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CHAPTER 1. REVOLUTIONS ON THE LAND

What is a farm? Farms are areas of land where plants and animals, commonly referred to as crops and livestock, are raised. Crops raised include fruits, vegetables, grains and hay. These are all examples of primary production. Livestock raised includes cows, sheep, goats, pigs, poultry, and horses. These are all primary consumers, and their growth is called secondary production. Plants and animals raised on farms are the main source of food for the world's population.

In years past, each farm included many of the animals listed above, a variety of crops to support the animals, and gardens and orchards where fresh vegetables and fruits were raised for the family. Such diversified farms and farm families were almost self-sufficient.

Figure 1-1. A diversified farmyard common in the past.

Diversified, self-sufficient farms are much less common now. Six revolutions in the 20th century have changed many farms from self-sufficient family operations to highly specialized enterprises. The revolutions are:

The mechanical revolution,
The technological revolution,
The biological revolution,
The business revolution,
The social revolution, and
The information revolution.

Before these revolutions, farming was labor-intensive. Farmers and their families put in long hours every day, planting and harvesting different kinds of crops and caring for different kinds of livestock. The work was done with hand tools and animal power. Now, farming is capital-intensive. Large amounts of money are needed to purchase machines and materials used to raise crops and livestock. A brief review of the revolutions follows.

TOPIC 1. THE MECHANICAL REVOLUTION

The mechanical revolution centered about the development of the tractor. Early tractors were "pulling machines," and horse-drawn implements were converted to tractor-drawn implements. the tractor quickly developed into more than a pulling machine, however, and specialized implements, many of them mounted directly on the tractor, came into use.

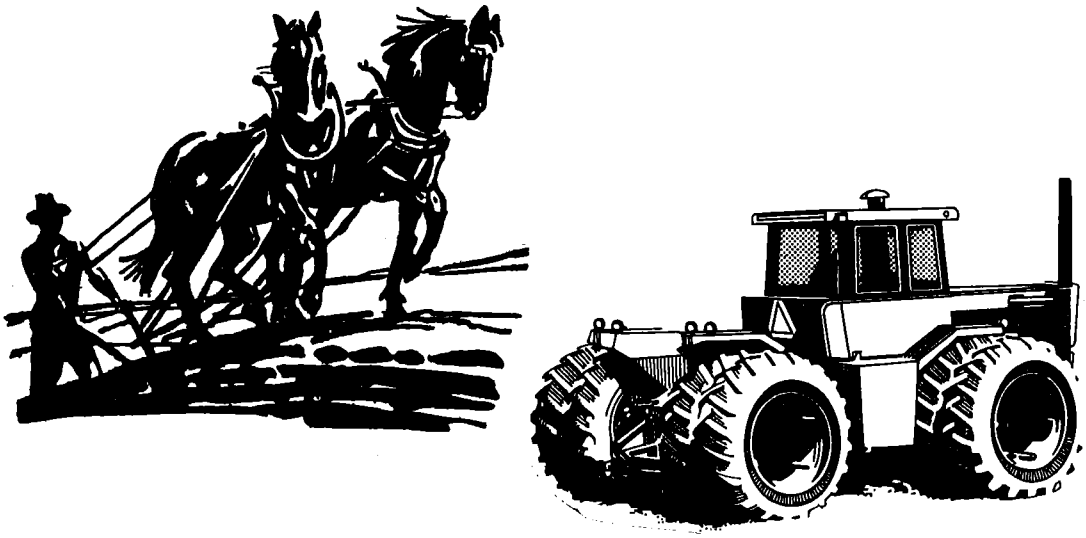


Figure 1-2. Labor-intensive(left) and capital-intensive (right) sources of power.

The tractor changed farming from a labor-intensive to a capital-intensive operation. The farmer must not only buy a tractor, but the fuel to power it and the implements to go along with it. Individual farmers may have several hundred thousand dollars invested in machinery.

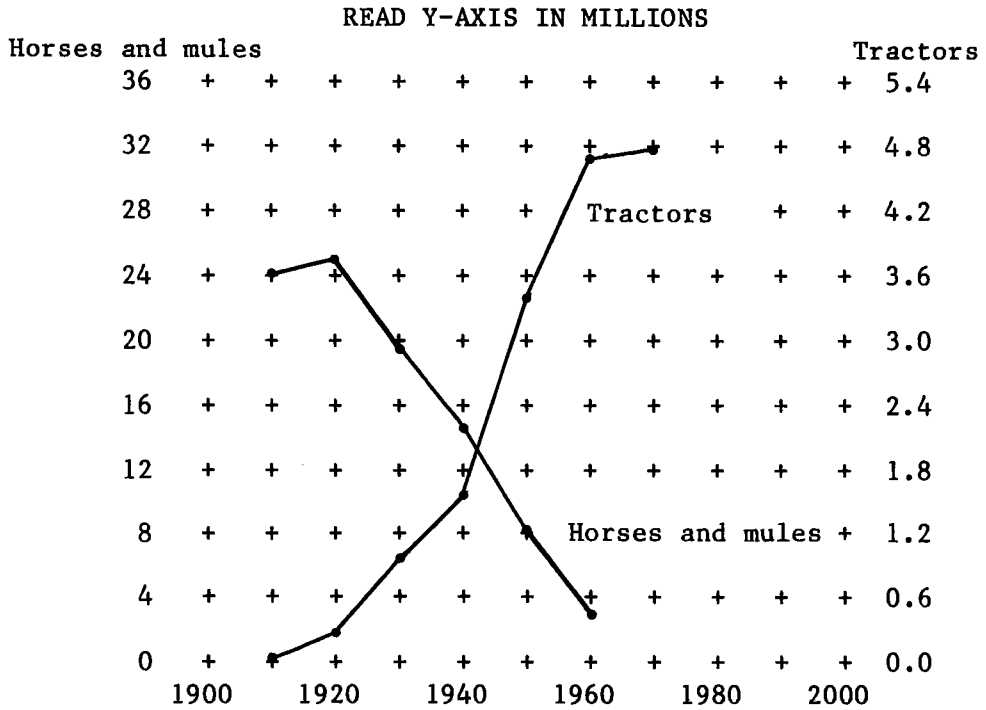


Figure 1-3. Changing sources of farm power from 1910 to 1960. (Source: Yearbook of Agriculture, 1960, and U.S. Bureau of Census, 1976).

TOPIC 2. THE TECHNOLOGICAL REVOLUTION

The technological revolution includes development of inorganic fertilizers, insecticides, pesticides, and herbicides, and development of barns and livestock shelters that are very different from those built even a few years ago. This revolution has dramatically changed the ways in which crops and livestock are grown. Earlier organic approaches to crop and livestock raising included rotation of different crops from year to year with a variety of farm animals consuming these crops. Crops were planted, weeded, and harvested by hand or with machines pulled by horses or tractors. Animals grazed in pastures, minimizing feeding by hand, and manure handling for part of the year at least. The several crop and livestock enterprises made balanced use of land and labor, and a minimum of feed, perhaps only protein supplements, as purchased off the farm.

Farms are much more specialized now. Grain farms, dairy farms, beef farms, hog farms, chicken farms, and turkey farms are examples of specialized enterprises found in different parts of the country. Plant and animal production is balanced over a large area rather than on a single farm.

Grain farms of several hundred to several thousand acres supply the grain and forage needed for specialized dairy farms. Dairy farms feed the grain and forage to milk cows and their offspring, and milk is sold to processing plants where it is made into dairy products for the household consumer.

Beef farms specialize in raising brood cows for the production of feeder calves which are raised for market. Hog farms raise hundreds or even thousands of hogs housed in specialized facilities and fed special formulated rations. Chicken farms specialize in egg production or broiler production. Turkey farms specialize in meat production, raising turkeys from day-old poults to desirable table weights. The grains for the feed rations come from grain farmers who sold grain to feed companies who formulate rations for different kinds, ages and production classes of livestock.

TOPIC 3. THE BIOLOGICAL REVOLUTION

A quiet but significant revolution has occurred as the genetic characteristics of both plants and animals have been developed for greater potential production, for easier management, for resistance to diseases, and for characteristics that are more desired by the consumer. Hybrid corn was a major major genetic development, followed by hybrid wheat and a host of new varieties of small grains. Different varieties of small grains are resistant to diseases. Dwarf and semi-dwarf fruit trees make harvesting more efficient, and sweet corn with higher sugar content has been developed. Higher-producing milk cows are the result of greater selection, and hogs with much less fat and more lean meat are much preferred by the consumer.

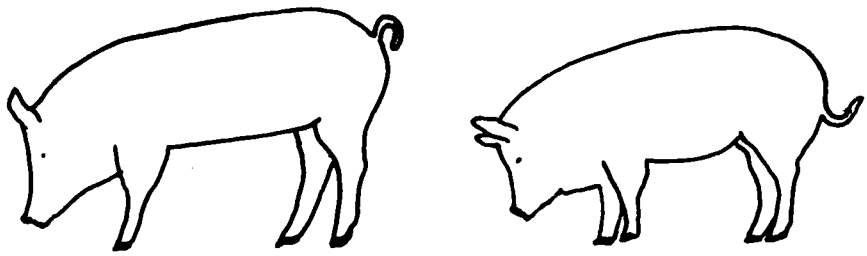


Figure 1-4. The appearance of hogs has changed in recent years . Silhouette of low-fat (left) and high-fat (right) Yorkshire hogs.

TOPIC 4. THE BUSINESS REVOLUTION

The business revolution in farming resulted from new needs for and methods of farm financing and financial management. Prior to 1920, farmers went in debt to buy land but paid cash or borrowed only small amounts to get established with a dairy cow or two, a team of horses, and minimum of machinery. Farms were quite self-sufficient, and only a few small hardware items were purchased off the farm. Now, farmers invest thousands of dollars in land, livestock, seed, fertilizers, and herbicides to grow their crops, and in machinery to plant and harvest the crops and feed the livestock. Large expenditures are handled by credit; farmers generally borrow the money necessary to plant the crops and to purchase the livestock to be fed and sold each year. Bankers and loan offices are very much a part of the lives of most farmers.

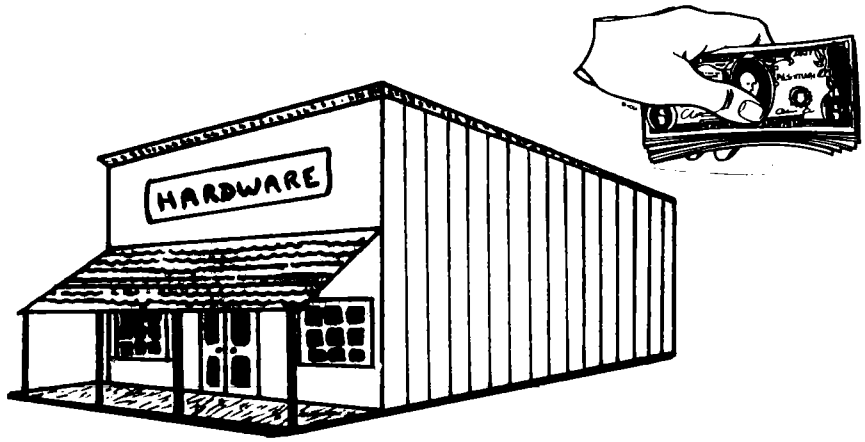


Figure 1-5. The country hardware store no longer supplies the needs of farmers from one season to the next; banks are very much a part of farm operations.

TOPIC 5. THE SOCIAL REVOLUTION

A fifth revolution was inevitable as a result of the previously described revolutions. Social changes must occur when a segment of society goes from a labor-intensive to a capital-intensive way of life. Farmers must go to town to do business, and the technologies that have changed farming have also changed travel and communication. Farms are no longer the isolated, rural outposts they once were. Now they are connected to the rest of the world by telephone, radio and television just as urban and suburban people are. Most farms are within minutes--seldom more than an hour--of business and shopping centers. Schools are centralized, and school buses provide transportation each day so farm and city school children mix together in daily life.

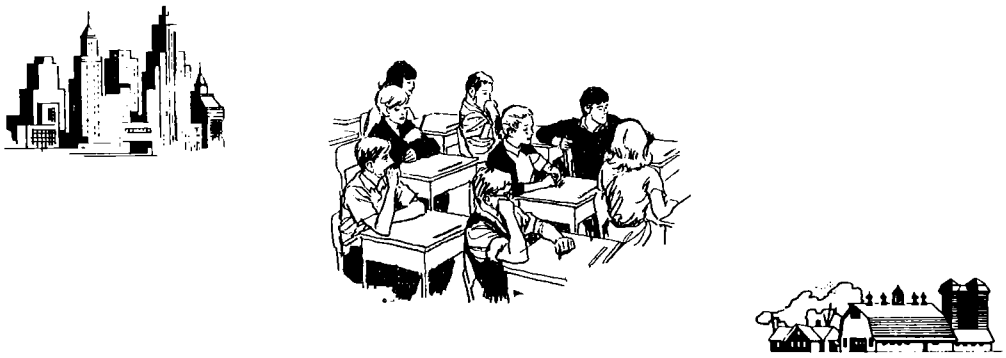


Figure 1-6. The social revolution has brought urban and rural folks together.

It appears that farm kids learn more from experiences about city life than city kids learn about farm life, whether by experience or from radio and television. Urban and suburban life is depicted regularly on television programs, whereas programs on farm life are often nostalgic in orientation, such as "Little House on the Prairie." Further, Conklin (1982) summarizes results of a Media Institute survey which showed that farmers and ranchers are "generally presented as not very bright," and "usually detrimental to the environment," and that "MI found most businessmen portrayed on the tube as greedy criminals or stupid buffoons." It is hard to promote understanding when such images of farmers and businessmen are magnified by television.

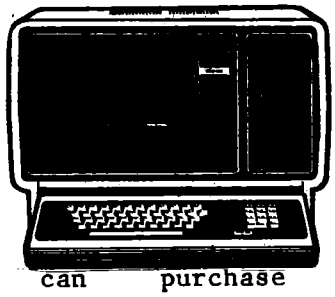
Wildlife seems to be of greater concern to more people now than ever before. Half-minute spot announcements about the environment and wildlife reach millions of TV viewers, and many young persons become interested in pursuing careers in widlife and environmental biology as a result of these. Then, as a wildlife biologist, they come in contact with a group of businessmen called farmers who own or manage much of the land that provides not only much of the habitat for wildlife populations, but also food for a growing national and world population. The young people who go to the University to be wildlife biologists and conservationists should know about farms and farmers, about farming and business in order to make rational judgments when involved in natural resource management decision-making procedures.

TOPIC 6. THE INFORMATION REVOLUTION

A recent and subtle revolution has occurred in the last few years that will come on society in full force in the years immediately ahead. The information revolution (which

is not the discovery of new information) centers on the processing of information, on the availability of information, almost instantaneously, almost anywhere. There has always been a generation gap between the agricultural scientist and the farmer, simply because it takes time for ideas to be transmitted from experimental farms to commercial farms, and for commercial farms to make transitions to new equipment, techniques and varieties. The information revolution will shorten that gap considerably.

The microcomputer is the central tool in the information revolution, and the rise in college-educated young farmers the means for it's rapid adoption. Farm magazines--Hoard's Dairyman, for example--has a classified section titled COMPUTER SERVICES. Listed there are such things as "Systems for Dairymen," "Dairy Ration Systems," and "Farm Weather Center Systems," and software which analyzes weather records and estimates crop development stage, soil moisture, etc. These are not ideas; they are working programs, available to the commercial farmer who can purchase a microcomputer and appropriate software for the price of 3 cows. The University of Florida lists over 1500 computer programs available to farmers for production and business purposes (Strain and Fieser 1982). On the day of this writing, I look forward to a seminar tomorrow on the use of microcomputers in Animal Nutrition at Cornell University. Decision-making may now be based on the evaluation of many more facts, with both inputs and outputs the responsibility of the farmer.



We are rapidly entering the "information age," and making a transition as important as that of the "industrial age" some 150 years ago. In Successful Farming, a monthly magazine of farm management, there is an account of a 61-year-old farmer who had graduated from Arkansas State University nearly 40 years ago when matching mules for a team was still part of an ag class. Recently enrolled in a computer course, he said: "Farmers were making the transition from mules to tractors then . . . today, we're moving to computers--just as important a step" (Anon. 1982).

The forward-looking wildlife biologist will be ready for the new age, with computer programs evaluating the effects of different management practices on wildlife habitats and wildlife that are as sophisticated as those of the farmer for evaluating the effects of different management practices on crops and livestock. I present this as a challenge to wildlife professors and students; educate for the future, not the present.

TOPIC 7. SUMMARY

What are the net results of these revolutions? High farm output, an even higher output per hour of labor, and a reduction in man-hours of farmwork. The trends are illustrated in Figure 1-7 as multiples in relation to 1910 levels, prior to these revolutions.

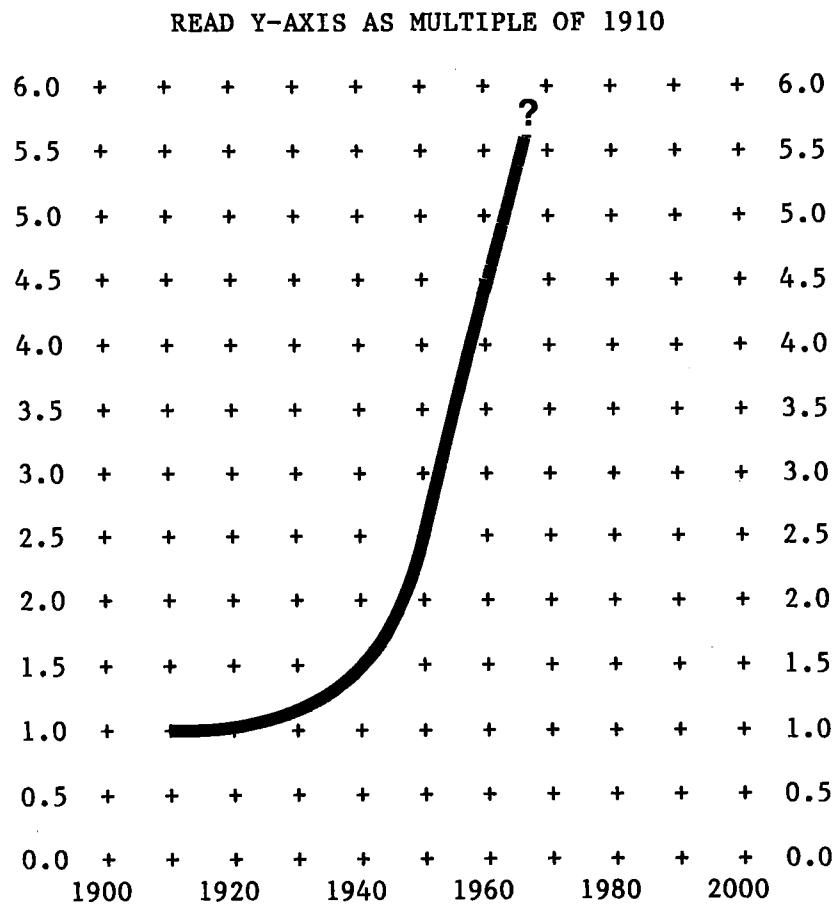


Figure 1-7. Efficiency in use of farm labor for total farm production, represented as a multiple of 1910-12. (Source: Yearbook of Agriculture 1960.)

Labor-intensive farming operations must be diversified in order to spread labor requirements out over the year. Capital-intensive farming operations must be specialized in order to reduce capital outlays, since a wide variety of machines are necessary for a wide variety of production enterprises. Then, one operator accomplishes a lot of work in a short period of time, using fewer machines much more intensively.

Changes in farm operations have affected wildlife habitats immensely. Before going into the details of farming, let us review the domestic and wildlife species common to farms in Chapters 2 and 3 and then proceed to discussions of farm enterprises in the next several Chapters.

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