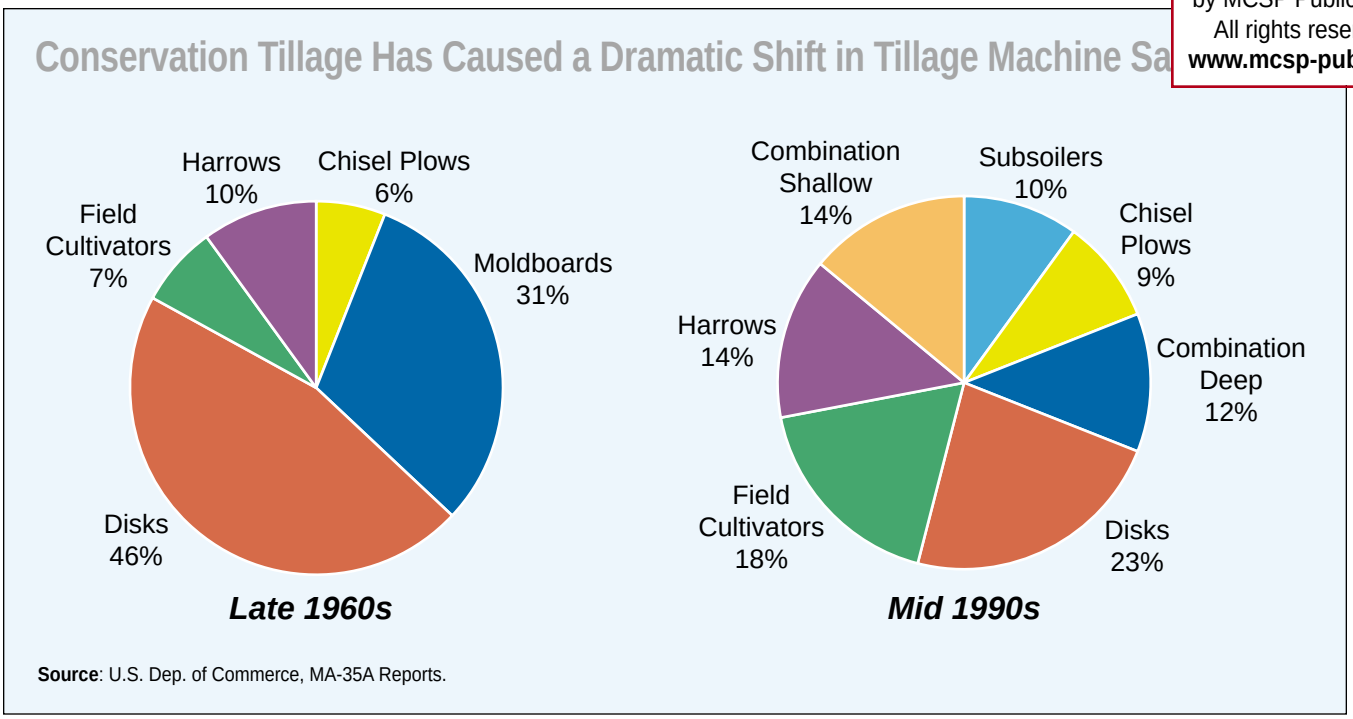

Figure 4.5. Value of U.S. tillage industry shipments in the late 1960s and mid 1990s.

formity of incorporation. Combination machines with field cultivator shanks, disk gangs, and harrow attachments are also commonly used to improve one pass herbicide incorporation (figures 4.3 and 4.6).

Fall Tillage

Deep tillage in the fall by itself may provide little if any potential for higher crop yields. However, it often allows earlier planting than spring tillage. The earlier planting often does increase yields.

The advantages of fall tillage are as follows:

- The slowest part of seedbed preparation is accomplished before the busy spring season.
- If the spring is wet, planting is more likely to be done on schedule where secondary tillage is all that remains to be done. This is of more importance for corn than for soybean or some other crops.
- Exposed soil warms faster in the spring, allowing more vigorous seedling growth.
- If clay soils are fall-tilled, winter freezing and thawing will mellow the clods and improve the structure.
- It is difficult to perform secondary tillage on some soils after deep spring tillage.

Fall tillage also has disadvantages:

- The soil is more exposed to wind and water erosion. These risks can be minimized by leaving the field as rough as possible, not turning under all of the residue, avoiding fields that have small amounts of residues such as soybeans, field beans, and sugar beets, and by leaving narrow, non-tilled strips at right angles to the prevailing wind direction.
- Soils that are high in silt but low in clay tend to run together or slake down over winter, often to a density close to that before tillage. Usually one disking or field cultivation is adequate, however, to prepare the surface for planting.
- A frozen, fall-tilled surface is very rough for spreading manure or fertilizer.

Management Risk

Management levels and risk for different tillage systems vary greatly. On well-drained, coarser-textured soils, no-till may produce the most consistent high yields and have the lowest management risk.

On other soils, having the capability to conduct tillage generally lowers management risk. It simply provides another management option to deal with nutrient, pest, cost and environmental problems. In most corn and soybean regions, almost any tillage and planting system can be used to grow a crop. But the critical question is which system fits within the time, cost, and management constraints for your farm or field.

More and more producers are using a mix of tillage and planting systems to manage risk in their overall operation. Realistic risk assessment is a very personal, but important process in choosing a tillage system. You want to use systems that give predictable performance year in and year out.

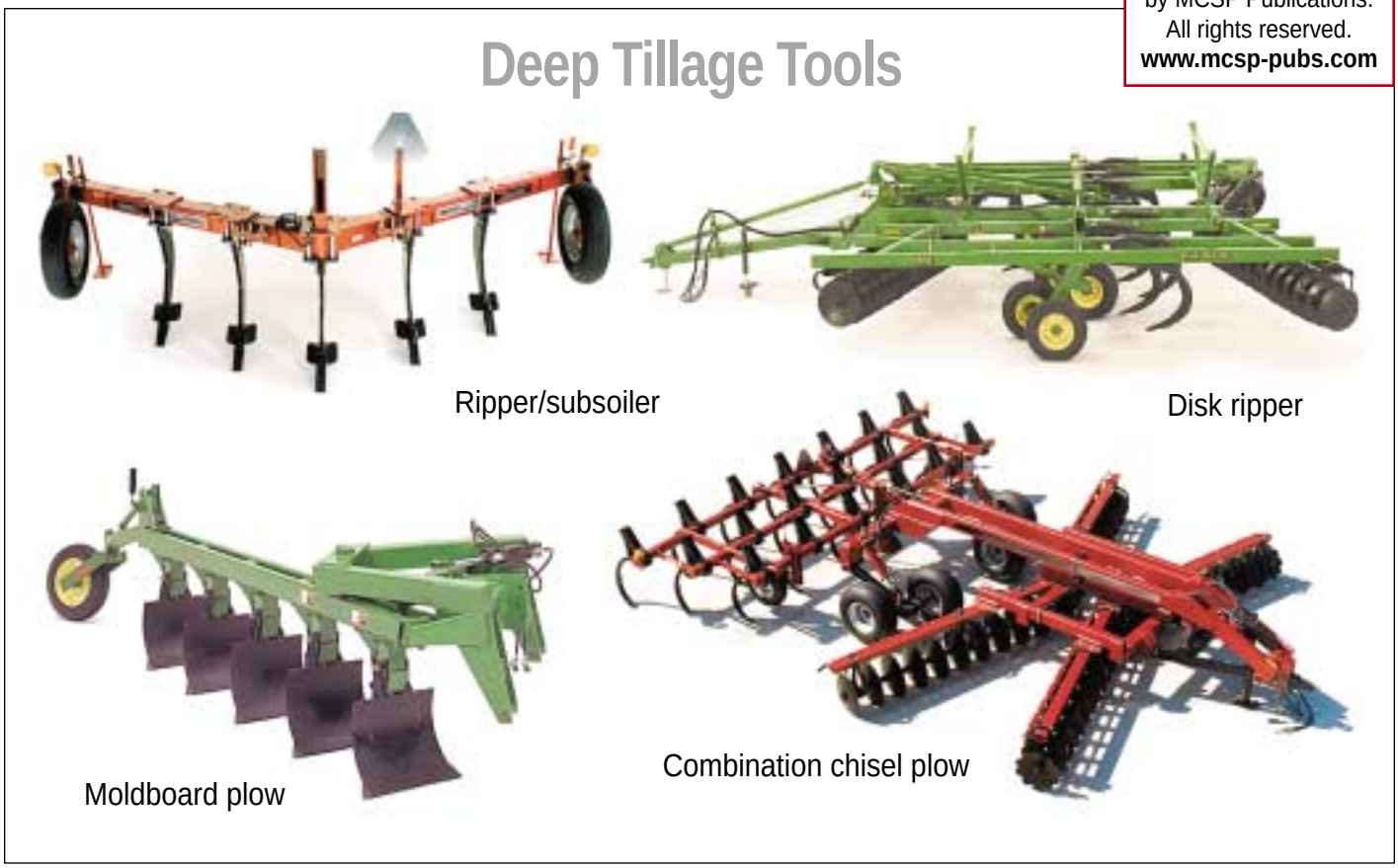

Figure 4.6. Common deep tillage tools.

Profits

When inputs are carefully chosen, widely different tillage systems often have similar costs. The most profitable system is generally the one with the highest yield and/or the lowest management risk.

Using new machine costs, shallow tillage operations generally cost from $2.50 to $6.00 an acre. Deep tillage operations generally cost $6.00 to $12.00 per acre. Time and machine savings from eliminating two or three tillage operations are partially offset by higher planting and sprayer costs for no-till. Where no-till is used, herbicide and other pesticide costs generally go up.

As tillage systems are changed, it is important to keep track of all costs. If you move from anhydrous ammonia to another nitrogen form, nitrogen costs generally go up. Surface application and/or wetter soil conditions can increase total nitrogen needs — this adds to cost, and each 5 pounds of nitrogen consumes the energy in one gallon of diesel fuel.

Other issues need to be considered. If a given tillage system delays maturity in corn, do drying costs go up? Can higher residue systems cut down on need for irrigation water? Have your needs for starter fertilizer changed? Does tillage allow you to use a lower cost incorporated herbicide? Careful attention to all of these costs generally means that good profits can be achieved with a wide range of tillage systems.

3. Tillage Tools and Operations

Types of tillage tools used have changed dramatically during the past 25 years. The U.S. Department of Commerce records the value of tillage equipment produced in the U.S. In the late 1960s very little conservation tillage was used. At that time, over three fourths of the tillage tools produced were disks and moldboard plows used mainly in clean tillage (figure 4.5). Harrows, field cultivators and chisel plows made up the balance.

Today, most tillage machines are able to operate in and maintain surface cover. Also, many more different types of machines are produced. Combination deep and shallow tillage machines have evolved as whole new classes of machines — they perform multiple operations during each field pass.

Moldboard plows sold in the U.S. are now manufactured in Canada and Mexico and are thus not shown in figure 4.5. They account for less than 5 percent of new tillage machine sales.