Garden & other	3
Small grains	15		
		Total	170

The acreage which can be handled with one medium-size tractor and one mule depends upon the distribution of tractor work throughout the year, which in turn depends upon the cropping system. The combination of enterprises on a given farm is determined by the relative prices of farm products, the relationship between and among enterprises, cultural practices, type of equipment used, and the price of cost items. It is the interaction of all of these forces which determine, at any given time, the combination of crop and livestock enterprises. The acreage which can be operated with one tractor will be determined by the nature of the cropping system or enterprise combinations. For instance, if the principal crops do not require intensive cultivation as in the case of small grains, lespedeza, soybeans, and corn a much larger acreage can be handled with a given power unit. Where cotton and peanuts predominate, the acreage that can be adequately cared for is relatively less as these crops are usually cultivated from five to seven times during the growing season.

The distribution of tractor work determines the maximum acreage of crops that can be grown with any given power unit. This distribution of work is necessarily dependent upon the combination of crops but, assuming a given cropping system, either crop acreages must be kept in line with peak requirements for a given period, or the power unit must be increased.

The semi-monthly distribution of tractor work for the representative cropping system is shown in figure 5. ^{4/} Assuming a ten-hour working day and weather permitting 20 suitable days for field work a month, the peak tractor work

^{4/} In determining the amount of tractor work which would be available, it was assumed that with usual weather conditions tractors would be used on an average of about 20 ten-hour days a month. Since tractors do not tire as do workstock it is possible, with the use of improved lights, to extend the working day in rush seasons to nearly 24 hours of working time. If this were done, the maximum acreage per tractor could be increased materially.

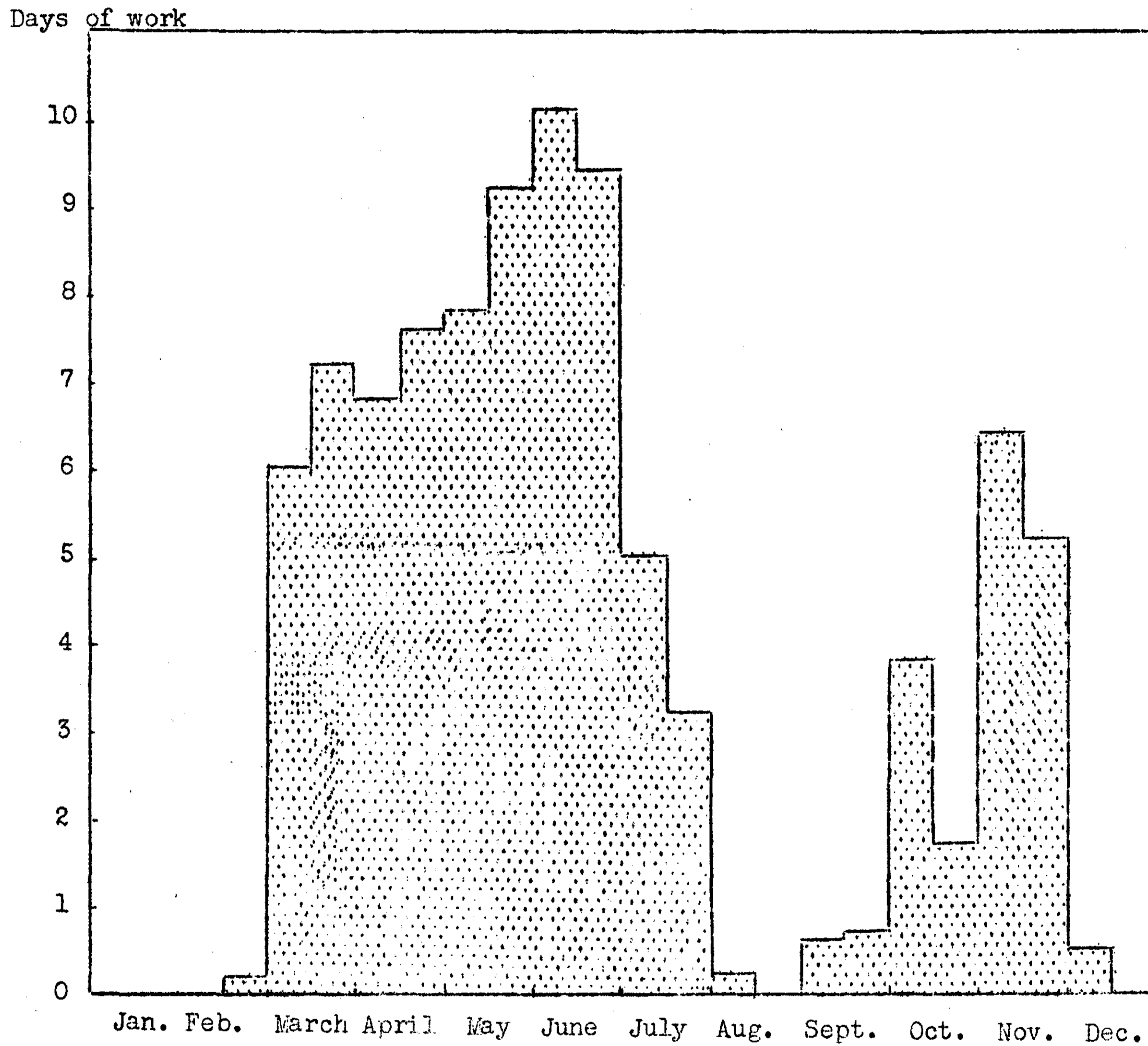


Figure 5. The semi-monthly distribution of tractor work for a typical cropping system of 170 acres that represents the maximum acreage which can be adequately handled with one medium-size tractor and one mule. It is assumed that 20 days of tractor work a month is the practical maximum.

requirements for this crop organization occur during the last half of May and the month of June. Since the peak requirements and the cropping system prevent the tractor from handling a larger acreage of crops, it is obvious that the tractor must remain idle during most of the year unless other suitable work can be found. The cropping system in this illustration requires only 913 hours of tractor work, but it would be impractical to assume that the average tractor would be used much more than this in a normal season.^{5/}

In special cases, where farm labor has become scarce and cropland is not being utilized, it is possible as well as desirable from the farm income aspects to adjust the crop pattern in such a way as to increase the total acreage handled with a given unit. That is, when sufficient labor is not available to produce tobacco, cotton, and peanuts, the farm operator may utilize his resources more effectively by increasing the acreage of crops that require less man labor and less power in their production. Even though per acre returns would be lower for the crops that replaced tobacco, cotton, and peanuts, it is likely that in this situation the net farm income would be greater than if part of the cropland remained idle. Mechanization adds more flexibility to farming systems and provides farm operators with the opportunity of meeting adverse conditions more easily. In addition to being adaptable to changes in the cropping system, tractors can be operated at night in order to meet increased and concentrated needs for cultivation and other operations which may have been caused by unfavorable weather conditions.

Even though the main purpose of this section is to set forth the conditions for lowest per acre operating costs, it should be helpful to compare the cost of power and labor for the two kinds of power. The cropping system in this illustra-

^{5/} Farm belt work and custom work on nearby farms would increase the use of the tractor but the amount of this work available to the average tractor operator is not sufficient to utilize the tractor to full capacity.

tion could be operated with one tractor and one mule or six mules. The cost of power and labor vary considerably depending upon the power unit employed. A summary of power and labor requirements and other related data for mechanized and non-mechanized methods of operating this farm is given in table 11.

Table 11. Comparison of power and labor requirements and related data for mechanized and non-mechanized methods of farming in the Northern Coastal Plains

Item	Tractor power	Mule power
Acres in crops <u>1/</u>	170	170
Number of mules	1	6
Number of tractors	1	0
Number of men (man equivalent)	3.6	4.7
Hours of mule work	660	4,916
Hours of tractor work	913	99
Hours of man labor	7,147	9,450
Power and labor costs <u>2/</u>	\$2,203	\$3,040

1/ See table 10 for the crop organization.

2/ 1943 prices.

If mules are used as the main source of power, the total cost of power and labor at 1943 prices is estimated to be \$3,040.00 or \$18.20 an acre in crops. Approximately 4,917 hours of mule work and 9,450 hours of man labor would be required to produce the crops enumerated.

If one tractor replaced five mules, the total cost of power and labor at 1943 prices would be \$2,203.16 or \$13.19 an acre. To produce the crops enumerated, it is estimated that 660 hours of mule work, 913 hours of tractor work, and 7,147 hours of man labor would be required.

The reduction of \$836.84 or \$5.01 an acre in the power and labor cost on this farm through the substitution of mechanical for animal power reflects the economy of farm mechanization. This change in cost reflects the reduction in power cost and the reduction in labor cost. There is no reason to believe that

crop yields would be different on mechanized and non-mechanized farms, provided production practices were the same. Since the cropping system was identical for both situations, it may be inferred that the reduction in power and labor costs realized when one tractor replaced five mules on this farm represented an addition to the net farm income. Furthermore the grain and hay that would normally be fed to workstock could be used to feed other kinds of productive livestock and should result in an addition to gross farm receipts as well as to net farm income.

MINIMUM REQUIREMENTS FOR SUCCESSFUL TRACTOR OPERATION

The problem of choosing between the use of animal power and tractor power is more difficult on farms with less than 100 acres of crops than on larger farms. If mule power can be dispensed with completely, the comparative economy of mechanical power is greater, consequently the minimum size of farm that could be operated with a tractor would be smaller. If mule power cannot be dispensed with entirely, as in the case where tobacco is found in the cropping system, the minimum size would be larger than where mule power is completely eliminated.

A typical three-mule farm in Halifax County is used to compare power and labor costs with animal or mechanical power, table 12. On this farm it would be necessary to keep one mule for the tobacco crop. This illustration, in which one medium-size tractor replaces only 2 mules, is considered to be representative of marginal cases. Prices prevailing during 1943 were used in comparing the cost of power and labor. Power and labor requirements and other related data are compared for this farm for mechanized and non-mechanized methods of farming in table 13.

The power and labor cost for operating this 60 acre farm with three mules is estimated to be \$1,339.92 or \$23.72 an acre. With animal power, 4,381 hours of man