

and as yet no end to further productivity from these advances is in sight.

Mechanization

In countries where productivity increases have come mainly from mechanization, the principal instrument of the transformation has been the tractor, which is not only the main source of traction power but also of power for many other farm operations. In 1918, there were about 27 million horses and mules in the United States; in 1960, only about 3 million. The number of tractors in operation increased during the same period from about 300,000 to 4.8 million.

The efficiencies leading to this transformation are fivefold: (1) fuel is cheaper than animal feed, (2) land formerly devoted to the production of feed for draft animals is released for other purposes, (3) machines consume fuel only when they are operating, (4) animal maintenance requires more time than machine maintenance, and (5) machines can perform a great many more operations than horses and mules—digging postholes, handling materials, etc.

As the mechanization of agriculture has progressed, manpower directly engaged in agriculture has declined at about the same rate as animal draft power. In the period 1940–60, nearly 20 million members of U.S. farm population migrated to the city; the farm population declined almost 50 percent in a period in which grain output increased by about two-thirds.²

The mere statistics on the increased use of tractors fail to communicate the multiple advantages of the tractor: the immense savings in human labor and other economic outlay on maintenance, and the much-increased facility and flexibility deriving from the use of mechanical power.

The Yearbook of Agriculture, 1960, observes, “the method and equipment used in planting seed can make the difference in getting or not getting a stand.”³ Mechanization has led to much more effective control of the factors involved in getting a good stand, as well as quicker and more timely performance of the operations. A single-row one-horse planter able to average 7 acres a day has given way to a six- or eight-row, tractor-drawn planter that will cover 80 to 100 acres a day. With mechanization, soil and moisture conditions can be more efficiently controlled and the critical planting operation can be carried out at the most favorable time.

Mechanization also improves the efficiency of applying fertilizer. If not properly applied fertilizer may damage the plant or fail to contribute effectively to growth. The protection of crops against weeds and pests is also dependent to a large degree on mechanized operations. As the already staggering number of chemical agents used in weed and pest control increases, with concurrent efficiency and timeliness of application, the time may soon arise when these ancient threats are brought under relatively full control.

Mechanization still has a long way to go before the productivity of Western agriculture reaches an optimum level. This may be illustrated by the labor requirements for an acre of cotton: the first stage of mechanization reduced the labor required to grow and harvest an

² See Philip M. Hauser, “Population Perspectives” (New Brunswick, 1961), and “Scientific American,” July 1961, for detailed appreciation of U.S. Changes.

³ U.S. Department of Agriculture (Washington, 1961). The yearbook is also the source (p. 36) of chart 1.