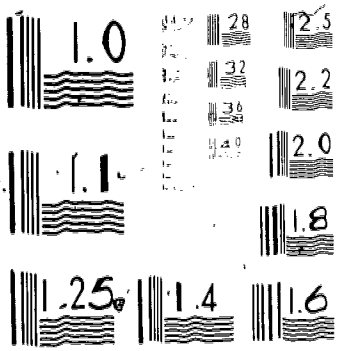

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ABSTRACT

Focusing on occupations in agriculture and logging and lumber mill products industries, this document is one in a series of forty-one reprints from the Occupational Outlook Handbook providing current information and employment projections for individual occupations and industries through 1985. The specific occupations covered in this document include conservation occupations (foresters, forestry technicians, range managers, soil conservationists), agriculture occupations (farm production, agricultural service, agribusiness, and agricultural research), cooperative extension service workers, and occupations in logging and lumber mills. The following information is presented for each occupation or occupational area: a code number referenced to the Dictionary of Occupational Titles; a description of the nature of the work; places of employment; training, other qualifications, and advancement; employment outlook; earnings and working conditions; and sources of additional information. In addition to the forty-one reprints covering individual occupations or occupational areas (CE 017 757-797), a companion document (CE 017 756) presents employment projections for the total labor market and discusses the relationship between job prospects and education. (BM)

Agriculture and Logging and Lumber Mill Products Industries

Reprinted from the
Occupational Outlook Handbook,
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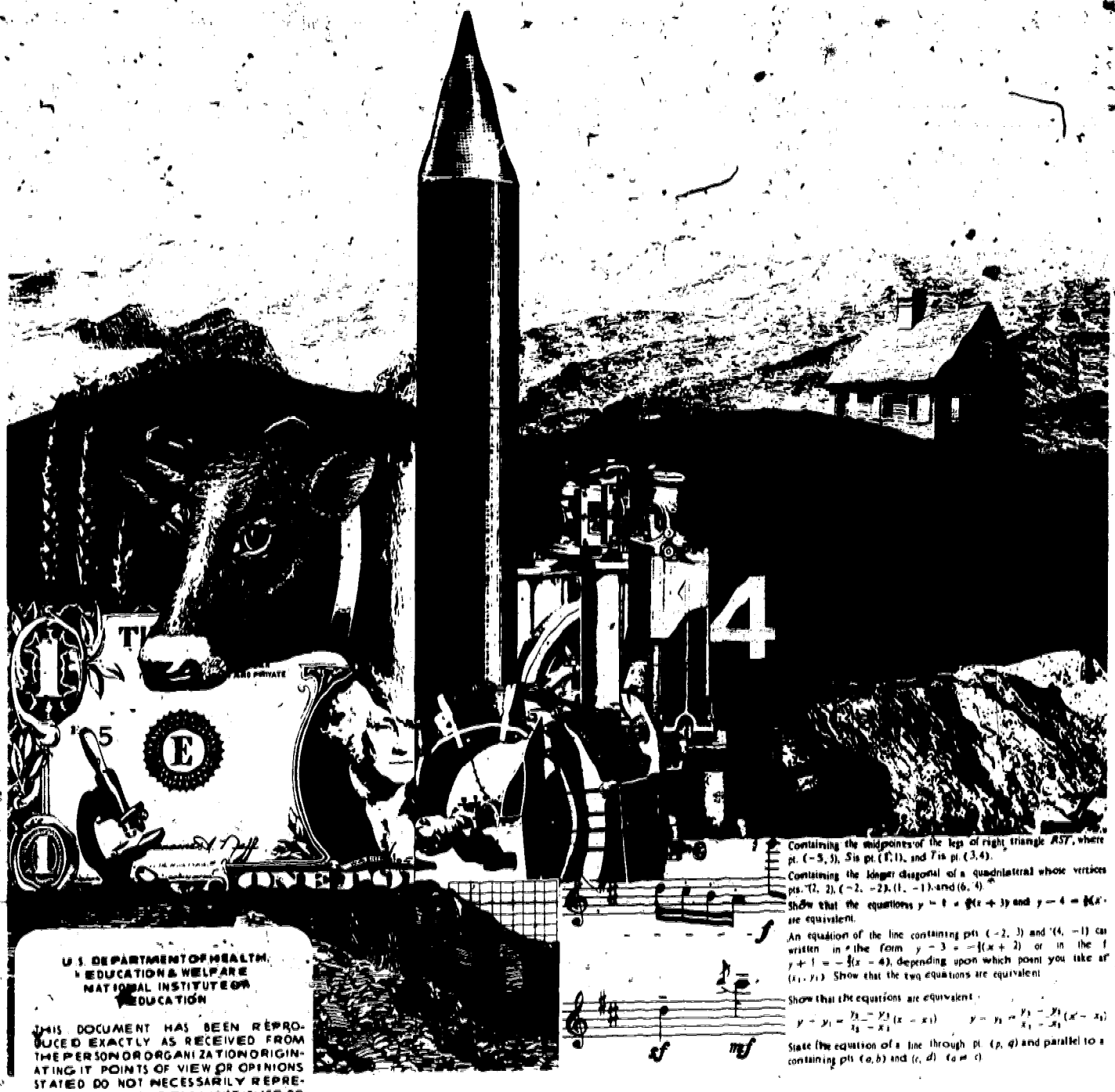
1978

Bulletin 1955-36



Containing the midpoints of the legs of right triangle RST, where pt. $(-5, 5)$, S is pt. $(1, 1)$, and T is pt. $(3, 4)$.

Containing the longer diagonal of a quadrilateral whose vertices pts. $(2, 2)$, $(-2, -2)$, $(1, -1)$, and $(6, 4)$.

Show that the equations $y - 1 = \frac{2}{3}(x + 3)$ and $y - 4 = \frac{2}{3}(x$ are equivalent.

An equation of the line containing pts $(-2, 3)$ and $(4, -1)$ can written in the form $y - 3 = -\frac{2}{3}(x + 2)$ or in the f $y + 1 = -\frac{2}{3}(x - 4)$, depending upon which point you take as (x_1, y_1). Show that the two equations are equivalent.

Show that the equations are equivalent:

$$y - y_1 = \frac{y_2 - y_1}{x_2 - x_1}(x - x_1) \qquad y - y_2 = \frac{y_2 - y_1}{x_2 - x_1}(x - x_2)$$

State the equation of a line through pt. (p, q) and parallel to a containing pts (a, b) and (c, d) $(a \neq c)$.

CONSERVATION OCCUPATIONS

Forests, rangelands, wildlife, soil, and water are important natural resources. Conservationists protect, develop, and manage these resources to assure that future needs will be met.

Persons interested in a career in conservation must have specialized training. Foresters, range managers, and soil conservationists generally need bachelor's degrees in their fields. Technical school is usually required for positions as forestry technicians. In addition to technical knowledge and skills, conservationists must have a sincere interest in the environment and the desire to protect it. They should enjoy dealing with others and like public service, since they often work with people in the community. Flexibility also is important, since a conservationist may work in a remote camping area one week, speak to a community group the next, and fight a forest or brush fire the next.

This section describes four conservation occupations—forester, forestry technician, range manager, and soil conservationist.

FORESTERS

(D.O.T. 040.081)

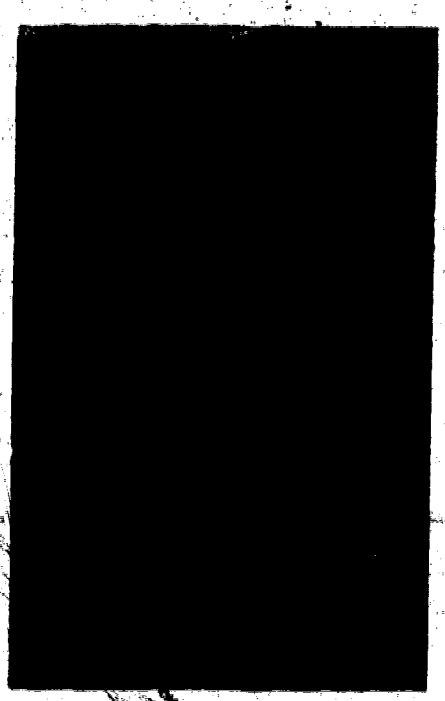
Nature of the Work

Forests are a vital natural resource. They can be used repeatedly without being destroyed—if properly managed. The condition of our environment has become a major national concern, and foresters play an important role in protecting that environment by ensuring that our forests are properly used. Foresters manage, develop, and protect these lands and their resources—timber, water, wildlife, forage, and recreational areas.

Foresters plan and supervise the cutting and planting of trees. They also protect the trees from fire, harmful insects, and disease. Foresters may be responsible for other duties ranging from wildlife protection and watershed management to the development and supervision of camps, parks and grazing lands.

Foresters also do research, provide forestry information to forest owners and to the general public (called extension work), and teach at colleges and universities.

Foresters often specialize in one area of work, such as timber management, outdoor recreation, or forest economics. Some of these areas are recognized as distinct professions.



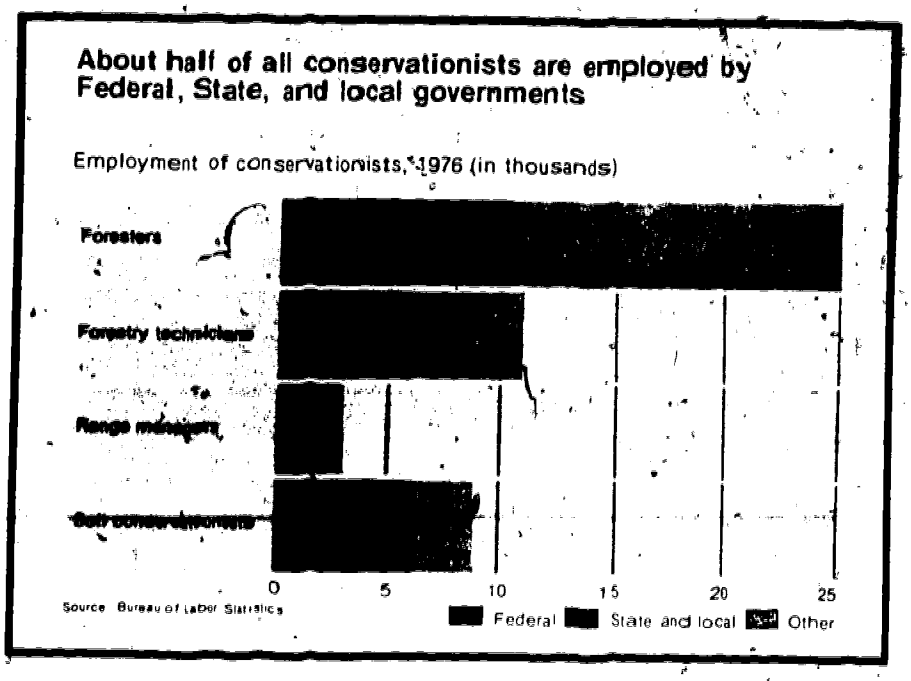
Foresters spend considerable time outdoors in all kinds of weather.

Places of Employment

About 25,000 persons worked as foresters in 1976. Nearly 2 out of 5 worked in private industry, mainly for pulp and paper, lumber, logging, and milling companies. About one-fourth worked for the Federal Government, primarily in the Forest Service of the Department of Agriculture. The remainder worked for State and local governments, colleges and universities, or consulting firms or were self-employed, either as consultants or forest owners.

Training, Other Qualifications, and Advancement

A bachelor's degree with a major in forestry is the minimum educational requirement for those desiring professional careers in forestry. However, due to keen job competition and the increasingly complex nature of the forester's work, employers prefer graduates who hold advanced degrees. Certain jobs such as teaching and research require advanced degrees.



Education in forestry leading to a bachelor's or higher degree was offered in 1976 by 50 colleges and universities, of which 43 were accredited by the Society of American Foresters. Curriculums stress the liberal arts and communications skills as well as technical forestry subjects. Most programs also include courses in forest economics and business administration to supplement the student's scientific and technical knowledge. Many colleges require students to spend one summer in a field camp operated by the college. All schools encourage summer jobs that give firsthand experience in forest or conservation work.

In addition to meeting the intellectual demands of forestry, foresters must enjoy working outdoors, be physically hardy, and be willing to move, often to remote places. Foresters should also be able to work well with people and be able to express themselves clearly.

Forestry graduates usually work under the supervision of experienced foresters. After gaining experience, they may advance to more responsible positions. In the Federal Government, an experienced forester may supervise an entire forest area, and may advance to regional forest supervisor or to a top administrative position. In private industry, foresters start by learning the practical and administrative aspects of the business. Many foresters work their way up to top managerial positions within their companies.

Employment Outlook

Employment requirements for foresters are expected to grow about as fast as the average for all occupations through the mid-1980's. In recent years, however, the number of persons earning degrees in forestry has exceeded occupational requirements, creating competition for jobs. If the number of degrees granted each year remains at present levels, competition is expected to persist throughout the period. Opportunities will be better for those who can offer an employer either an advanced degree or several years' experience.

The country will need more foresters in the future to ensure an increasing output of forest products. Employment also may increase as we become more aware of the need to conserve and replenish our forest resources, and to improve the environmental quality of our forest lands.

Private owners of timberland may well employ more foresters as they recognize the need for—and the higher profitability of—improved forestry and logging practices. The forest products industry will require additional foresters to apply new techniques for using the entire forest crop, to develop methods of growing superior trees in a shorter period of time, and to do research in the fields of plant genetics and fertilization.

Employment of foresters will probably continue to grow faster in private industry than in the Federal Government where budget limitations may restrain growth. State government agencies will probably hire more foresters through Federal-State cooperative programs for fire control, protection against insects and disease, recreation, and technical assistance to owners of forest lands.

The expected rapid increase in the employment of forestry technicians will reduce the amount of time spent by foresters in performing routine tasks, but the forester will have to devote more and more time to supervisory work and to the general management of the forest.

Earnings and Working Conditions

The average starting salary for foresters in 1976 was $10,000 a year, while experienced foresters averaged over $18,000, according to the limited data available.

In private industry, starting foresters averaged $10,300 a year in 1976 and the overall average salary was $17,700, according to the limited data available.

Graduates entering the Federal Government as foresters in 1977 with just a bachelor's degree started at $9,303 a year. However, because of keen competition, most foresters hired by the Federal Government either held a master's degree or had some experience, and generally started at $11,523 a year. Ph. D.'s generally started at $14,097 or $17,056 a year. The median annual salary in 1977 for federally employed foresters exceeded $20,000.

In local government, foresters generally began at about $10,700 a year in 1976, while their median annual salary was $15,400. State governments paid about $9,200 annually to start in 1976, and State median salaries were $15,400 per year. College professors generally started at about $11,000 annually in 1976, while their median salary was over $20,000 per year. Many faculty foresters supplement their regular salaries with income from lecturing, consulting, and writing.

Many experienced foresters advance to jobs which require them to spend most of their time in an office. However, the beginning forester spends considerable time outdoors in all kinds of weather, sometimes in remote areas. Foresters may also work extra hours on emergency duty, as in firefighting or search and rescue missions.

Sources of Additional Information

General information about the forestry profession, lists of reading materials, and lists of schools offering education in forestry are available from:

Society of American Foresters, 5400 Grosvenor Lane, Washington, D.C. 20014.

National Forest Products Association, 1619 Massachusetts Ave., NW., Washington, D.C. 20036.

General career information is also available from:

American Forest Institute, 1619 Massachusetts Ave. NW., Washington, D.C. 20036.

American Forestry Association, 1319 18th St. NW., Washington, D.C. 20036.

For details on forestry careers in the Forest Service, contact:

U.S. Department of Agriculture, Forest Service, Washington, D.C. 20250.

FORESTRY TECHNICIANS

(D.O.T. 441.137 through 441.887)

Nature of the Work

Forestry technicians, sometimes called forestry aides in entry level

positions, assist foresters in the care and management of forest lands and their resources. (See statement on foresters earlier in this chapter.)

Forestry technicians help estimate present and potential timber production in a certain area. If new roads are needed to make the timber accessible for cutting and removal, technicians may supervise the surveying and road building crews. After the timber has been cut, they measure the logs to determine how much lumber the trees will yield and then assist in the sale of the timber.

Technicians work on many forest improvement projects. They inspect trees for disease and other problems, and record their findings. On watershed projects, they work to prevent flood damage and soil erosion and seek ways to increase the quality of water in the forest.

Forestry technicians also help to prevent and control fires. They give fire prevention information to people using the forest and lead firefighting crews if a fire occurs. After fires are extinguished, they take inventory of burned areas and supervise the planting of new trees and shrubs to restore the forest.

Recreational use of the forest has increased greatly. Technicians maintain forest areas for hunting, camping, hiking, and other recreational activities. They also explain forest regulations and policies to visitors and enforce these rules.

Forestry technician measuring the diameter of a tree.

Places of Employment

About 11,000 persons worked year round as forestry technicians in 1976. Nearly the same number found temporary employment—primarily with Federal and State Governments—during the summer or in the spring and fall fire seasons.

Nearly half the year-round total worked in private industry, mainly for logging, lumber, and paper companies. Reforestation projects of mining, oil, and railroad companies—as well as employment in tree nurseries—accounted for the remainder of the workers in private employment. The Federal Government employed about 3,700 full-time forestry technicians in 1976, primarily in the Forest Service of the U.S. Department of Agriculture, while another 2,200 worked for State governments.

Training, Other Qualifications, and Advancement

Most persons qualify for beginning jobs as forestry technicians by completing a specialized course of study in a 1- or 2-year postsecondary school or through work experience on firefighting crews, in tree nurseries, or in recreation work.

Because of keen job competition at the present time, opportunities for employment are better for those with postsecondary school training. In 1976, about 80 technical institutes, junior or community colleges, and universities offered forestry technician training, of which 53 are recognized by the Society of American Foresters.

Most forestry technician schools require graduates to complete general education courses such as mathematics and English, forestry-related courses including biology and botany, and specialized forest technol-

ogy courses such as land surveying, tree identification, aerial photograph interpretation, and timber harvesting. To gain practical experience, students may be required to work in a forest or camp operated by the school.

Enthusiasm for outdoor work, physical stamina, and the ability to carry out tasks with and without direct supervision are essential for success in this field. Technicians should be able to work with survey crews, users of the forest lands, forest owners, and foresters. They must express themselves clearly when talking to others and when making written reports.

Forestry technicians generally begin work as trainees or in relatively routine positions under the direct supervision of an experienced technician or forester. As technicians gain experience, they are given more responsibility, and often move into supervisory positions. Some technicians obtain bachelor's degrees in forestry and are promoted to the forester level.

Employment Outlook

Growth in employment of forestry technicians is expected to be faster than the average for all occupations through the mid-1980's. Private industry should continue to provide a high proportion of these jobs.

Environmental concern, a rising demand for forest products and increased use of technology in the forest industry are expected to stimulate demand for more technicians each year. Trained technicians will be required to operate specialized and efficient laborsaving machines and to help apply sophisticated scientific methods to forest management. Technicians will also increasingly perform many of the more routine jobs done by foresters.

Despite this expected growth, keen competition for jobs is anticipated. Currently, the number of persons seeking employment as forestry technicians greatly exceeds the jobs available. Unless the number of graduates of forestry technician schools declines substantially in the future, this keen competition for jobs is expected to continue. Those offering specialized forestry technician training and some practical experience may have better opportunities.

Earnings and Working Conditions

Starting salaries of forestry technicians ranged from $7,500 to $10,000 a year in 1976, according to the limited data available; experienced forestry technicians averaged about $12,300.

In the Federal Government, forestry technicians started at $8,316 or $9,303 a year in 1977 depending on education and experience. Experienced forestry technicians in the Federal Government averaged between $12,000 and $13,000 annually.

Forestry technicians spend considerable time outdoors in all kinds of weather, sometimes in remote areas. In emergencies, such as fighting fires and controlling floods, forestry technicians work many extra hours. Climatic conditions often limit year-round field work, and firefighting jobs are limited to the fire season.

Sources of Additional Information

Information about a career in the Federal Government as a forestry technician is available from:

U.S. Department of Agriculture, Forest Service, Washington, D.C. 20250.

For a list of schools recognized by the Society of American Foresters offering training in the field write to:

Society of American Foresters, 5400 Grosvenor Lane, Washington, D.C. 20014.

RANGE MANAGERS

(D.O.T. 040.081)

Nature of Work

Rangelands cover more than 1 billion acres of the United States, mostly in the Western States and Alaska. They contain many natural resources: grass and shrubs for animal grazing, habitats for livestock and wildlife, water from vast watersheds, facilities for water sports and other kinds of recreation, and valuable mineral and energy resources. Rangelands also serve as areas for scientific study of the environment.

Range managers, sometimes called *range scientists*, *range ecologists*, or *range conservationists*, manage, improve, and protect range resources to maximize their use without incurring ecological destruction. For example, range managers determine the number and kind of animals to be grazed, the grazing system to be used, and the best season for grazing in order to yield a high production of livestock. At the same time, they must conserve soil and vegetation for other uses such as wildlife habitat, outdoor recreation, and timber production.

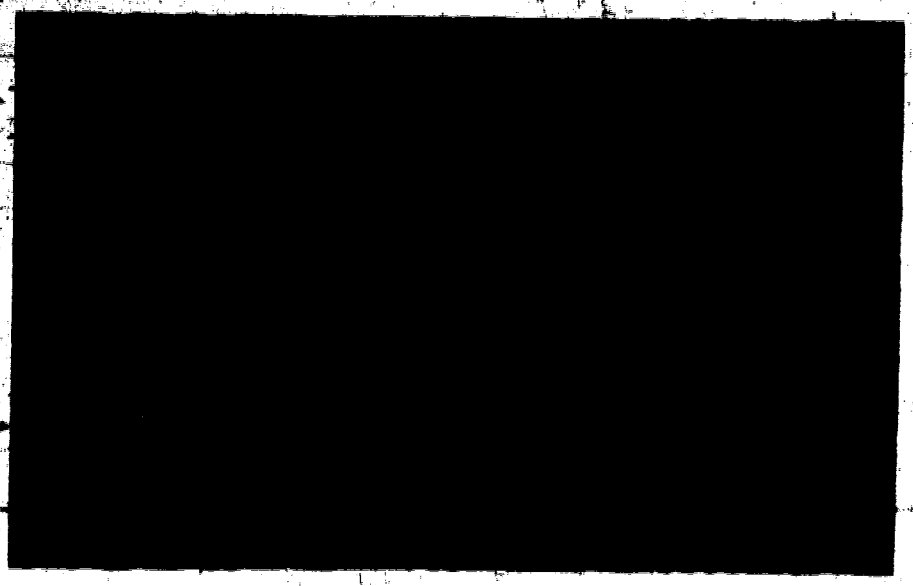
Range managers restore and improve rangelands through techniques such as controlled burning, reseeding, and biological, chemical, or mechanical control of undesirable plants. For example, selected rangelands with natural sagebrush vegetation may be plowed and reseeded with a more productive grass. Range managers also determine the need for and carry out range conservation and development such as providing for animal watering facilities, erosion control, and fire prevention.

Not all of the range manager's time is spent outdoors. Office work is not unusual. The range manager may consult with other conservation specialists, prepare written reports, and perform certain administrative duties.

Because of the multiple use of rangelands, range managers often work in such closely related fields as wildlife and watershed management, forest management, and recreation.

Places of Employment

About 3,000 persons worked as range managers in 1976. The majority worked for the Federal Government, principally for the Forest Service and the Soil Conservation Service of the Department of Agriculture and the Bureau of Land Management of the Department of the Interior. Range managers in State governments are employed in game and fish departments, State land agencies, and extension services.



Range managers may spend considerable time away from home working outdoors in remote parts of the range.

An increasing number of range managers are working for private industry. Coal and oil companies employ range managers to help restore the ecological balance to mined out areas. Banks and real estate firms employ them to help increase the revenue from their landholdings. Other range managers work for private consulting firms and large livestock ranches.

Some range managers with advanced degrees teach and do research at colleges and universities. Others work overseas with United States and United Nations agencies and with foreign governments.

Training, Other Qualifications, and Advancement

A bachelor's degree with a major in range management or range science is the usual minimum educational requirement for range managers. In the Federal Government, a degree in a closely related field, such as agronomy or forestry, including courses in range management and range science, may also be accepted. Graduate degrees in range management are generally required for teaching and research positions, and may be helpful for advancement in other jobs.

In 1976, about 20 colleges and universities had degree programs in range management or range science. A number of other schools offered course work in range management.

A degree in range management requires a basic knowledge of biology, chemistry, physics, mathematics, and communication skills. Specialized courses combine plant, animal, and soil sciences with principles of ecology and resource management. Desirable electives include economics, computer science, forestry, wildlife, and recreation.

Federal Government agencies, primarily the Forest Service, the Soil Conservation Service, and the Bureau of Land Management, hire some college students for summer jobs in range management. This experience may better qualify these students for jobs when they graduate.

Besides having a love for the outdoors, range managers should be able to write and speak effectively and work with others. They should have the ability to work alone or under direct supervision. Good physical health and stamina also are important.

Employment Outlook

Employment of range managers is expected to grow faster than the average for all occupations through the mid-1980's. Job opportunities throughout this period are expected to be good for persons with degrees in range management or range science. Also, some jobs may be filled by persons with degrees in related fields who have had some range management courses.

An increasing demand for meat and other rangeland products should stimulate the need for more range managers. Since the amount of rangeland is generally fixed, range managers will be needed to increase the output of rangelands while protecting their ecological balance. Also, more range managers will be needed as the number of large livestock ranches increases.

As oil and coal exploration accelerates, private industry will probably require many more range specialists to rehabilitate ecologically disturbed areas.

The use of rangelands for other purposes such as wildlife protection and recreation could create additional needs for range managers. Federal hiring for these activities depends heavily upon legislation concerning the management of range resources.

Earnings and Working Conditions

In the Federal Government, range managers with the bachelor's degree started at either $9,303 or $11,523 in 1977, depending on their college grades. Those having 1 or 2 years of graduate work began at $11,523 or $14,097; persons with Ph. D. degrees started at either $14,097 or $17,056 a year. Range managers with the Federal Government averaged about $20,000 a year in 1977.

Salaries for range managers who work for State governments and private companies are about the same as those paid by the Federal Government, according to limited data.

Range managers may spend considerable time away from home working outdoors in remote parts of the range.

Sources of Additional Information

Information about a career as a range manager as well as a list of schools offering training is available from:

Society for Range Management, 2760 W. 5th Ave. Denver, Col. 80204.

For information about career opportunities in the Federal Government, contact:

Bureau of Land Management, Denver Service Center, Federal Center Building 50, Denver, Col. 80255.

Forest Service, U.S. Department of Agriculture, Washington, DC. 20250.

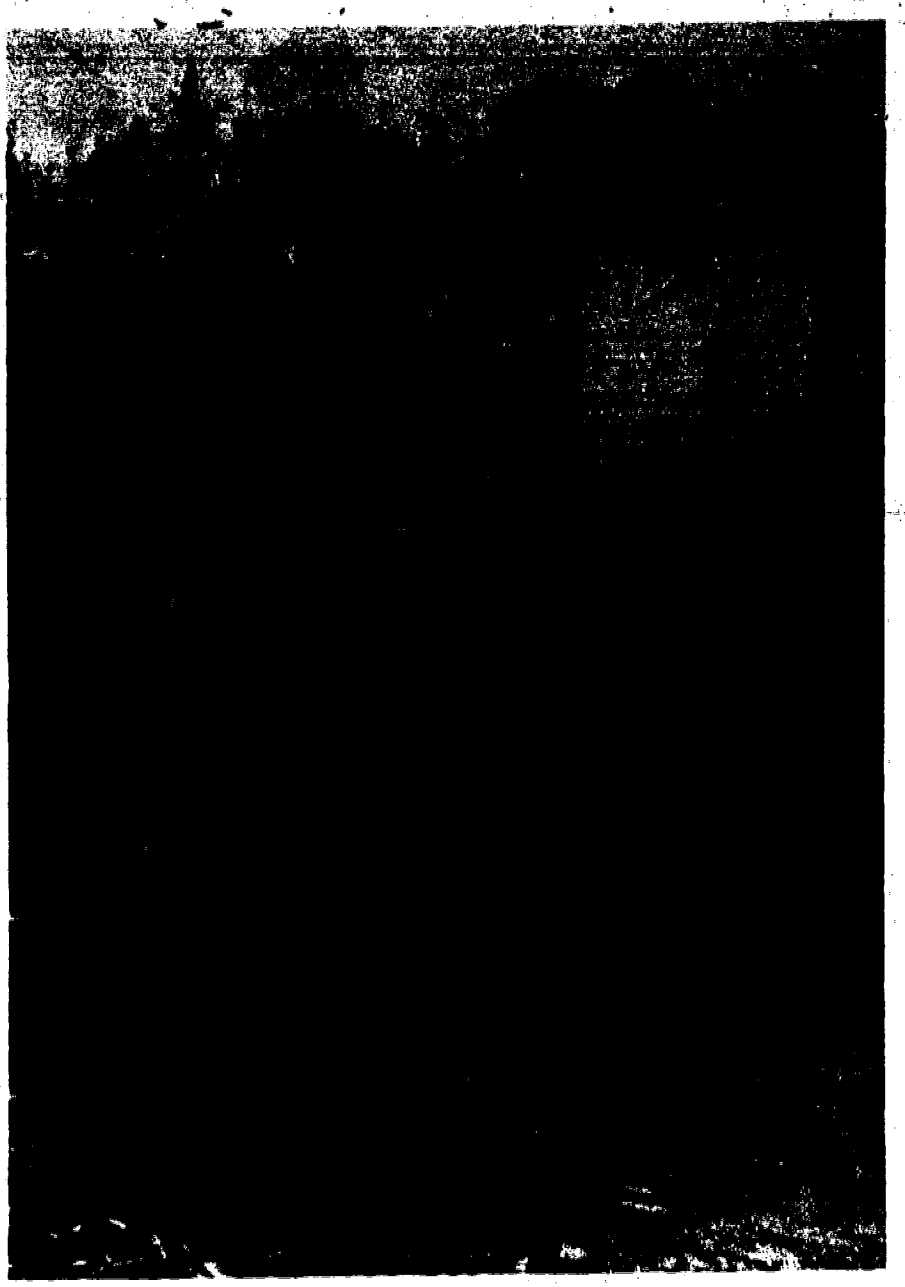
Soil Conservation Service, U.S. Department of Agriculture, Washington, D.C. 20250.

SOIL CONSERVATIONISTS

(D.O.T. 040.081)

Nature of the Work

Soil conservationists provide technical assistance to farmers, ranchers, and others concerned with the conservation of soil and water. They help farmers and other land managers develop programs that make the most productive use of land without damaging it. Soil conservationists do most of their work in the field. If a farmer is experiencing an erosion problem, the conservationist will visit the farm, find the source of the problem, and develop a program to combat the erosion. For example, if the erosion is caused by water runoff on sloped fields, the conservationist may recommend ways to terrace the land, or construct pathways for the runoff that do not remove soil. If erosion results from wind, the conservationist may recommend growing hedges in places that will provide windbreaks or may suggest improved methods of farming, such as leaving the wheat or corn stalks on the field after harvesting to provide ground cover.



Soil conservationist provides farmer with technical assistance.

In many areas of the country—particularly in the West—rainfall is insufficient to permit the growing of crops. Much of this land, however, can be made suitable for grazing livestock if proper water conservation techniques are used. Soil conservationists inspect rangeland and recommend to range managers areas where ponds can be constructed to provide water for livestock. They also recommend solutions to problems of overgrazing, such as seeding grassland or placing salt licks in undergrazed areas to keep the livestock away from areas that have been overgrazed. In this manner they can distribute herds so that the concentration of animals in any one area does not exceed the replaceable food supply.

Soil conservationists pay close attention to weather patterns in order to be aware of conservation problems before they arise. During the winter months, they make periodic snowmobile or ski patrols into the Rockies and other mountainous areas of the West to measure snowfall. This enables them to predict the spring and summer water runoff. In years when the snowfall is light, they alert range managers and farmers to possible water shortages, and develop appropriate water conservation measures.

In addition to working with individual farmers and ranchers, soil conservationists are assigned to work as technical advisors to Soil and Water Conservation Districts when solv-

ing area-wide land management problems. A Soil and Water Conservation District is made up of a group of individuals within a county who are concerned with, and responsible for, conservation problems within that county. Soil conservationists working with Conservation Districts prepare maps of the district or parts of the district, depicting particular problems of soil and water conservation. They then use the maps to develop a conservation program for the entire area, whether it is only a few farms and ranches or an entire watershed.

Places of Employment

An estimated 7,500 soil conservationists were employed in 1976, mostly by the Federal Government in the U.S. Department of Agriculture's Soil Conservation Service or in the Department of the Interior's Bureau of Indian Affairs. Soil conservationists employed by the Department of Agriculture work as advisors for Soil and Water Conservation Districts in almost every county in the country. Those employed by the Bureau of Indian Affairs generally work near or on Indian reservations, most of which are located in the Western States. In addition to those who work for the Federal Government, others are employed by State and local governments, and some teach at colleges and universities.

Other soil conservationists are employed by rural banks, insurance firms, and mortgage companies that make loans for agricultural lands. A few also work for public utilities, and lumber and paper companies that have large holdings of forested lands.

Training, Other Qualifications, and Advancement

Very few colleges and universities offer degrees with a major in soil conservation. Most soil conservationists, especially those employed by the Soil Conservation Service, have degrees in agronomy. A few soil conservationists have degrees in related fields of the natural resource sciences, such as wildlife biology, forestry, and agricultural education. Programs of study generally must include 30 semester hours in natural resources or agriculture, including at least 3 hours in soils.

A background in agricultural engineering is very helpful to soil conservationists, and courses in cartography, or mapmaking, also are helpful. Soil conservationists must be able to communicate well with people, since much of their work deals with educating farmers and ranchers in sound conservation practices. Also, they must be able to prepare written reports and plans of programs to present to farmers, range managers, and Soil and Water Conservation Districts.

Opportunities for advancement are somewhat limited. However, conservationists working at the county level may advance to the State level. Also, soil conservationists can transfer to related occupations such as farm management advisor or land appraiser. Those with advanced degrees may find teaching opportunities in colleges and universities.

Employment Outlook

Employment of soil conservationists is expected to increase about as fast as the average for all occupations through the mid-1980's. In addition to employment growth, several hundred openings will occur each year from the need to replace conservationists who die, retire, or transfer to other occupations. For example, even though employment of conservationists in the Soil Conservation Service has not increased over the past decade, the Department of Agriculture has hired, on the average, about 400 new conservationists each year.

Employment growth will occur in banks, public utilities, and other organizations that make loans on agricultural lands or that have large holdings of farm or ranch lands. Many of these organizations are adding conservationists to their staffs to help preserve the value of farmlands on which they hold mortgages or to help them comply with recent conservation and anti-pollution laws. In addition, as concern for the environment and interest in conserving the productivity of agricultural lands increases, a larger number of colleges should add soil conservation majors to their degree programs, which would increase the demand for soil conservationists to fill teaching positions. However, because this is a very attractive job choice for many people, competition for jobs as soil conservationists may make it difficult to find jobs in this field.

Earnings and Working Conditions

Soil conservationists who had a bachelor's degree and were employed by the Federal Government received $9,303 a year in 1977. Advancement to $11,523 could be expected after 1 year of satisfactory service. Those who had outstanding records in college, or who had a master's degree, started at $11,523 and could advance to $14,097 after 1 year. Further advancement depends upon the individual's ability to accept greater responsibility. Earnings of well-qualified Federal soil conservationists with several years' experience range from $17,056 to $28,725 a year.

Because soil conservationists do most of their work in the field, this may be an ideal career for a person who enjoys working outdoors. Usually during periods of bad weather they work in their offices, but occasionally they have to work outdoors in inclement weather.

Sources of Additonal Information

Additional information on employment as a soil conservationist may be obtained from the U.S. Civil Service Commission, Washington, D.C. 20415; Employment Division, Office of Personnel, U.S. Department of Agriculture, Washington, D.C. 20250; or any office of the Department's Soil Conservation Service.

AGRICULTURE

For decades the word agriculture has referred to agricultural production or farming—a major American industry that employed over 3 million workers in 1976. But today this word encompasses more than just farm production. Agriculture is closely related to many other industries in the economy—food and fiber processing, marketing and distribution industries, farm implement producers and dealers, and feed and fertilizer manufacturers.

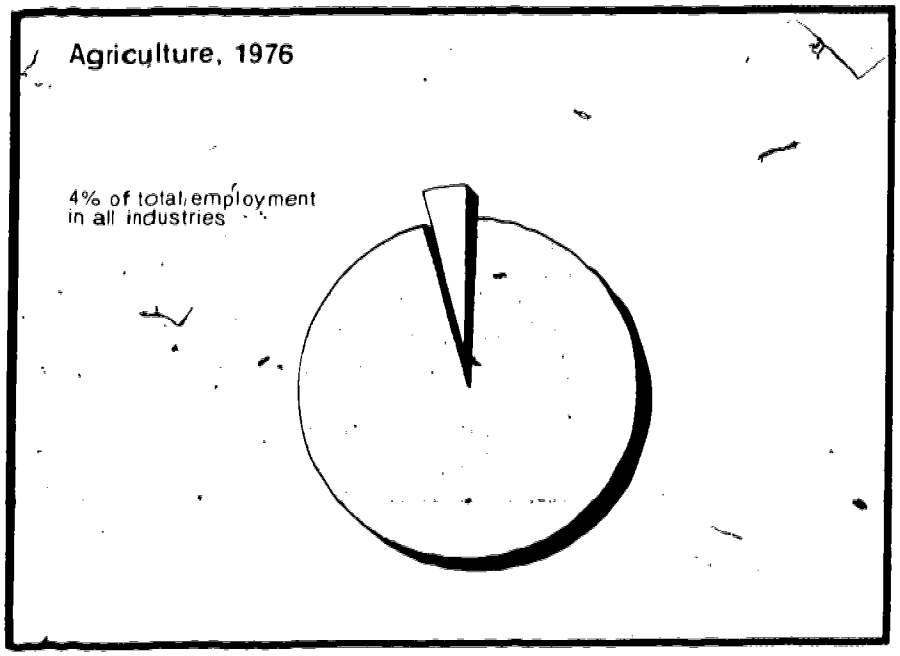
Although jobs requiring agricultural knowledge or skills long have been available in off-farm locations, the number and variety of these agricultural jobs have increased dramatically in recent years. At the same time, significant improvements in agricultural productivity have reduced the number of jobs actually available on the Nation's farms. During the last two decades, employment on U.S. farms and ranches has declined to only half its former level. Improved agricultural technology has been among the factors that have reduced employment on farms and created a need for workers with agricultural skills in off-farm occupations.

Although future growth in agricultural employment will be in off-farm occupations and industries, about 2 million workers still will be needed in basic agricultural production in 1985. This statement begins with a discussion of the occupations in basic farm production and the factors to consider in making the decision to farm. Subsequent sections describe the increasing variety of work available in the growth sector of agriculture—off-farm businesses, occupations, and professions utilizing agricultural skills.

Occupations in Farm Production

Farmers and farm workers accounted for over 95 percent of all farm employment in 1976. Although most farmers and farm workers are engaged in growing crops, over 1 million raise livestock. Because activity on many farms is seasonal, some farm employees work 3 months or less during the year. This seasonality of farm production enables many small farm owners to hold another job while working their farms part time.

Although employment on most farms is limited to the farm operator and one or two family workers or hired employees, large farms often have 100 full-time workers or more. Some of these are in nonfarm occupations, such as truckdrivers, sales representatives, and clerks.



Farm Operators. Three out of every four farms are operated by an owner or *tenant farmer* (D.O.T. 409.181). The remainder are run by hired farm managers or partners. The specific tasks a farm operator must do are determined by the type of farm he or she runs, but, in general, farmers are responsible for planning, tilling, planting, fertilizing, cultivating, and harvesting crops. Those who raise livestock must feed and care for their animals and keep barns, pens, milking parlors, and other farm buildings clean. Farmers also perform various other tasks, ranging from setting up and operating machinery to erecting fences and sheds. The size of the farm often determines which of these tasks operators will handle themselves. Operators of large farms have employees do much of the physical work that small farm operators do themselves.

In addition to the physical work that farm operators must do or arrange to have done, they also must make the management decisions required of modern agricultural production. Farm operators must carefully plan the combination of crops they grow so that if the price of one crop goes down they will have sufficient income from another to make up for it. Also, prices of crops and livestock change from one month to another, and farmers who plan ahead may be able to store their crops or keep their livestock to take advantage of better prices later in the year.

Farm operators make other important management decisions, such as determining when to seed, fertilize, cultivate, and harvest. After harvesting, they make sure that products are packaged, loaded, and delivered promptly to market. If necessary, they secure loans from credit agencies to finance the purchase of machinery, fertilizer, livestock, and feed. They also keep financial records of the farm operation, and train and supervise family and hired workers in the use of equipment and performance of farm chores.

Tenant farmers rent their land. Although they often manage their farm operations, they sometimes consult the land owner or hired manager when deciding what to plant or scheduling the harvest. Tenant farm-

ers also supervise the work of family and hired laborers. Although tenant farmers generally provide their own machinery, livestock, seed, and fertilizer, under special agreements the land owner may furnish one or more of these. Most tenant farm operators turn over an agreed-upon percentage of the crop to the land owner for the use of the land. Others may pay a flat yearly rent to the land owner.

Farm laborers and farm labor supervisors. Very few farms today can be run by only one person. In 1976, approximately 975,000 hired workers, 340,000 family workers, and 30,000 farm labor supervisors were employed on farms.

On many farms, especially those that rely on a few family workers or hired employees, farm laborers perform a variety of duties. For example, *farm hands* (D.O.T. 421.883) on a farm devoted to diversified agriculture may care for livestock and crops as well as maintain structures and equipment.

Livestock generally require a great deal of attention on a day-to-day basis. Farm hands must mix feed and additives, and fill feed and water troughs. They clean barns and animal pens and check livestock regularly for signs of disease or infection. Often farm hands must vaccinate livestock, such as cattle and poultry, against diseases or spray them with insecticides to protect against harmful parasites. Also, farm hands on dairy farms must clean and milk cows twice a day.

In contrast, hands on crop farms have duties that vary with the seasons.

Before seeding, they must prepare the soil by plowing, harrowing, and fertilizing. Once the crops are partially grown, they cultivate fields to loosen soil and reduce the number of weeds. Often, crops are sprayed to control weeds, harmful insects, and fungi. Farm hands also assist in harvesting, and storing, packing, and transporting crops.

Many of the tasks performed by farm hands require the use of machinery, such as milking machines, hay balers, and cotton pickers. In addition to setting up and operating machinery, hands maintain and clean it and may do minor repairs, if necessary. Also, they maintain and repair farm structures, including barns, fences, and irrigation systems.

Farm hands generally perform some, or all, of these duties regardless of farm location or what crops are grown. However, many types of crops require special attention. For example, a farm hand working in an orchard (D.O.T. 404.883) may have to transplant seedlings, prune fruit trees, thin immature fruit to improve quality, and prop up overloaded branches.

Other farm laborers may perform specialized job duties depending on the location of the farm. In areas where rain is insufficient, *irrigators* (D.O.T. 422.887) water crops by controlling the flow of water from irrigation ditches, through gates or portholes, to the fields. They also operate portable sprinkling systems that pump water through pipes spread on the ground, and move the pipes from one area of the field to another.

Farms such as those producing fruit or vegetables often need a large number of workers to harvest their crops. These farms employ laborers with more specialized job duties. For instance, if produce is packed on the farm to prepare it for shipment, then *produce sorters* (D.O.T. 529.687) and *produce packers* (D.O.T. 920.887) will be employed. Other laborers may spend most of their time operating a particular piece of machinery. Still others may be full-time maintenance workers.

When many workers are employed in specialized jobs, *farm labor supervisors* (D.O.T. 429.131) are needed to coordinate work activities such as planting, cultivating, and harvesting. They schedule the work of crews and may hire additional hands, especially during the harvesting season. Farm labor supervisors also teach new employees how to use machinery and tools and keep records of production and crop conditions. (For additional information on labor supervisors, see the statement on blue-collar worker supervisors, eleswhere in the *Handbook*.)

Places of Employment

Some farming is done in nearly every county in the United States, but more than one-third of all farms are in the following States: Texas, Missouri, Iowa, North Carolina, Illinois, Kentucky, and Tennessee. Thus, employment of farm operators is concentrated in these States. Farms in some of these States, however, are smaller on the average than those in other areas of the country, and more than one-third of all farm products are raised in Iowa, California, Texas, Illinois, and Kansas.

Often the topography of the land and the climate of an area determine the type of farming that is done. For example, wheat, corn, and other grains are most efficiently grown on large, flat farms on which large and sophisticated machinery can be best used. Thus, these crops are ideal for the Plains States of Kansas, Nebraska, Iowa, and Illinois. Other States such as Wisconsin, Minnesota, and New York have rolling hills, sufficient rainfall to provide good pastures, and denser populations, and thus smaller farms that are ideal for grazing dairy herds. Climate is the main reason why crops which require longer growing seasons, such as cotton, tobacco, and peanuts, are grown chiefly in the South.

About three-fifths of all farmers and farm workers are employed raising crops; the remainder raise cattle, hogs, sheep, and poultry.

Raising fruits and vegetables, which must be picked and packaged by hand, generally requires a large number of employees during the harvesting season. Thus many hired laborers work on these farms on a seasonal basis. About one-half of all commercial vegetables grown in the United States are produced in California, and large amounts of fruits and vegetables also are grown in Texas and Florida. Two-fifths of all farm labor supervisors and one-third of all hired farm laborers are employed in these three States.

Much of the work on farms that produce animals and dairy products is on a day-to-day basis, so these farms often rely on the farm operator and several unpaid family laborers to do most of the work. Unpaid family workers and farm operators also provide most of the labor on farms that produce crops, such as wheat, corn, or cotton, that can be machine har-

vested and packaged without damage. Therefore, only a small number of hired farm laborers and almost no farm labor supervisors are employed in the regions that produce these farm products.

Training, Other Qualifications, and Advancement

Modern farming is very costly and usually requires a large initial investment. The prices of farmland, fertilizer, hybrid seeds, and other resources needed by farmers have risen dramatically over the past decade. Also, more expensive machinery is needed today to farm efficiently. To obtain the financing necessary to get started in farming, prospective farmers must be able to show that they are well trained and knowledgeable in their field.

Growing up on a family farm and participating in farming programs for young people, such as the Future Farmers of America or the 4-H Clubs, is still an important source of training for tomorrow's farmers. However, because of the complexities of modern scientific farming and the need to keep up with advances in farming methods, an increasing number of young farmers find it desirable to receive additional training at a 2- or 4-year college of agriculture. Also, a degree in agriculture is almost essential for persons who wish to farm but who have not had the advantage of living or working on a farm in their youth.

Most colleges of agriculture offer major programs of study in areas such as dairy science, crop science, agricultural economics, horticulture, and animal science. Also, colleges usually offer special programs of study concerning products that are important to the area in which they are located, such as grain science programs at colleges in the Plains States.

In addition to the knowledge of agricultural practices that farming requires, a wide variety of building, maintenance, and business skills often are needed on farms. On corporate farms and on large, established, family farms, there may be many workers, each supplying a particular skill. However, beginning farmers may wish to supply as much labor as possible to the operation of the farm in order to hold down costs, so it often is helpful for them to have these other skills. The carpentry skills needed to erect or repair fences and farm buildings may be learned in courses at vocational schools, as can farm machinery maintenance and repair. Sound business practices can be learned through high school courses in bookkeeping, and the knowledge of financial management, accounting, and tax accounting that is almost essential to today's farmer can be obtained through college courses.

In contrast to the extensive and varied training needed to be a farm operator, most farm laborers, such as field and livestock workers and packinghouse workers, learn their jobs in a matter of hours on the farm and require little or no outside training. Some farm laborers on large farms perform more specialized jobs, such as machine operator, for which limited experience may be helpful, but previous experience and training are not necessary.

Farm laborers and farm operators should be in excellent physical condition. Physical stamina and strength are important to farm workers, since they must often work long days on their feet or stooped over under the hot sun, and they may be required to lift and carry heavy objects, such as hay bales, or to restrain animals.

Over 1.5 million acres of farmland in the United States are lost each year to suburbanization, and in many areas of the country farmland for sale is scarce. The scarcity of available land and the large cost of getting started in farming, may make it necessary for a beginning farmer to start out as a hired hand on a nearby farm, or as a tenant farmer for a land owner who supplies the machinery, seed, and fertilizer in return for a percentage of the crop. Hired hands and tenant farmers may later find jobs as farm managers or one day become owners of their own farms.

Opportunities for advancement for farm laborers are very limited; however, they may advance to become farm labor supervisors and a few may have the opportunity to become working farm managers, tenant farmers, or to one day own their own farms.

Making the Decision to Farm

Farming may be the ideal career for people who enjoy working outdoors and being their own bosses. The desire to live in a rural area, away from urban congestion, also may be an important consideration in choosing farming as an occupation. However, farming is a very demanding career, and only persons with a great deal of initiative and a sense of responsibility can expect to be successful.

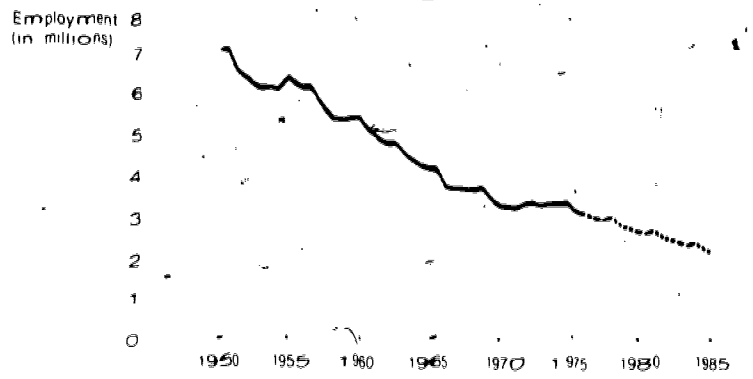
Farmers often must work long hours. A 6- or 7-day workweek is common during busy seasons and is the rule on certain types of farms, such as dairy and livestock farms. Farmers should be willing to try new processes and adapt to constantly changing technologies to produce their crops or raise their livestock more efficiently. Farmers also must have enough technical knowledge of crops and growing conditions and plant and animal diseases to be able to make decisions that insure the sucessful operation of their farms. They also must have the managerial skills necessary to organize and operate a business. Mechanical aptitude and the ability to work with tools of all kinds also are valuable skills for the operator of a small farm who often must maintain and repair machinery or farm structures. A basic knowledge of accounting and bookkeeping can be helpful in keeping financial records, and a knowledge of credit sources is essential.

Both the average size of farms and the price of farmland have increased greatly in recent years, thus considerably raising the cost of buying a farm. Therefore, young people interested in farming may wish to start by farming part of a relative's farm or by leasing land from an absentee owner. However, even if the beginning farmer does not purchase land and buildings, financing is generally necessary to purchase livestock, seed, feed, fertilizer, and machinery.

The Federal Land Bank is the largest source of credit for farmers. In addition, many commercial banks and savings and loan institutions, es-

Even though farm output has increased by 50 percent since 1950, employment has been cut in half and is expected to continue to decline

Farm employment,[1] 1950-76 and projected 1985



pecially those in rural areas, and many life insurance companies, extend credit to farmers. Also, the Farmers Home Administration extends credit for purchasing farms and paying for yearly operating costs to people who have been unable to obtain loans from any other source.

Employment Outlook

Employment in the agriculture industry is expected to continue to decline through the mid-1980's, as the trend toward fewer but larger farms continues. Fewer farms means fewer farm operators, and as farms become larger, the additional use of more and larger machinery makes it unnecessary to hire more farm laborers.

Beginning farmers who wish to grow crops such as grain crops or cotton, which often are profitably produced on farms of 1,000 acres or larger, will find extremely limited opportunities, since farms of this size rarely are available for purchase and those that are cost a great deal. Beginning farmers should find more opportunities to get started in a type of specialty farming that requires less land, and in which they have an expertise. For example, a successful family dairy farm may require only 100-160 acres of pasture and crop land. Specialty crops such as tomatoes, strawberries, or watermelons may be profitably grown on even smaller farms using intensified farming methods.

Opportunities for beginning farmers may be best in rural areas in the Eastern and Southern regions where there are many small farms. However, many farms on the fringes of metropolitan areas in these regions are being lost each year to suburbanization, and thus the price of this farmland should continue to increase.

Employment of farm laborers will decline as the number of farms declines and as machinery replaces much of the work that laborers now do. For example, an improved hybrid tomato has been developed that has hard skin and can be machine harvested without damaging the tomatoes. Now one machine can do the harvesting work that formerly required many hand laborers.

As the cost of farming increases, fewer individuals will be able to afford the initial investment needed to get started in farming, and the number of large corporate and partnership farms that employ more workers per farm will increase. Since these types of farms usually are operated by farm managers, employment of farm managers is expected to increase about as fast as the average for all occupations through the mid-1980's, and beginning farmers may find opportunities in this field.

Earnings and Working Conditions

No information is currently available on the average earnings of farm operators. Earnings of farm operators vary greatly from year to year and by type and size of farm. Prices of many farm products fluctuate greatly depending on weather conditions which determine the amount and quality of products that are produced. A farm that shows a large profit in one year may show a loss in the following year.

Farm laborers are generally among the lowest paid workers; in 1976 average hourly earnings of all hired farm workers were only $2.66. In comparison, average hourly earnings of all production workers in private nonagricultural industries were $4.87 in the same year. Average wage rates for hired farm workers ranged from $2.47 an hour for field and livestock workers to $4.39 an hour for farm labor supervisors. In general, workers paid on a piece-rate basis earned more than those who received a straight hourly wage. In addition to their wages, some hired farm workers receive room and board allowances, however, almost no farm workers receive benefits such as paid vacations, sick leave, or health benefits.

Many types of agriculture are very seasonal in nature and many farm operators and farm laborers on crop farms may have to work from sunup to sundown during the planting and harvesting seasons. Farm workers often work fewer than 6 to 7 months a year on the farm, and, while many can find off farm employment, others are often unable to find outside employment during the winter months.

On farms on which animals are raised for meat or dairy products, the work is distributed more evenly throughout the year. However, these farms cannot be left unattended since animals must be fed and watered regularly, and cows must be milked twice daily. Owners and operators of these farms may rarely get the chance to travel.

Over 1 million farmers and farm workers raise livestock

[illegible] people [illegible] farm [illegible] the [illegible] area [illegible] work can be extremely hazardous. Each year many farm workers suffer debilitating injuries from farm machinery. Also, farm workers are subject to illnesses and diseases from harsh [illegible] and from the dangers of pesticides and chemicals and from handling [illegible] sprayed [illegible] to these problems [illegible] far area sometimes is inadequate or too expensive to meet the needs of farm workers.

Many farm [illegible] those [illegible] by the United Farm Workers (UFW) and others are represented by the International Brotherhood of Teamsters, Chauffeurs, Warehousemen and Helpers. Many [illegible] are affiliated with local and regional cooperatives that enable them to reduce the cost of their supplies and obtain better market for their products.

Agricultural Services

The agricultural service industry offers careers in hundreds of occupations [illegible] skills [illegible] ability to operate farm equipment. In 197[illegible] approximately 250,000 people provided crop and animal services to farmers and farm cooperatives. Most worked for small companies or were self-employed. Although a few of these people are employed as laborers, many others work in professional or supervisory positions, such as agricultural scientists. Others work as managers, agricultural technicians, veterinarians, machine operators, clerks and secretaries.

Many occupations [illegible] to individuals who [illegible] working with animals. These occupations vary greatly in skill requirements, from professional requiring college training to jobs that may be learned in a few days or by merely getting up with a farmer and beginning the task being performed.

[illegible] provide [illegible] and [illegible]. They inspect livestock and poultry for disease and at points of entry into the United States to keep diseased animals out of the country and prevent the spread of disease. They also administer tests for animal diseases, conduct programs for disease eradication, and carry out research to develop vaccines for disease control. (Veterinarians are discussed in more detail elsewhere in the *Handbook*.) *Animal breeders* (D.O.T. 419.181) use their knowledge of genetics and ranch or dairy management to develop improved breeds of animals that will be more productive. They conduct tests on new breeds of livestock to determine growth rates for beef cattle and milk production for dairy cattle. Breeders also maintain records on offspring of new breeds with an animal breeding association or on their own. *Artificial-breeding technicians* (D.O.T. 467.384) and *artificial inseminators* (D.O.T. 467.384) collect semen from male livestock such as bulls and rams, and artificially impregnate cows and ewes. These workers may be employed by animal breeding associations or by *artificial breeding distributors* (D.O.T. 180.168) who manage insemination distributorships.

Several occupations in livestock services may be learned more easily. Cow testers employed by dairy herd improvement associations travel from farm to farm to test the milk from each cow in a herd for acidity and butterfat content and record the results. Cattle dehorners remove the horns from cattle to prevent injuries to other animals in the herd, and others perform tasks such as dinging and dehorning services as well. Poultry hatchery employees perform several types of animal care tasks, or vaccinate poultry, place eggs in trays in incubators, and care for baby chicks being used for experimental tests.

In addition to workers who supply animal services, others provide custom crop services or other general crop services, which are contract basis. Although most farm services are provided by self-employed individuals or small businesses with 10 or fewer employees, larger service businesses employ people with professional and technical skills as well as laborers and machine operators. Professional managers are needed to direct the work of employees as well as manage the business. Also, profes

sional farm managers, who are generally college trained, provide farm management services to absentee land owners and their tenants. They schedule the plowing, fertilizing, planting, cultivating, and harvesting of fields, and the marketing of crops and livestock. Often they work for businesses which specialize in supplying these services; however, some are self-employed.

Other occupations in this field require technical skills or specialized equipment, but can be learned through technical training, on-the-job training, or training in another job. For example, *agricultural pilots* (D.O.T. 196.283) and their assistants mix agricultural chemicals and apply them while flying airplanes or helicopters over fields at low altitudes. They also seed an increasing number of fields from the air. Also, some airplane mechanics are employed to repair and maintain agricultural aircraft.

In contrast to those occupations that require professional or technical training, farm service laborers work in occupations that may be entered merely by having the necessary equipment or by being familiar with farm operations. For example, grain elevator operators who have grain drying equipment may provide grain drying and storage services, and agricultural chemical dealers may provide fertilizer hauling and spreading and crop dusting services. Sometimes farmers with special equipment supplement their incomes by providing corn shelling, hay baling, threshing, or other services to farmers in their area. Employees of seasonal service businesses often must work long hours and 6 or 7 days a week during the busy season.

Farm labor contractors and crew leaders also require no special training. However, they must establish contacts with farmers and farm managers to whom they supply farm laborers, especially harvest laborers, on a contract basis at specified times of the year. (Farm laborers employed by contractors and crew leaders receive better social security coverage by having only one employer).

Sources of Additional Information

The most significant sources of information and guidance available to farmers are the services provided by the land-grant colleges and universities and the U.S. Department of Agriculture, Washington, D.C. 20250. These services include research, publication, teaching, and extension work. The county agricultural agent is often the best contact for the young person seeking advice and assistance in farming. The Farmers' Home Administration system of supervised credit is one example of credit facilities combined with a form of extension teaching. Organized groups, such as the Future Farmers of America and the 4-H Clubs, also furnish valuable training to young farm people.

For information about opportunities in off-farm activities, contact individual colleges of agriculture or the U.S. Department of Agriculture, Washington, D.C. 20250.

Jobs in Agribusiness

Agribusiness occupations, broadly speaking, are those in off-farm settings that demand agricultural knowledge or skills. Some can be learned in a few days by persons who have lived or worked in rural areas or on farms. Others require training in technical schools, junior colleges, colleges and universities, from a few months duration to as long as several years. Although all industries offer some agribusiness jobs, they tend to be concentrated in the manufacturing, trade, agricultural services, and government sectors.

Since agribusiness occupations are so varied and numerous, this section deals only with selected jobs in the field—those that best represent the different types of work available. See the "Sources of Additional Information" portion of this statement for a guide to other materials on specific agribusiness jobs.

Professional and Technical Occupations in Agribusiness. One of the oldest areas of professional work in agribusiness involves collecting, compiling, and analyzing data. Workers in these jobs have titles that reflect the particular setting in which they are employed; most are agricultural accountants, marketing specialists, and agricultural economists or statisticians.

Agricultural accountants prepare and analyze financial reports that managers use to make important decisions. They may specialize in tax matters, such as preparing income tax forms and advising farm managers and operators about the tax advantages and disadvantages of business decisions. Accountants employed by hardware and farm supply retail businesses, such as dairy equipment stores and farm machinery stores, often need a knowledge of agriculture to perform their jobs.

Agricultural marketing specialists survey wholesalers, retailers, and consumers, analyze data on products and sales; and prepare sales forecasts that businesses use to make decisions relating to product design and advertising. The results of their research are used by food processing companies to create food products that consumers will buy, and by agricultural suppliers to develop products for agribusiness and industrial firms. Marketing specialists also work for commodity brokerage firms, farm organizations, cooperative marketing and purchasing organizations, and research divisions of the Federal Government.

Agricultural economists (D.O.T. 050.088) deal with problems related to production, financing, pricing, and marketing of farm products. They provide information to policymakers, agribusinesses, farmers, and other sectors of the agriculture industry. Many work for the U.S. Department of Agriculture, developing cost-benefit analyses for evaluating farm programs at the national, State, and local levels. As part of their analysis, economists study the effects of mechanization and technological advances, for example, on the supply of and demand for farm products and the resulting impact on costs and prices. Others work for farm lending institutions, such as rural banks, The Farmers Home Administration, The Federal Land Bank, and insurance companies that make loans to farm-

ers, determining the feasibility of loan programs and individual loans. Many agricultural economists also work for businesses which manufacture products and provide services for farmers, such as farm equipment. Still others work for agribusiness firms that market agricultural products at both retail and wholesale levels. Agricultural economists who have advanced degrees may teach at colleges and universities. There also are opportunities for agricultural economists in the Foreign Service, conducting research to improve the productivity of agriculture aboard.

A more recent, but expanding, field in agriculture is agricultural communications. Persons employed in this area perform the vital job of keeping farmers, consumers, and others concerned with the agriculture industry abreast of current developments in farm technology, research, and consumer products. Crop reporters and market news reporters are employed by the U.S. Department of Agriculture in field offices throughout the United States. Crop reporters gather information on crop production throughout the growing season. Market news reporters collect information on the movement of produce from the farm to the market.

Other agricultural journalists, such as reporters and editors, collect farm news and data for publication in farm journals, magazines, bulletins, and for broadcast. Some may have job titles, such as livestock editor, that reflect their area of special knowledge. Agricultural journalists also are employed as farm directors for radio and television broadcast stations in farming areas to report on prices, sales, crop conditions, and other agricultural information of importance to farm residents. Still others are employed in communications departments of agribusiness firms to develop advertisements and public relations bulletins.

Agricultural education is an important and growing area of employment of professional workers in the field of agriculture. Because of the constant changes in production processes and technological innovations in farming, teachers are a vital link between agricultural researchers and future farmers. *School teachers* (D.O.T. 091.228) in vocational agriculture instruct secondary school and adult education classes in farm management, agricultural production, agricultural supplies and services, operation and repair of farm equipment and structures, inspection and processing of farm products, and ornamental horticulture. An increasing number of 2-year programs that require trained educators are taught at junior colleges. Colleges and universities employ many agricultural professors to teach as well as to do research and publish their findings.

Cooperative extension service workers (D.O.T. 096.128) also do educational work in fields such as agricultural production and home economics and may conduct agricultural educational programs through youth groups such as the 4-H Clubs.

Another very important area of agriculture involves scientists who conduct research vital to the development of more productive plants and animals, and better food products for consumers. Although agricultural researchers are employed in almost all sectors of the economy, the largest concentrations are in government agencies. The U.S. Department of Agriculture employs researchers in various parts of the country, including Washington, D.C., the Agricultural Research Center at Beltsville, Md., and at land grant colleges. State agricultural experiment stations employ researchers, as do other government agencies such as the Food and Drug Administration. Still other agricultural scientists do research at private colleges or for agribusiness firms, such as food processors, fertilizer and agricultural chemical manufacturers, and manufacturers of feed, seed, and farm equipment.

The following list of occupations is not complete, but is a representative sample of agricultural researchers. Many of these occupations are discussed in more detail elsewhere in the *Handbook* (see index).

Agronomists (D.O.T. 040.081) conduct experiments in field crop problems and develop new methods of growing crops to make farming more efficient, obtain higher yields, and improve quality. They study methods of planting, cultivating, and harvesting field-crops such as cereals, grains, legumes, grasses, cotton, and tobacco. They also study the effect of various climates on crop production.

Plant pathologists (D.O.T. 041.081) study the causes of plant diseases to develop methods to control noxious weeds, insect pests, and plant diseases.

Plant physiologists (D.O.T. 041.081) study the structure of plants and factors which affect their growth, such as respiration, metabolism, and reproduction. They also are concerned with methods of improving the storage life of fruits and vegetables.

Geneticists (D.O.T. 041.081) try to develop strains, varieties, breeds, and hybrids of plants and animals that are better suited than those presently available for the production of food and fiber.

Microbiologists (D.O.T. 041.081) study bacteria and other microorganisms to better understand their relation to human, plant, and animal health, and learn how these microorganisms function in the production of vitamins, antibiotics, amino acids, alcohols, and sugars.

Animal physiologists (D.O.T. 041.081) study the functions of various parts of the bodies of livestock.

Animal scientists (D.O.T. 040.081) are concerned with production and management of farm animals. They conduct research in the selection, breeding, feeding, and marketing of farm animals and develop improved methods of housing, sanitation, and parasite and disease control. Some are called animal nutritionists, and specialize in finding feed requirements that will maximize production and developing new livestock and poultry feeds.

Entomologists (D.O.T. 041.081) study beneficial and harmful insects. They identify the populations and distributions of insects that injure agricultural products during growth, shipping, storage, processing, and

distribution. Their research is directed toward finding ways to control harmful insects and manage beneficial ones.

Human nutritionists (D.O.T. 077.128) study the means by which the body utilizes foods and nutrients, and their relation to health and disease. They also study social, economic, and cultural aspects of food to determine how the diets of people may be improved.

Seed analysts (D.O.T. 040.381) conduct tests on samples of seeds to determine their rate of germination, purity, and noxious weed content.

Agricultural chemists (D.O.T. 022.081) conduct research to improve crop yield and promote soil conservation. They develop chemical compounds for use in controlling insects, weeds, fungi, and rodents. They also perform experiments to determine proper usage of fertilizers and investigate the problems of nitrogen fixation in soils.

Food chemists (D.O.T. 022.081) such as dairy products chemists and cereal chemists develop new foods, food preservatives, and similar products. They study how various methods of preserving foods affect nutrient content and taste, and test food samples to ensure that they meet government standards for quality and purity.

Soil scientists (D.O.T. [illegible]) study the physical, chemical, and biological characteristics and behavior of soils and classify them according to a national system. They determine the ability of various soils to produce certain crops.

Rural sociologists (D.O.T. 054.088) study the structure and functions of social institutions, such as customs, practices, and laws that are a part of rural society and thus affect farm residents.

In addition to these agricultural researchers and scientists, *agricultural engineers* (D.O.T. 013.081) develop the physical layout of farms, such as the placement of barns, sheds, and irrigation systems, used to carry out production. Many agricultural engineers work for manufacturers of farm implements and machinery, designing equipment that enables farmers to increase their production. Others design improved farm structures, such as dairy barns or irrigation systems, and some work for electric utility companies developing efficient methods of utilizing electric power on farms and in food processing. Still others are employed by the Federal Government in soil and water management. Agricultural engineers with advanced degrees may also teach at colleges and universities.

In addition to the many agriculture-related professional occupations for which a college degree is necessary, there are a number of occupations of a technical nature that do not always require college training. Often, practical work experience is sufficient to qualify a person for a job in these fields, although college training may be required of persons without work experience.

One important group of these occupations is made up of inspectors and graders of agricultural products. Meat and poultry inspectors are employed by the U.S. Department of Agriculture and by many of the State departments of agriculture. They work under the supervision of veterinarians and inspect meat and poultry slaughtering, processing, and packaging operations to insure that proper sanitation is maintained throughout all phases of processing. They also inspect meat additives and make sure that processed meats are labeled correctly.

Agricultural commodity graders (D.O.T. 168.287) inspect samples of agricultural products to determine their quality and grade, and then issue grading certificates. They generally specialize in the inspection and grading of one particular commodity, such as eggs, vegetables, fresh fruits, dairy products, or grain. Grain inspectors inspect large quantities of grain for the presence of parasites, spoilage, or impurities, such as weeds. They also inspect ships for sanitation prior to loading for transport. Most grain inspectors are employed by Federal and State agencies, however, some also are employed by large buyers of grain, such as breweries.

Cotton classers (D.O.T. 469.387) use the standards for various grades of cotton established by the U.S. Department of Agriculture to classify cotton samples on the basis of color, fiber length, and presence of impurities. *Tobacco graders* (D.O.T. 529.687) examine the size, color, and texture of tobacco at auctions and certify the quality according to the Federal classification system. Some are employed at tobacco processing plants, and use less complex grading systems.

Persons with technical skills related to agriculture also are employed in a variety of positions to assist agricultural and biological research scientists in conducting experiments. Biolgical technicians work primarily in laboratories in which biological scientists are engaged in research, development, control, and testing of the chemical and biological properties of crops. Agricultural technicians generally work in fields and other experimental areas, such as greenhouses, barns, or growth houses. They assist agricultural scientists in experiments conducted under actual growing conditions.

Research technicians may perform a varity of duties. For example, they generally are responsible for preparing human subjects, animals, insects, plants, soils, and food samples for tests. Other responsibilities include setting up and adjusting instruments and equipment, conducting experiments, and tabulating and recording data. Additional duties, such as caring for laboratory animals, may be part of the job in some areas of specialization; technicians employed at Federal research facilities may specialize in microbiology, biochemistry, laboratory animal, animal science, plants, insects, or soils.

Other Jobs in Agribusiness. In addition to the many professional and technical jobs that require a knowledge of and training in agriculture, many industries that supply raw materials to farmers and process and distribute agricultural products employ persons in urban as well as rural areas. While some of these people work in occupations that require some agriculture-related training, others work in jobs that are nonagricultural. Together with agricultural

production, these industries make up an efficient food production and distribution system. This section will briefly discuss some of the career opportunities available in this system, in both rural and urban areas.

Many farmers are members of local and regional cooperatives. By joining cooperatives, farmers can buy many of their supplies, such as seeds, feeds, and fertilizers, as well as food and household goods, in large volumes and thus at lower wholesale prices. In addition, cooperatives provide marketing services so that individual farmers do not need to locate buyers for their products. Some also operate local stores. Local branches of cooperatives are found in nearly every rural community and in many small and medium-sized cities, although regional offices of large cooperatives often are located in large metropolitan areas.

Cooperatives employ persons with many different skills. Stock clerks and feed store managers are employed in local stores. Cooperatives also employ college-trained business managers to operate the cooperatives. Regional cooperatives employ sales representatives, wholesalers and brokers to contact buyers for large grocery chains, food processing firms, and agricultural exporters to arrange contracts to sell agricultural products. They also employ purchasing agents and buyers to arrange volume purchases of seed, feed, fertilizers, and other supplies.

Farm equipment dealerships in agricultural areas employ persons in farm-related and nonfarm occupations. *Farm equipment dealers* (D.O.T. 277.358) must know the needs of farmers in their area and stock the latest equipment and machinery to meet those needs. Dealers and sales workers demonstrate and sell equipment, and farm equipment mechanics service and repair the machinery that is sold. Dealerships often have parts departments and thus employ parts sales workers. In addition, large dealerships often employ secretarial and other clerical employees.

The agricultural chemical industry, including manufacturing, distribution, and application, employs professional and technical workers with agricultural training. Chemists, agronomists, soil scientists, and other professional workers, along with research technicians, conduct research to develop new fertilizers and pesticides as well as to improve other chemicals for better agricultural uses. Many agricultural chemicals are sold by cooperatives; however, retail dealerships also are found in many small towns in farming areas. Retail dealerships employ store managers, stock clerks, sales workers, and clerical employees, and large dealerships often employ agricultural pilots and their assistants to apply chemicals.

These are just some of the many businesses that employ persons with agricultural training and also offer opportunities in nonagricultural occupations to people in farming areas. Over the past quarter-century the agricultural supply and distribution system has become more diverse, and now employs persons in most major industries, including the transportation, communications, and manufacturing industries.

Sources of Additional Information

[illegible] the occupations discussed in this section are described in more detail elsewhere in the *Handbook*.

[illegible] in Research. Additional information on research opportunities at land grant colleges may be obtained from the dean of agriculture at the State land grant college. Information on employment in the U.S. Department of Agriculture is available from the USDA recruitment representatives at land-grant colleges and from the Office of Personnel, U.S. Department of Agriculture, Washington, D.C. 20250.

The following publication will be valuable.

Careers in Agriculture and Related Sciences. American Association of Land Grant Colleges and State Universities, Washington, D.C. Copies can be obtained free from State agricultural colleges.

[illegible] Agricultural Finance. For information about employment opportunities in agricultural finance, contact:

Farm Credit Administration, Washington, D.C. 20578.

Farmers Home Administration, U.S. Department of Agriculture, Washington, D.C. 20250.

Agricultural Director, American Bankers Association, 90 Park Ave., New York, N.Y. 10016.

Opportunities with Cooperatives. Cooperatives in the individual communities are a good source of information on jobs either in their own organizations or in other cooperatives. Most States have a State council or association of cooperatives that can provide information on cooperative locations and some job information.

Opportunities as Vocational Agriculture Teachers. Prospective teachers should contact the head teacher trainer in agricultural education at the land-grant college or the State supervisor of agricultural education at the State department of public instruction in their respective States.

Also, many books written on the subject of jobs in agribusiness discuss opportunities in much greater detail and may be available in your local high school and public libraries.

COOPERATIVE EXTENSION SERVICE WORKERS

(D.O.T. 096.128)

Nature of the Work

Cooperative extension service workers, or extension agents as they are often called, conduct educational programs for rural residents in areas such as agriculture, home economics, youth activities, and community resource development. Extension agents generally specialize in one of these areas and have titles that match their specialties, such as extension agent for youth activities or extension agent for agriculture science and horticulture. They are employed jointly by State land-grant univers-

ties and the U.S. Department of Agriculture.

Extension agents usually work with groups of people. For example, the extension agent for youth activities conducts 4-H meetings for members in the area. During the summer, they may hold day camps to organize youth recreational activities. Agents who work in home economics set up meetings and programs to illustrate the benefits of proper nutrition and to educate homemakers in good nutrition.

Agriculture science extension agents conduct group meetings on topics of special interest to area farmers. In a county which has much dairy farming, extension agents arrange seminars covering dairy herd health or the raising of forage crops. During these seminars, agents instruct farmers in using the proper feeds to meet cows' nutritional needs and to raise their output of milk, and recognizing and combating health hazards including the possible establishment of a herd inspection program. They also may help local farmers market their products.

Extension agents for community resource development meet with community leaders to plan and provide for economic development of the community. They also assist community leaders in developing recreational programs and facilities and in planning other public projects, such as water supply and sewage systems, libraries and schools.

In addition to group work, they also do field work with individuals. If a farmer is having a problem with his or her crops, an extension agent will visit the farm, examine the problem and suggest remedies. Likewise, home economics extension agents occasionally visit homemakers to give personal help in solving problems.

An important part of each extension worker's job is to provide information that is important to people in the community. Many extension agents write articles dealing with their areas of specialization for publication in local newspapers. Often these are regular feature columns that appear once a week. Others appear on local radio and television shows to give marketing reports for agricultural products important to the area, or present Saturday morning programs for young people. A few extension service workers produce documentary films on topics in which they have special training for broadcast on local television stations. Also, extension workers at some land grant universities produce and broadcast programs on university owned UHF and cable television stations.

In addition to the extension service workers who work at the county level, State extension specialists at land grant universities coordinate the efforts of county agents. State extension agents keep abreast of the latest research in their fields of study and develop ways of using the research in extension work at the county level. Some State extension workers may be on a split assignment and may teach classes at the university. Also, about 200 agricultural extension specialists are employed by the Extension Service of the U.S. Department of Agriculture in Washington, D.C.

County extension worker gives technical advice to dairy farmer

Places of Employment

More than four fifths of the approximately 16,000 cooperative ex

tension service workers are employed by counties throughout the United States. Almost all of the more than 3,000 counties have county staffs. Depending on the population of the county, staffs range in size from one agent, who serves a wide variety of clientele interests, to a dozen or more agents, each serving a highly specialized need. Most of the remaining extension agents are employed by State extension services located on the campuses of land grant universities. A few work for regional staffs serving multicounty areas, and a small number are employed by the Extension Service of the U.S. Department of Agriculture. In addition, a few work in urban areas, mostly organizing 4-H activities for youth.

Training, Other Qualifications, and Advancement

Cooperative Extension Service agents are required to be proficient in disciplines related to the needs of their clientele. They must have a bachelor's degree in their subject matter field. In addition, training in educational techniques and in a communications field such as journalism is extremely helpful.

Often, they receive specific instruction in extension work in a preinduction training program, and can improve their skills through regular in-service training programs that cover both educational techniques and the subject matter for which they are responsible. Beside being proficient in their subject matter extension workers must like to work with people and to help them.

In most States, specialists and agents assigned to multicounty and State staff jobs are required to have at least one advanced degree and in many they must have a Ph.D.

Employment Outlook

The employment of cooperative extension service workers is expected to increase more slowly than the average for all occupation through the mid-1980's. As agricultural technology becomes more complicated, more extension workers trained in education and communications will be needed to disseminate information concerning advances in agricultural research and technology to the farm population. Also, modern farmers often are college educated and, thus, more likely to use innovative farming practices. This may increase the demand for extension agents since extension agents relay advances in farming practices from researchers to farmers.

Earnings and Working Conditions

The salaries of extension workers vary by locality, but, for the most part, they are competitive with salaries of other municipal and county professional employees, such as school teachers.

Extension agents work in offices and in the field. Since most extension service offices are located in small towns, persons who wish to live outside the city may find extension work the ideal career. Extension agents often get great satisfaction out of helping others.

Sources of Additional Information

Additional information is available from County Extension offices, the State Director of the Cooperative Extension Service located at each land-grant university, or the Extension Service, U.S. Department of Agriculture, Washington, D.C. 20250.

OCCUPATIONS IN LOGGING AND LUMBER MILLS

The logging and lumber mill industry offers a variety of careers for people who enjoy outdoor work. Logging camps and sawmills provide many job opportunities, especially in the South and Pacific Northwest, the Nation's major timber-producing regions.

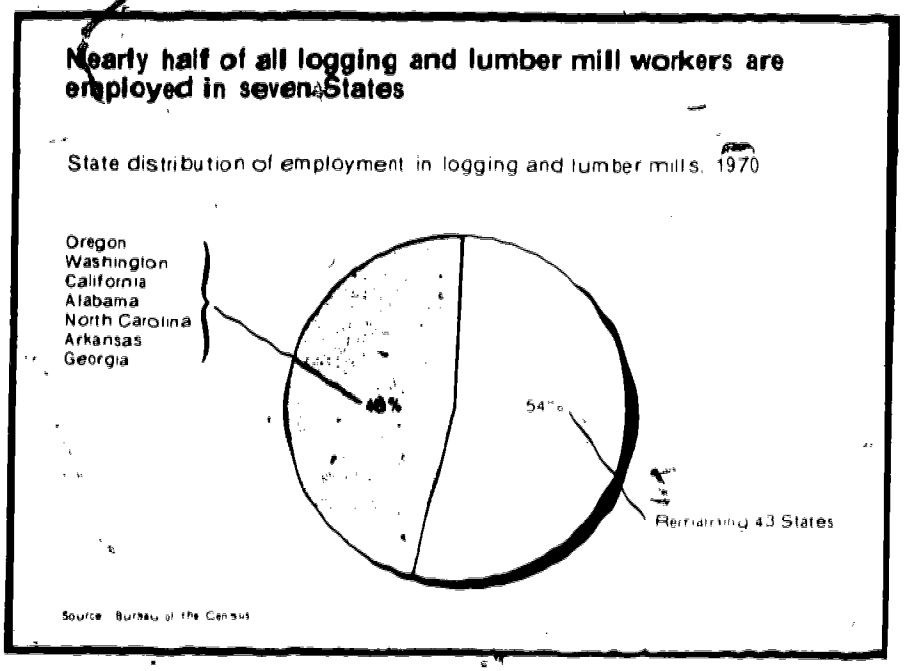
Nature and Location of the Industry

In 1978 about 75,000 wage and salary workers were employed in logging—harvesting trees and removing them from forests. A much larger number—about 210,000—worked in sawmills and planing mills where logs are converted into lumber. In addition, there were about 60,000 self-employed workers, most of them in logging.

This statement deals with activities and jobs involved in cutting and removing timber from forests and in the processing of logs into rough and finished lumber. It excludes the manufacture of paper, plywood, veneer, and other wood products such as furniture and boxes. Occupations in paper manufacturing are discussed in a separate statement elsewhere in the *Handbook*.

Lumber production has followed the same basic process for many years. A stand of timber is harvested in the forest, moved to a central location or "landing" accessible to transportation, and then carried by truck or rail to a mill for processing. Logging crews typically consist of from 5 to 15 workers. Several crews, each working at a different location, may be needed to supply logs for a single mill. The crew moves through the forest as one area after another is harvested. Years ago these workers lived in camps close to the cutting site. With better roads and transportation, almost all can now live at home and commute to work.

In the sawmill, logs are debarked, rough-sawn into boards or timbers of various widths and lengths, and then seasoned (dried) so the wood will not warp. A small amount of rough lumber is sold without further processing, but the rest must be sent to a planing mill before it goes to market. In the planing mill, rough boards are finished to give them a smooth surface. Boards also are made into flooring, siding, moulding, and other forms of building trim. Since logs cost more to ship than processed lumber, sawmills usually are located



near tree-harvesting areas. Some of these mills are small, portable operations that can be moved about from week to week as the harvest progresses, but the large ones are permanent. Planing mills may be part of sawmill operations or may be separate facilities miles away. Many sawmills and planing mills employ fewer than 20 workers, but some have more than 100.

Although some logging and lumber mill workers are employed in nearly every State, seven States account for about half of the industry's employment: Oregon, Washington, California, Alabama, North Carolina, Arkansas, and Georgia.

Logging. Before a stand of timber is harvested, a *forester* (D.O.T. 040.081) selects and marks which trees to cut. Foresters also map the cutting areas, plan and supervise the cutting, and plant seedlings to replace the trees that were removed. *Forestry technicians* (D.O.T. 441.384) assist foresters in performing these duties. *Timber cruisers* (D.O.T. 449.287) estimate the amount and grade of standing timber and help foresters make maps. Heavy equipment operators build access roads and trails to the cutting and loading areas so that they can be reached by logging crews.

The initial harvesting task—"falling and bucking"—is the process of cutting the tree down and further cutting (bucking) it into logs for maximum product value and easier handling. *Fallers* (D.O.T. 940.884), working singly or in pairs, use powersaws to cut down large trees marked by the forester. Expert fallers can usually drop a tree in the exact spot where they want it, without injuring other trees. As soon as the tree is down, *buckers* (D.O.T. 940.884) saw the limbs off and saw the trunk into logs. Sometimes, small trees are felled with tree harvesters, which are machines mounted on a tractor and operated by a *logging tractor operator* (D.O.T. 929.883).

The next task—"skidding"—is a method of removing logs from the cutting area. A choker (steel cable) is noosed around the log by *choker setters* (D.O.T. 942.887) and then attached to a tractor, which drags or "skids" the log to the landing. A *rigging slinger* (D.O.T. 942.884) supervises and assists choker setters and tractor drivers.

Sometimes, other methods of removal are necessary or desired. In rough terrain in the West, where logs must be moved up or down steep slopes or across ravines, the "high-lead" method is used instead of skidding. This method is somewhat like a fishing rod and reel. Steel cables run from a diesel-powered winch (reel) through pulleys at the top of a large steel tower (rod) and down to the cutting area which may be hundreds of feet away from the tower. Choker setters noose the end of the cable around a log and a *yarder engineer* (D.O.T. 942.782) operates the winch to pull the log into the landing. Other methods include the use of heavy-duty helicopters and balloons that lift logs weighing several tons and carry them to the loading sites. The major advantages of these methods are that forest obstacles may be avoided more easily and environmental damage caused by dragging logs across the land is reduced.

After logs reach the landing, they are loaded on a truck trailer and hauled to a mill. A *loader engineer* (D.O.T. 921.883) operates a machine that picks up logs and places them on the trailer. A *second loader* (D.O.T. 949.884) directs the positioning of logs on the trailer. Although trucks usually are used, logs are sometimes carried by railroad cars.

Loader operators take logs from landing area and place them on trucks to go to plants for processing.

Sawmills and Planing Mills. At the sawmill incoming logs are stacked on the ground (cold decking) or dumped into a pond to await cutting. Water storage protects the logs from splitting, insect damage, and fire. Cold decking, on the other hand, permits greater storage volume per acre, and some trees such as oak must be stored this way because they will sink in water. *Log scalers* (D.O.T. 941.488) measure logs and look for defects, such as knots and splits, to estimate the amount and quality of lumber available. *Pond workers* (D.O.T. 921.886) sort the logs so that all of one kind or size go into the mill together.

A *bull-chain operator* (D.O.T. 921.885) controls a conveyor that pulls logs up a chute into the sawmill. A *barker operator* (D.O.T. 533.782) operates machinery to remove bark and foreign matter that could damage saws. One kind of machine has rough metal bars or knives that rub or chip the bark away. Another kind tears it off with the high pressure force of water. The removed bark may be processed into garden mulch or burned to produce heat and steam for the sawmill.

As a log enters the sawmill, a *deck worker* (D.O.T. 667.887) rolls it onto a platform called a "carriage" and a *block setter* (D.O.T. 667.885) aligns the log and locks it into position. The carriage, which moves back and forth on rails, carries the log into the teeth of a large bandsaw; each time the log passes the saw a board is sliced off. This operation is controlled by a *head sawyer* (D.O.T. 667.782), who is one of the most experienced workers in the mill. The quality and quantity of usable lumber obtained from logs depends largely on the head sawyer's skill and knowledge.

After leaving the carriage, the lumber moves to an edger saw, consisting of two or more circular blades. Operated by a *pony edger* (D.O.T. 667.782), the edging machinery cuts the lumber to the desired width. For example, the production run may be cutting boards to a 4 inch width. Next, a *trimmer saw operator* (D.O.T. 667.782), using a series of circular cross cut saws, cuts the lumber to various lengths, such as 8, 10, or 12 feet.

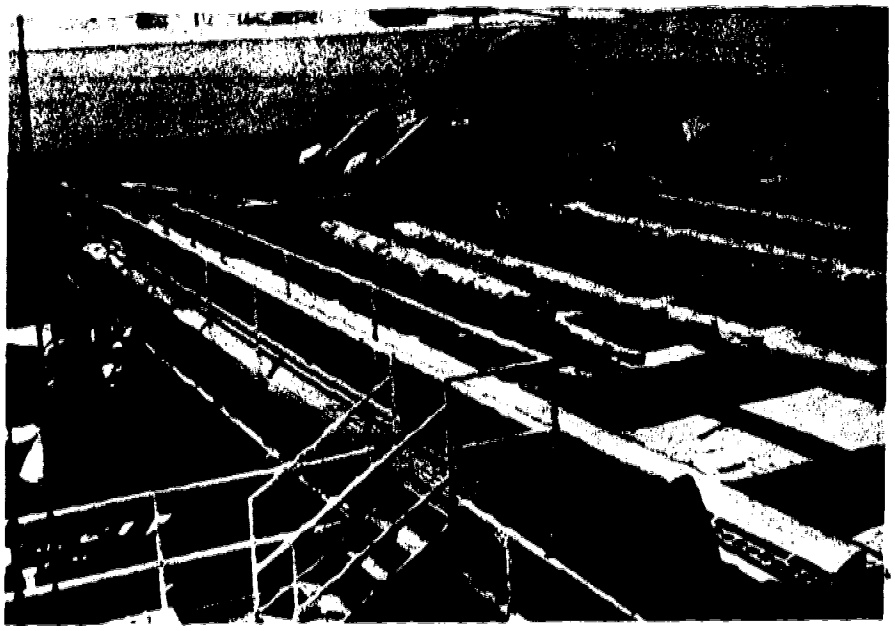
When all sawing is completed, a conveyor system moves the rough lumber into a sorting shed, where *graders* (D.O.T. 669.587) examine each board and determine its grade according to set standards of quality and value. After grading, *sorters* (D.O.T. 922.887) pull and stack the lumber according to type, grade, and size.

At this stage, the lumber is still green and must be seasoned so that it will not shrink or warp. It may be stacked outdoors where the sun and wind will remove excess moisture. More frequently, however, it is placed in a specially heated building (dry kiln). *Dry kiln operators* (D.O.T. 563.381) control temperature, humidity, and ventilation in kilns.

Some seasoned lumber is ready for use without further processing. Most of the lumber, however, must pass through a planing mill before being shipped to market. In this mill, the rough dried lumber is run through a set of rotating knives controlled by a *planer operator* (D.O.T. 665.782). Some knife heads produce smooth surfaces while others tongue and groove the boards for flooring or paneling. Similarly, a wide variety of moulding or other building trim may be cut. The dressed or finished lumber is usually graded again before storage by a *planer mill grader* (D.O.T. 669.587). The milling process is now ended and the lumber is ready for shipment.

In addition to those already described, workers in many other occupations requiring a broad range of training and skill are needed in the logging and milling processes. Maintenance mechanics install and repair saws and related machinery. Saw filers sharpen and repair saws, and electricians maintain and repair wiring, motors, and other electrical equipment. Increasingly, people with electronics backgrounds are being hired to maintain the growing amount of electronically controlled or operated equipment. Truckdrivers transport logs to the mills and deliver the finished lumber products to wholesalers.

Many workers are employed in clerical, sales, and administrative occupations. For example, many companies employ office managers, purchasing agents, personnel managers, salesworkers, office clerks, stenographers and typists, bookkeepers, and business machine operators. Also, the industry employs professional and technical workers, such as civil and industrial engineers, drafters and surveyors, and accountants. (Detailed discussions of professional, technical, and mechanical occupa-



Saw operator cuts logs into 8-foot lengths for plywood.

tions, found not only in logging and milling but in other industries as well, are given elsewhere in the *Handbook* in sections covering individual occupations.)

Training, Other Qualifications, and Advancement

Most loggers and millhands get their first jobs without previous training. Employers prefer high school graduates, but applicants with less education frequently are hired. Entry level jobs usually can be learned in a few weeks by observing and helping experienced workers.

A beginning logger may start by helping choker setters or buckers. After gaining logging experience and basic skills, workers may advance to higher paying positions as vacancies occur. Those with an aptitude for operating machinery may become a yarder engineer, or a tractor operator. Others may be interested in the highly skilled faller or bucker jobs.

In the mill, the beginner often is assigned to a labor pool to do odd jobs, such as sorting and stacking lumber. Millhands may be trained to operate various machines such as the edger saw or a band saw. Other mill workers may be able to pursue careers in lumber sales and marketing or be trained for research jobs.

Mechanics, electricians, and others who repair and maintain the industry's equipment are trained on the job under the guidance of supervisors and experienced workers. In some companies, this training is supplemented by classroom instruction. Maintenance trainees frequently are selected from workers already employed in mills or logging crews. Many firms, however, will hire inexperienced people who have mechanical aptitude. Generally, it takes a trainee 3 to 4 years to become skilled in one of the maintenance jobs.

Workers who have leadership ability and years of experience can advance to supervisory positions in mills and logging crews. Many of the smaller logging companies and sawmills are owned by people who began their careers as loggers or millhands.

Loggers and millhands must be in good physical condition. Although modern equipment has reduced some of the heavy labor, stamina and agility are still important qualifications, particularly for loggers. Because of the danger involved in operating and working around heavy machinery, workers should be alert and well coordinated.

A bachelor's degree usually is the minimum educational requirement for forester, engineer, accountant, and other professional occupations. Completion of commercial courses in high school or business school usually is adequate for entry into clerical occupations, such as secretary, typist, and bookkeeper.

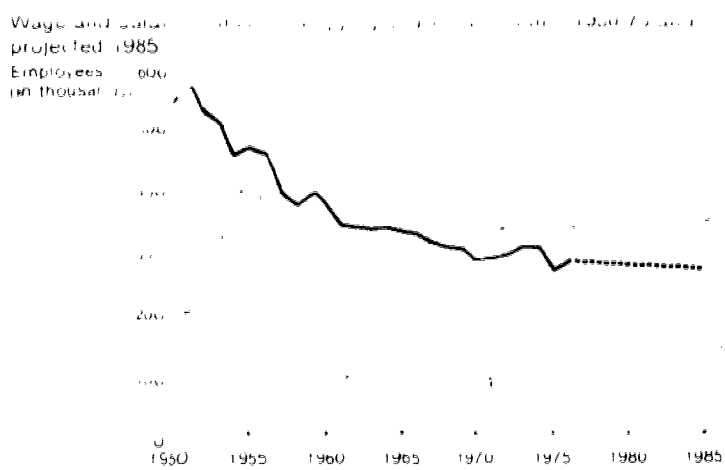
Employment Outlook

Employment in logging and lumber mills is expected to decline through the mid-1980's despite anticipated increases in lumber production to meet the Nation's population and industrial growth. Laborsaving machinery will make it possible to harvest more timber and process more lumber with fewer employees. Nevertheless, many workers will be needed each year to replace those who retire, die, or leave the industry for other reasons. The number of job openings may fluctuate from year to year, however, because the demand for lumber is sensitive to changes in construction activity.

Employment in logging camps and mills will decline over the long run as more modern equipment and techniques are adopted. A tree harvester, for example, which has a scissor-like pair of blades, can cut down a tree four times as fast as a saw. As more harvesters come into use, fewer logging workers will be required. Sawmills and planing mills may reduce employment requirements by installing new machinery and improving plant layouts. In the kiln area, for example, a stacking machine operated by two or three people can replace six who stack by hand.

Although employment in the industry as a whole is declining, certain occupations will grow. Additional mechanics, for example, will be needed to maintain the growing stock of logging equipment, trucks, and mill machinery. More foresters and forestry technicians will find jobs in this industry as forest replanting and conservation programs receive greater attention. Engineers will be in greater demand as the industry's production methods become more complex. As in the past, however, most of the industry's job openings will be for logging and mill workers; because they make up a very large proportion of the industry's total employment, replacement needs are high.

Laborsaving machinery has cut employment in the logging and lumber mills industry in half since 1950



Summer jobs sometimes are available for high school students 17 years of age or older. These jobs are unskilled and include such tasks as working on a survey crew, helping haul logs to landings, clearing brush, and fighting forest fires.

Earnings and Working Conditions

In 1976, production workers in sawmills and planing mills averaged $4.59 an hour. In comparison, production workers in manufacturing industries as a whole averaged $5.17 an hour.

Wage rates in logging, sawmills, and planing mills vary considerably by occupation and geographic area. Workers in different regions of the United States often earn vastly different hourly wages for doing the same job. Average hourly rates for selected occupations in Western logging camps and sawmills in 1976 are shown in the accompanying tabulation. Workers in the South earned considerably less than those in the West.

Logging and lumber mill workers often must do their jobs under unpleasant working conditions. Most logging jobs are outdoors and the weather often is very hot and humid or extremely cold. The forest may be wet and muddy, with many annoying insects during the summer. Sometimes, working time and pay may be lost because of heavy rain or snow or very extreme temperatures. Although usually sheltered, sawmills and planing mills may be noisy and dusty, and uncomfortably warm during the summer. Moreover, work at logging sites and in mills is more hazardous than in most manufacturing plants. For many persons, however, the opportunity to work and live in forest regions away from crowded cities more than offsets these disadvantages.

The major unions in this industry are the International Woodworkers of America (AFL-CIO) and the Lumber Production and Industrial Workers, an affiliate of the United Brotherhood of Carpenters and Joiners of America (AFL-CIO). On the West Coast, a large proportion of the industry's production workers are covered by union-management contracts. In the South, on the other hand, relatively few are covered.

Logging	Hourly rates, West Coast
Deck workers	$6.00
Pond workers	6.00
Sorters	6.25
Trimmers	6.25
Choker setters	6.45
Pony edgers	6.45
Truckdrivers	6.55
Graders	6.65
Lumber stackers	6.80
Planer operators	7.00
Rigging slingers	7.10
Yarder engineers	7.70
Head-saw operators, circular saw	7.80
Head-saw operators, band saw	8.30
Fallers and buckers	9.15

Sources of Additional Information

For further information about job opportunities and working conditions, contact:

International Woodworkers of America, 1622 N. Lombard St., Portland, Oreg. 97217

Wood Industry Careers, National Forest Products Association, 1619 Mass. Ave. NW., Washington, D.C. 20036.

What to Look For in this Reprint

To make the *Occupational Outlook Handbook* easier to use, each occupation or industry follows the same outline. Separate sections describe basic elements, such as work on the job, education and training needed, and salaries or wages. Some sections will be more useful if you know how to interpret the information as explained below.

The TRAINING, OTHER QUALIFICATIONS, AND ADVANCEMENT section indicates the preferred way to enter each occupation and alternative ways to obtain training. Read this section carefully because early planning makes many fields easier to enter. Also, the level at which you enter and the speed with which you advance often depend on your training. If you are a student, you may want to consider taking those courses thought useful for the occupations which interest you.

Besides training, you may need a State license or certificate. The training section indicates which occupations generally require these. Check requirements in the State where you plan to work because State regulations vary.

Whether an occupation suits your personality is another important area to explore. For some, you may have to make responsible decisions in a highly competitive atmosphere. For others, you may do only routine tasks under close supervision. To work successfully in a particular job, you may have to do one or more of the following:

- motivate others
- direct and supervise other
- work with all types of peopl
- work with things you need
  and manual dexterity
- work independently you have and
  self discipline
- work as part of a
- work with details per
  or laboratory reports
- help people
- use creative tal
- work in a confined area
- do physically hard
- work outside in all types of

[illegible] abilities so you can judge whether [illegible] suit you.

The EMPLOYMENT [illegible] the job market is likely to be favorable, [illegible] expected growth is compared to the average projected growth rate for all occupations (20.1 percent between 1976 and 1985). The following phrases are used:

Much faster	[illegible]
Faster	[illegible]
About as fast	15.0 to 24.9%
Slower	4.0 to 14.9%
Little or no change	3.9 to 3.9%
Decline	4.0% or more

Generally, job [illegible] ing at least as fast as the economy as [illegible]

But, you would have to know the number [illegible] peting with you to be sure of your prospects. Unfortunately [illegible] supply information is lacking for most occupations.

There are exceptions, however, especially among professional occupations. Nearly everyone who earns a medical degree, for example, becomes a practicing physician. When the number of people pursuing relevant types of education and training and then entering the field can be compared with the demand, the outlook section indicates the supply/demand relationship as follows:

Excellent	Demand much greater than supply
Very good	Demand greater than supply
Good or favorable	Rough balance between demand and supply
May face competition	Likelihood of more supply than demand
Keen competition	Supply greater than demand

Competition or few job openings should not stop your pursuing a career that matches your aptitudes and interests. Even small or overcrowded occupations provide some jobs. So do those in which employment is growing very slowly or declining.

Growth in an occupation is not the only source of job openings because the number of openings from turnover can be substantial in large occupations. In fact, replacement needs are expected to create 70 percent of all openings between 1976 and 1985.

Finally, job prospects in your area may differ from those in the nation as a whole. Your State employment service can furnish local information.

The EARNINGS section tells what workers were earning in [illegible]

[illegible] to pinpoint the [illegible] hard question to answer because good information is available for only one type of earnings: wages and salaries, and not even this for all occupations. Although 9 out of 10 workers receive this form of income, many earn extra money by working overtime, night shifts, or irregular schedules. In some occupations, workers also receive tips or commissions based on sales or service. Some factory workers are paid a piece rate, an extra payment for each item they make.

The [illegible] of all workers, the self employed, includes people in many occupations: physicians, barbers, writers, and farmers, for example. Earnings for self-employed workers in even the same occupation differ widely because much depends on whether one is just starting out or has an established business.

Most wage and salary workers receive fringe benefits, such as paid vacations, holidays, and sick leave.

Workers also receive income in goods and services (pay in kind). Sales workers in department stores, for example, often receive discounts on merchandise.

Despite difficulties in determining exactly what people earn on the job, the Earnings section does compare occupational earnings by indicating whether a certain job pays more or less than the average for all nonsupervisors in private industry, excluding farming.

Each occupation has many pay levels. Beginners almost always earn less than workers who have been on the job for some time. Earnings also vary by geographic location but cities that offer the highest earnings often are those where living costs are most expensive.