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AS AN INTEGRATED PART  
OF WESTERN AGRICULTURE

FROM

THE WESTERN RANGE—A GREAT  
BUT NEGLECTED NATURAL RESOURCE

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## AS AN INTEGRATED PART OF WESTERN AGRICULTURE

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### INTRODUCTION

The use of native forage by domestic livestock in the West probably began in 1598 when Don Juan de Onate brought 7,000 cattle and probably some sheep and established colonies on the Rio Grande River in north central New Mexico. Continuous use, however, did not begin until about 1692 when DeVargas reconquered the Indians who had rebelled and driven the white men out of the country. Then for a century and a half numerous little villages basked peacefully in the southwestern sunlight along the Rio Grande, their inhabitants content with the living derived from irrigated fields and the cattle and sheep which grazed the surrounding hills. By the early part of the eighteenth century a number of large and prosperous haciendas had developed in the Southwest, dependent on mining, cattle, and farming. Some of these haciendas grazed large numbers of cattle. The San Bernardino, which was about 17 miles east of the present town of Douglas, Ariz., once ran 100,000 head of cattle, 10,000 horses, and 5,000 mules (70).

Another section of this report has told how, from its beginning in the Southwest, California, Texas, and the mining camps, livestock quickly occupied the entire range country. This industry was at first almost wholly pastoral. Based upon the sole use of native forage, it was naturally transitory in character and subject to many vicissitudes.

But even during these early days of the vast range livestock industry, crop farming began to appear here and there throughout the West and before long to ally itself closely with stock raising. Disappointed gold seekers began to farm in the great valley of California in the early fifties. The Mormons in Salt Lake Valley began to grow lucerne and other crops on irrigated tracts about the same time. Even while the cowboy—that picturesque figure of the West—sang his “lament” to the herd on the Chisholm Trail, the breaking plows turned under ever-increasing acreages of lush grass sod on the prairies. Daniel Freeman patented the first homestead near Beatrice, Nebr., in 1869. In the seventies ranchers began to cut native hay on the Platte and Arkansas Rivers in Colorado, first to supply Army posts, and later for winter feeding of range livestock. Soon visionaries were dreaming of the Roosevelt and Pathfinder Dams, the Boise, Minidoka, and other reclamation projects.

Thus crop farming was developing within the same territory and upon land first used for grazing. By 1900 there were 242,908 farm units in the 11 western range States with 93,797,000 acres<sup>41</sup> of land in farms; in 1910 there were 373,337 farm units and 110,862,000 acres

<sup>41</sup> These acreages include all land in farms regardless of ownership (i. e., private, State, county, and Indian lands).

of land in farms. The first big irrigation dam—the Shoshone—was completed in 1910, the Roosevelt in 1911, and others followed.

Western agriculture became more and more diversified. Specialty crops, largely independent of the use of range forage, such as fruits, nuts, cotton, and vegetables were grown, mostly on irrigated lands.

In great part, however, crop farming was dependent on range use by domestic livestock. In some places use of the range by livestock developed coincidentally with the growing of grains, forage, and other crops. Meat packing and processing plants were established over the West and the fattening and finishing of range steers and lambs with western-grown feeds began and grew. Many of those engaged in crop farming also grazed domestic livestock on the range and thus more and more people became dependent in part upon grazing. By 1930 there were 775,748 farm units and 392,159,936 acres of land in farms in the entire range country, and the texture of western agriculture had become in great part an interwoven complex of interdependent crop farming and grazing of range land.

### THE MAGNITUDE OF WESTERN AGRICULTURE

A substantial part of the total wealth of the West comes from its agricultural development. In contrast with the Middle West, this development has not been easy. In the Middle West, as a result of ample precipitation, the lands were in large part ready for cropping when the settlers arrived. All that was necessary was the breaking up of the virgin sod, the planting of the seed, and the cultivation and harvesting of the crop. The semiarid conditions of the West, however, imposed a much heavier burden. Irrigation developments, usually at a heavy cost per acre served, had to be completed before the land was ready for tillage and the raising of cultivated crops.

Huge expenditures by the Federal Government, the States, and private enterprise have been made for the development of irrigation, roads, range improvements, and other construction projects. Additional expenditures have been made in developing new species or strains of fruits, vegetables, grains, forage, and livestock adapted to western conditions; in the prevention and control of insect pests and disease scourges; in financial loans, and in other ways, to improve and give stability and permanence to western agriculture.

Farm lands, buildings, machinery, and farm and range livestock form a substantial part of the wealth taxed for the support of State and local governments, educational and other institutions, and improvements. These lands, buildings, and machinery in the range region in 1930 (1930 census) were valued at 11.5 billion dollars, or 22 percent of the comparable total for the United States. The number of livestock was 63,092,000 valued at 1.4 billion dollars.

Domestic production of wool and mohair is primarily in the range territory. In 1930 the production of these commodities was 276,217,000 pounds, with a value of about \$82,134,000 (75 percent of the 366,317,000 pounds valued at \$113,317,000 produced in this country).

The full importance of any business to a community is not, however, expressed by statements of values in dollars. It is the flow of money in a community which supports the stores, the banks, the churches, the schools, and in fact the whole community existence.

That the direct value of crop products from the range States was \$1,600,354,000 and of livestock was \$476,135,000 in 1930 only partly expresses its magnitude. It is even more significant when expressed in the standard of living of about two million American families, plus the contribution which is made to all of the business enterprises which serve the agricultural undertaking. It hardly need be said that the agriculture of the West affects local, national, and world trade and penetrates into the whole social and economic fabric.

### DIVERSE PATTERNS OF WESTERN AGRICULTURE

The range country encompasses wide expanses of plains, plateaus, mountains, and lowlands, with almost every degree of intermixture and arrangement. Within such an area there are many conditions of soil, of rain and snowfall, of temperatures, and of vegetation. In general, however, it is semiarid country with crop farming on scattered irregular areas of widely different sizes and condition—fertile irrigated and subirrigated tracts in the valleys along the base of the mountains, or on the plains where water is available; supermarginal and submarginal dry farms sometimes in large blocks, sometimes dotted here and there with no apparent semblance of order; native hay lands in the mountain meadows, along the mountain valleys—and on the plains; and enveloping all of these are the range lands.

Over such a large area, and under such a wide variety of influencing conditions the patterns are many and varied, but they fall into two general forms, specialized crop farming and combined crop farming and range livestock grazing.

#### SPECIALIZED CROP FARMING

Specialized crop farming is devoted primarily to the production of fruits, nuts, vegetables, and other specialty crops. For the most part, it is conducted on very high value fertile lands, where adequate water is obtainable for irrigation. This type of agriculture devotes suitable land to its highest use and is of great economic importance. In general, however, it has but indirect relationship to the use of range-land forage.

#### CROP FARMING AND RANGE LIVESTOCK GRAZING

Variations in the association of crop farming for other than specialty produce and range livestock operations are innumerable. At one extreme is the wheat and cotton farmer, whose operation may be but indirectly related to range use. At the other is the yearlong livestock operation, to which little or no cropland is attached. In between these extremes is a great number of combinations of farming and range livestock operations. Here cultivated crops furnish the main cash income with sometimes the livestock grower as the only available marketing opportunity. There livestock raising is the major business, with farming merely to produce the necessary supplemental feed. Elsewhere the harvested croplands and even the vineyards and orchards furnish forage. And again a hay producer depends on the stock owned by his neighbors to furnish a market for his product. Thus the farms and the ranges of the West, whether they be in Arizona, Utah, Montana,



California, or Washington, are so interdependent one with the other that to think of either separately is impossible. While no attempt can be made to list all combinations, it is feasible to distinguish the following distinctive types:

1. Consisting entirely of range lands used for livestock production—all supplemental or fattening feeds purchased.

2. Consisting of range land used for livestock production and of limited areas of crop land used for raising small amounts of supplemental feed for saddle and work animals. Additional supplemental feed purchased.

3. Range lands used for livestock grazing with crop farming sufficient only to provide supplemental feed.

4. Innumerable variation of range lands used for livestock production and crop lands used for cash crops, and to provide supplemental feed for range livestock.

5. Various combinations of range livestock and crop farming, together with other part-time occupations as, for example, "dude" ranching.

6. Dairy farming. Use of range confined to summer pasturage for dry cows and heifers.

7. Crop farming entirely, with milk and work stock using adjacent range.

8. No range use—crop farming for the production of grain or other cash crop. The only direct dependence on the range is sales of supplemental feed and plowed and irrigated pastures for use by range livestock.

#### SIZE OF FARM AND RANCH OPERATIONS

Within the types described there is an equally great variation in the size of outfits. They may have as few as 5 to 10 head of cattle or sheep or as many as 60,000 cattle, and 80,000 sheep, or more. Acreages of land controlled may vary from as little as 10 acres of farm land to 400,000 or 500,000 acres of range land with some farm land. There are some limited instances of probably 1,000,000 acres in a single ranching operation.

#### PRODUCTS OF FARM AND RANGE OPERATIONS

The products of western agriculture consist in part of the things that grow from the soil and in part of the animals which feed on them. Grain crops and other products, chiefly livestock feeds, are produced on the cultivated areas and are in large measure consumed by the ultimate marketable product—livestock. The other major product, the range forage, often determines whether or not a well-rounded and profitable agricultural business results. Thus the products of the farm and of the range are so thoroughly integrated in the economic structure of the western agriculture that they are in truth inseparable.

#### *Livestock and Livestock Products*

Some idea of the extent to which range livestock contributes to the possible prosperity of western agriculture can be obtained from the following figures:

The estimated present numbers of livestock other than milk cows and swine in the 17 range States are 13,737,000 cattle, 32,407,000 sheep, 3,531,000 horses, 531,000 mules, and 4,664,000 goats. In addition, there are estimated to be 3,509,000 milk cows, and 4,714,000 swine. Use of the range by both milk cows and swine is, however, of minor consideration.

Range forage is used chiefly by meat cattle, sheep, horses, and goats. The usual range livestock operations graze either cattle or sheep, but combinations of two or three classes of stock are not uncommon. Few ranches graze horses exclusively.

Livestock products vary with the suitability of the range and crops to produce certain classes of meat animals, and with trade demands. Changes in livestock breeds and in type of animal produced are often made to meet changes in public fancy for meats of different classes or to meet trade demands for various grades of wools. While there are infinite variations over such a large territory as the range States, ranching operations from the standpoint of products may be placed in several major groups.

1. *Feeders and stockers*.—Feeders and stockers are the major products of most cattle ranches. They are sold by producers either as feeders for finishing as fat cattle on grain, crop forage, or feed concentrates, or for further conditioning on crop-land roughage in winter, or on grass pasture during the spring, summer, and fall. Large numbers of feeder steers are sold as "long yearlings", or about 15 to 18 months old. Feeders and stockers include steers, heifers, cows, and bulls (171).

2. *Grass-fat cattle*.—Many ranches having an abundance of summer forage turn off in the fall cattle that are in condition to slaughter. Large numbers of steers, dry cows, heifers, and bulls are sold in grass-fat condition. Grass-fat stock, particularly steers, are often subject to competition between packers for immediate slaughter and feeders for finishing.

3. *Aged steers*.—Three and 4-year-old steers are still grown on some ranches. Production has decreased over the years, however, as exports markets for heavy beef have decreased, and as domestic fancy for beef has turned more to lighter cuts. Especially good range forage is required to produce this class of stock in acceptable flesh.

4. *Calves*.—Public fancy for light cuts of meat and young beef has turned many ranches to the marketing of calves at weaning age. Large numbers of these calves are fattened and marketed as "baby beef."

5. *Feeder and mutton lambs*.—Sheep growers produce both feeder and mutton lambs. The lambs which reach the market in middle and later summer or early fall are sold either as feeders or fat lambs for immediate butcher, depending largely on their condition. Also many lambs are sold directly as feeders to operators who fatten them for later marketing. The late summer and fall runs of range sheep fall in this class. Old ewes are also fattened for mature mutton.

6. *Spring lambs*.—Many sheep growers produce spring lambs which are marketed during the slack spring period after the heavy sales of winter-fed lambs and before the heavy summer sales of fat

lambs. The earliest of these, known as "Easter" or "hot-house" lambs, are produced mainly in Arizona and California by supplemental feeding of mother ewes on cropland forage and concentrates, and by use of irrigated pasture during the winter period. Idaho, California, Oregon, and Washington produce large numbers of "milk fat" lambs which are marketed during the spring and early summer soon after the early runs of "Easter" lambs.

7. *Fat cattle and lamb finishing.*—Feeding and finishing of cattle for slaughter has increased in the range States with the increase in crop farming and with the increased production of corn and other grains, alfalfa and other hay, and feed concentrates. For example, on January 1 of the last year for which figures are available, there were estimated to be 402,000 head of cattle and 1,560,000 lambs on the feed lots in the 11 western range States. Lambs, however, are often fed and shipped to market as fast as they are put in condition, and then replaced, so that the number on feed on any one date does not indicate the total number marketed during a season. Feeding operations are conducted by (1) operators who produce the feeders and purchase feed from crop farmers and others, (2) feeder producers, who grow their own grain and hay, (3) crop farmers who purchase feeder cattle for fattening, (4) contract feeding under various systems, (5) and independent operators who buy both stock and feed.

8. *Dairy stock.*—Many dairy farmers throughout the West depend on the range for pasturage for dry cows and young heifers being held for replacement of aged cows.

9. *Purebred livestock.*—Purebred livestock are raised to some extent throughout the West, for local and interregional markets.

10. *Wool and mohair.*—Wool is a major product of all sheep-raising and mohair of goat-raising operations. Wool varies in quality from the fine wools of the Merino and Rambouillet breeds to the medium and coarse wools of the mutton breeds of sheep.

11. *Saddle and light work horses.*—These are raised usually in connection with cattle operations. With the mechanization of farming there was small demand for horses, but during the past few years, with returning use of horses, sales have been good and have been an important source of income to many farmers and ranchers in the range States.

12. *Hides and pelts.*—These are a product of all cattle and sheep operations.

#### *Cropland Products*

Crops grown by farmers and ranchers vary widely depending on soil types, climate, irrigation, needs for diversification of products, and requirements for supplemental forage and fattening feeds. The wide variety and combinations of crops produced precludes any attempt at detailed classification; there are, however, some general types which may be recognized:

1. *Native hay usually with limited corn or small grains.*—In many cases such crops are used almost exclusively for supplemental feeding of range livestock either as a part of a combined crop-farming and grazing operation, or by livestock operations which purchase supplemental feed.

2. *Native hay and alfalfa, limited corn or small grains.*—Such crops are often used primarily for feed in connection with a combined crop-farming and livestock operation. They may, however, be in part used and in part sold as cash crops, with innumerable variations according to the operating set-up of different “outfits.”

3. *Wheat farming, with limited other small grains.*—Wheat farming in the main is for the production of a cash crop but other crops are usually grown also, which, together with stubblefields and forage byproducts, furnish feed for livestock.

4. *Combination crops of alfalfa, grain, sugar beets, potatoes, and truck.*—Alfalfa, beet pulp, and grain straw furnish supplemental and fattening feeds for livestock. They may be used by the producer for feeding stock raised by him or sold to livestock operators.

5. *Corn, beans, and sorghums, grown primarily for feed.*—Dry-land farming may be limited to a small variety of crops which are used primarily as supplemental feed for range livestock.

6. *Cotton, wheat, and sorghums.*—Crop production in parts of Oklahoma and Texas consists chiefly of various combinations of cotton, wheat, and sorghum crops. The cottonseed concentrates and sorghums are used as feed for livestock, either as part of a combination farming and livestock operation or for sale to livestock grazers. Cotton is also grown under irrigation in Arizona, California, and New Mexico.

Thus the feeder steers, the baby beeves, the feeder lambs, the finished cattle, and other livestock usually depend for salability in greater or less degree upon the hay, the grain, the sugar beets, the corn, and the sorghum produced on the crop lands. Too often without the farm the range would be unprofitable and without the range there would be no market for the products of the farm.

#### SEASONAL USE

Just as there is great diversity in the type and size of the operation and in the kind and method of marketing the products grown, so also there is a wide variety in the customs and requirements for seasonal use of the range. That this should be true, naturally follows from the great spread in climate, topography, and vegetative types included in the range country.

Range lands are grazed for different periods, from 3 or 4 months in summer to the full year. Seasonal-use ranges are usually placed in four major classes—spring and fall, winter, spring-fall-winter, and summer (fig. 79).

The use of spring, summer, and fall ranges is governed primarily by altitudinal variations and general climatic conditions. Year-long use is confined to areas where winter climate is mild, and to types of forage which cure well on the stalk and provide nutritious dry feed. Large areas, however, adapted by climate and forage to yearlong grazing, are used only during the winter season, because of their proximity to summer range in the mountains, or to crop lands where they are used in connection with supplemental feeding of forage crops, and irrigated pasture. Other areas otherwise suited to yearlong use, because of absence of permanent water, may be grazed only during periods when temporary water from rain or snow

is available. Use of some ranges upon which the forage consists of annual species which dry up during the summer months, are confined to fall, winter, and spring grazing.

There are, within wide latitudes, several general characteristics of seasonal use by ranching operations.

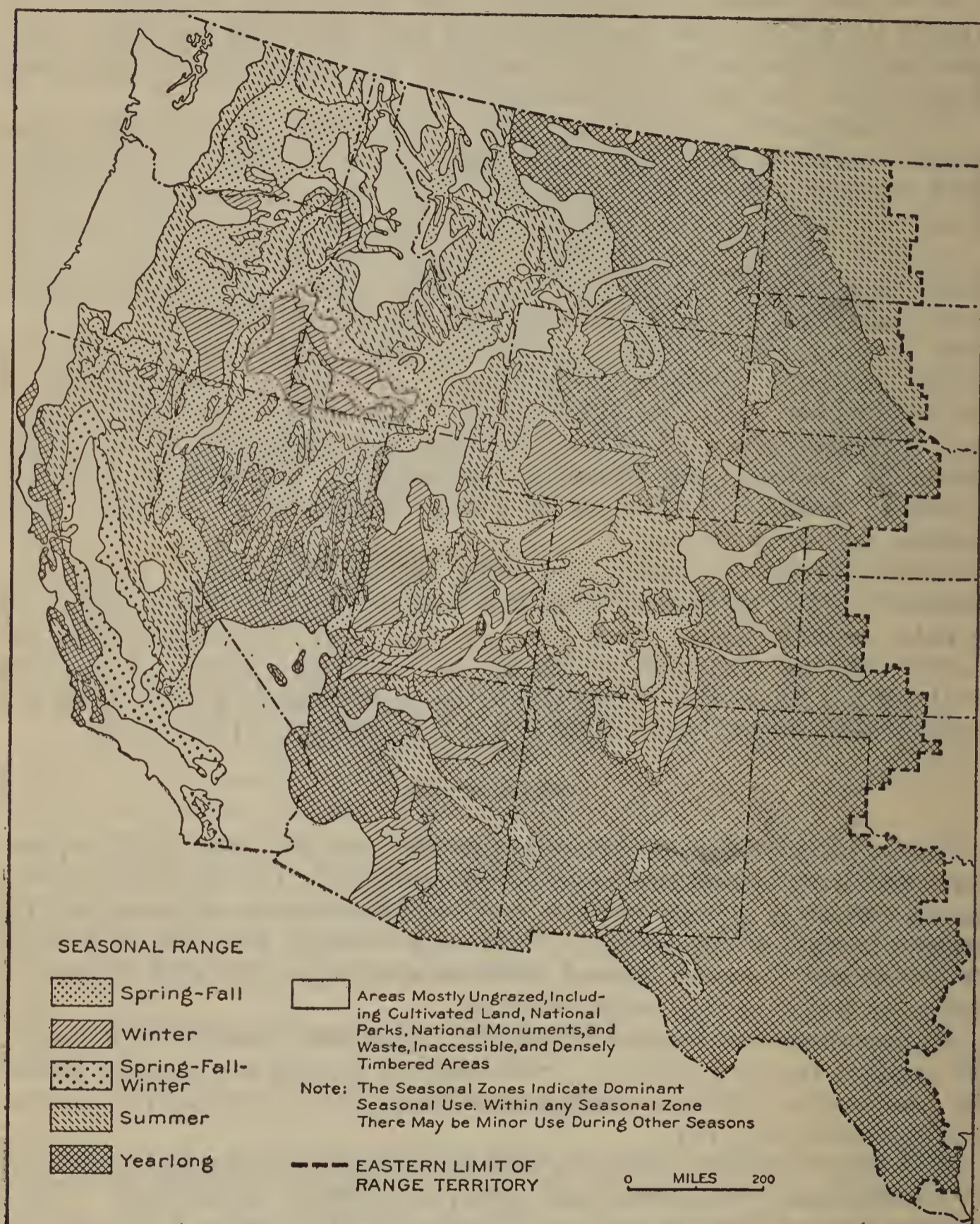


FIGURE 79.—SEASONAL-USE AREAS.

In the mountain regions the shortage of range for spring-fall use presents a serious problem, particularly as deterioration is greatest on this class of range.

1. *Use of one range unit throughout year.*—Such use is confined to areas where climatic conditions are favorable, and forage species furnish nutritious dry feed after the growing season.

2. *Use of range all year with removal from low areas in winter to high areas in summer.*—Sheep are sometimes trailed or shipped

200 miles or more twice during the year between summer and winter range; cattle are usually moved but short distances.

3. *Use of range in spring, summer, and fall with short winter-feeding season on products from crop farming.*—Many small and moderate-sized operations winter-feed on crop forage for varying periods.

4. *Long period.*—This consists of 7 to 10 months on summer range and 2 to 5 months winter-feeding period, with some continual use of range except for storm periods or deep snow. Prevalence of severe winters in some parts of the West preclude winter grazing except to a limited degree, and stock are fed during the winter season. This is practicable only where forage crops and hay, usually produced wholly or in part on crop and hay lands operated by the livestock concern, provide reasonably priced supplemental feed.

5. *Rotation between cropland pasturage and range at various seasons.*—Owned or leased stubble fields and cutover hay lands are used by many operators in late fall for periods of 2 weeks to a month or more, also after stock are removed from the range and before winter feeding begins. Winter wheat in some sections is grazed for varying periods in late fall and early winter. In California particularly, cropland and irrigated pasturage are used during the summer period when range feed dries up.

Thus the seasonal use of the range varies all the way from year-long continual use to a short period during the summer. The character and availability of farm-grown forage and supplements, the character of the range, and the climate, all enter into the determination of the grazing season for any given locality.

#### LAND TENURE AND CONTROL

In no phase of western agriculture is there wider diversity than in that of land tenure and control. This varies from the tramp stockman who owns no land and leases little for his precarious but often profitable operation, to the substantial operator who owns the farms, ranches, and ranges on which his stock graze throughout the year. In between there are many combinations of ownership, leases, permits, and unauthorized use. Primary factors which influence tenure and control are (1) the variegated pattern of land ownership in the West, (2) purchase prices and leasing costs of land as compared with its productivity values, (3) the methods of handling stock on the range, (4) forms of Federal reservation of public lands, (5) the extent of unreserved public domain usable as free commons, and (6), in part, the purposes of land occupation since the beginning of settlement. A few important general types of land tenure and control require definition.

#### *Range Land*

1. *All owned by ranching operation.*—There are comparatively few livestock operators who own in fee simple all of the range land required by the outfit.

2. *Owned and leased in varying proportions.*—Use of leased land in connection with varying proportions of owned land is a very common system of range tenure throughout the West.

3. *National-forest range*.—Many range livestock operators, large and small, are entirely dependent on feed grown on owned crop land and forage on the national forests.

4. *Owned or leased land, public domain, and other publicly owned ranges*.—The most common type of outfit owns some farm and some range lands, leases a varying acreage of both from private parties, uses the unreserved public domain for certain seasons, and utilizes national forests, Indian reservations, or State land under permit or lease, as the case may be, for the remainder. Normally the national forests provide high range required for the summer season.

5. *No owned range*.—Many livestock concerns operate entirely on leased range lands or with varying acreage of leased range used in connection with unreserved public domain and other free range.

6. *The tramp sheepman*.—This class of sheepmen, who controls no range nor owns a ranch, is disappearing.

The fact that the right or the privilege of occupancy of range land is held by various methods does not in innumerable instances insure the grazier control of his areas to the exclusion of others. Many ranges are used in common by a number of concerns who individually own or lease widely scattered and intermingled parcels of land, among which may also be included unreserved public domain or other free range. Individual control of such ranges for purposes of good land management and husbandry is impracticable. In other cases owned and leased lands may be strategically located to control watering places or ingress or egress to grazing areas in such a manner as to give virtual control on the range unit.

#### *Cropland*

Much crop land used by livestock concerns is owned, but large acreages of irrigated pasturages and some crop-producing areas are leased.

#### REGIONAL CHARACTERISTICS OF CROP- AND RANGE-LAND AGRICULTURE

In the development of the West, partly as a result of precedents which came with settlement, partly as a result of wide differences in market possibilities for the products raised, and partly as a result of differences in such controlling features as climate, topography, and the availability of water for irrigation, rather distinctive regional differences have been built up. Although sharp dividing lines cannot be drawn and the characteristics of one region may gradually merge with those of another, the major differences justify the recognition of four broad regions.

#### PLAINS REGION

The Plains region as used here includes the range area east of the Rockies and north from southern Colorado and the Oklahoma Panhandle to Canada. This region is well adapted to a highly interdependent crop farming and range agriculture. The remaining range areas of the tall-grass prairies and most of the short-grass plains are within this region. The range lands in general support

a good growth of nutritious forage, used in close relationship with a large amount of dry-land crop farming and some irrigation, particularly along the North and South Platte and Arkansas Rivers and in Montana. Grains, sorghums, corn, sugar beets, alfalfa, and other crops, together with native hay, furnish large quantities of supplemental and fattening feeds. The area around Greeley, Colo., for example, is one of the important lamb-feeding sections of the West.

Livestock are grazed for the most part during a long summer season varying from 7 to as much as 10 months, and in some instances yearlong. The prevalence of severe winters and at times intense blizzards and drifting snow requires winter feeding of supplemental crop forage. Because of the high productivity of these ranges in general, they turn off large numbers of grass-fat cattle as well as feeders.

In spite of naturally favorable conditions for integrated agriculture, this region, with some notable exceptions, presents major range problems. The relatively level to rolling topography led to widespread homesteading and to attempts to grow wheat on land which is now known to be submarginal for such use. Because of this submarginal farming much of the region is characterized by a high percentage of abandoned farms and deserted homes. Furthermore, the land ownership pattern is complex and confusing, owing to remnants of State land, tax-reverted county land, mortgage-foreclosed land in the hands of insurance companies and financial agencies, railroad grants, and a large percent of nonresident-owned private land as a result of speculation. Generally, owned land forms a high percentage of the operating acreage of ranching concerns.

Some outfits lying along the eastern front of the Rockies use national-forest range. The regional characteristics are reflected in ranch organization.

A group of 77 ranches studied in North Dakota, South Dakota, Montana, and Wyoming run an average of about 300 head of cattle and control by ownership and lease an average of 5,692 acres of land (187). More than half of the ranches made some use of national-forest or public-domain ranges. The average total area owned and leased was divided up as follows:

	<i>Acres</i>
Owned crop land (6 percent)-----	344
Leased crop land (0.6 percent)-----	34
Owned grazing land (48 percent)-----	2,746
Leased grazing land (45 percent)-----	2,568

Studies in eastern Colorado (25) toward the southern portion of the Plains region show a trend toward larger outfits, less crop land, and more leased grazing acreage. Twenty-two ranches, running usually a little over 1,000 head of cattle, had an average controlled area of 19,071 acres, as follows:

	<i>Acres</i>
Owned crop land (1 percent)-----	187
Owned grazing land (32 percent)-----	6,092
Leased grazing land (67 percent)-----	12,792



## SOUTHWEST REGION

The Southwest, including Arizona, New Mexico, and the range country of Texas, embraces large areas of low-lying desert and semidesert, broad plateaus, and comparatively few isolated mountain ranges.

Climatic conditions and forage types are favorable to yearlong use of the range. Dry-land crop farming is limited to scattered areas varying greatly in size and in general is very uncertain. There are some irrigated areas along the base of the mountains and in the mountain valleys and several large reclamation projects.

Because of this lack of well-distributed crop farming, livestock concerns are highly dependent on the range-forage resource. Crop farming by range-livestock outfits, except in a few favored localities, is extremely limited, and supplemental feed is purchased, usually at expensive figures, when necessary to meet shortages of range forage.

The low forage productivity of the range and lack of diversification result in many large livestock concerns, both in numbers of livestock and range areas controlled.

The cost per animal unit of range improvements for control and management is high. Lack of adequate natural stock water over much of the range necessitates costly water development.

The low grazing capacity, dry-feed ranges produce chiefly feeder cattle and feeder lambs. In Arizona, however, the irrigated crop farming and pasturage on the Salt River Valley projects enable some sheep growers to produce early milk-fat "Easter" lambs.

Acreage prices of land, grazing capacity considered, are high, and there is a high proportion of tenure by lease. In Texas 82 percent of the land is privately owned, often in large blocks, and 18 percent is State owned. As a result, ranching operations in Texas show a high proportion of owned land in rather compact units of management.

Also in the northern portion of the Texas range area there is considerable crop farming. Wheat, grain, sorghums, and cottonseed concentrates provide supplemental feed for use in connection with livestock grazing.

Studies of ranch organization show the means of land tenure, the acreage relationship of crop and grazing land, and size of outfits for different groups of ranches in the Southwest (99). Eighty-three ranches in Arizona and New Mexico, grazing an average of 2,087 head of cattle, controlled on the average 79,326 acres of land, distributed as follows:

	<i>Acres</i>
Owned crop land (0.08 percent)-----	62
Owned grazing land (8 percent)-----	6,165
Leased grazing land (29 percent)-----	22,852
National-forest range (9 percent)-----	7,602
Public domain (54 percent)-----	42,645

Another group of 11 ranches, each grazing about 1,500 cattle and 6,300 sheep, controlled an average total of 96,840 acres of land, comprising the following:

	<i>Acres</i>
Crop land (0.1 percent)-----	96
Owned grazing land (32 percent)-----	31,171
Leased grazing land (49 percent)-----	46,996
National-forest range (7 percent)-----	6,759
Public domain (12 percent)-----	11,818

The high percentage of private ownership of land in Texas is reflected in land tenure of individual ranches. Twenty-eight ranches studied in western Texas used an average area of 71,705 acres for 2,300 cattle, as follows:

	<i>Acres</i>
Owned crop land (0.04 percent) -----	30
Owned grazing land (73 percent) -----	52, 574
Leased grazing land (27 percent) -----	19, 101

Another group of three sheep and cattle ranches used an average area of 21,600 acres, all of which was owned land, and grazed an average of 303 cattle and 3,789 sheep.

One large ranching concern reflects the greater degree of crop farming in the Texas Panhandle country. This ranch, which runs 17,000 head of cattle, comprises 1,400 acres of farming land and 420,000 acres of grazing land, all of which is owned.

#### MOUNTAIN REGIONS

The mountain regions (Intermountain, Northern Rockies, and Pacific Northwest) are characterized by high mountain areas and low-lying valleys and plains.

The mountains supply large quantities of water, and irrigated crop farming is interspersed frequently throughout the grazing lands, usually along the base of the mountains and in the valleys. There are several large irrigation projects, and a wide variety of crops are produced which afford supplemental and fattening feeds for range livestock. Mountain meadows and subirrigated valleys produce native hay and cultivated crops.

As crop farming has developed in this region, the range livestock business has become more and more interlocked with it, and in fact the use of large areas of range land was possible only after crop-farming supplied required winter feeds.

Because of sharp changes in altitude and the high mountain ranges, there is a very distinctive seasonal use of the range between winter, spring and fall, and summer. The high mountain ranges are used for periods of 3 to 5 months in summer, the lower slopes of the mountains for periods of 2 to 6 weeks in spring and fall, and the low valleys and plains—either as range, farm pasture, or feed lots—are used during the winter.

The national-forest system covers much of the mountain area in this region and the greater part of the summer ranges and much of the spring and fall range is, therefore, used under grazing privileges permitted by the Forest Service.

There are large ranching concerns throughout this region, but the moderate-sized combined crop-farming and grazing ranches predominate. While there are innumerable variations, the following examples indicate size and type of ranches, the combinations of crop and grazing agriculture, and the means of land tenure of many ranching outfits in this general region.

Thirteen cattle ranches in Utah (103), with about 244 head each, used an average of 5,799 acres of land distributed as follows:

	<i>Acres</i>
Owned crop land (4 percent) -----	210
Owned grazing land (21 percent) -----	1, 232
Leased grazing land (5 percent) -----	298
National-forest range (33 percent) -----	1, 925
Public domain (37 percent) -----	2, 134

An average of two typical sheep ranches in Idaho amounts to 4,820 acres of owned and leased land exclusive of use of national-forest and public-domain lands—1,030 acres of owned crop land farmed, and 2,415 acres of owned and 1,375 acres of leased range land grazed. During the summer national-forest range was used, public domain was grazed for about 3 months in early spring and late fall, and supplemental crop feeds were used during most of the winter. The average number of sheep grazed was 9,100 head, which is somewhat larger than the average for this broad region as a whole.

#### CALIFORNIA REGION

The bulk of the grazing lands in California and the crop farming which is closely integrated with use of the range lie within the great valley of the San Joaquin and Sacramento Rivers, which stretches through the interior of the State for a distance of over 500 miles.

The climate of this valley is unique in that the growing period occurs during the late fall and winter and spring. The range forage in the valley and along the lower slopes of the mountains is composed mostly of annuals which produce an abundance of excellent forage during the growing season but dry up and are of greatly reduced value in summer.

Since the mountain summer ranges furnish only a little over 10 percent of the range feed, livestock are largely dependent during the summer on crop land stubble and irrigated and subirrigated pastures.

Seasonal use revolves largely around croplands. Cattle for the most part use annual grass ranges during late fall, winter, and spring, and are summered on irrigated and other farm pasturage, subirrigated bottomlands, and on the national-forest mountain ranges. In the early fall they use largely grain stubble fields.

Sheep are grazed usually on annual grass pasture in late fall, winter, and spring, move to the national forests, or irrigated or subirrigated pasture and other croplands in summer, and use grain-stubble fields and irrigated pasture in the early fall.

California produces a tremendous variety of crops which provide large quantities of supplemental and fattening feeds. One hundred thousand tons of cottonseed cake, 350,000 tons of beet pulp, and large amounts of linseed meal and rice bran are produced annually. For the important Los Angeles market, large numbers of cattle and lambs are fed annually. Many lambs are fed by feeding companies with large plants and are sent to market as fast as conditioned during the season. California is one of the few States which produce early spring lambs.

The coast ranges, where there are some perennial grasses, are used to some extent yearlong, although winter feeding of supplemental crop land forage is also practiced.

Tenure of crop and range lands by livestock operations varies greatly with different concerns. Figures for two widely different counties show that 17 percent of the cattlemen and 28 percent of the sheepmen in Stanislaus County and 24 percent of the cattlemen and 52 percent of the sheepmen in Kings County own no real estate.

The 17 percent of cattlemen graze 29 percent of the cattle, and the 28 percent of sheepmen graze 51 percent of the sheep in Stanislaus County. In Kings County the cattlemen who own no real estate graze 56 percent of the cattle, and the sheepmen 82 percent of the sheep. There are a total of 69 cattlemen in Stanislaus County and 17 in Kings County. The total number of cattle grazed are 11,409 head and 2,526 head, respectively.

The dense population of California (5,677,000, or 38.8 percent of the total for the range country) makes meat production of great importance for local food requirements. This State at times draws for cattle on all the 11 western range States, and Texas, Canada, and Mexico. There is a lack of suitable range land but an abundance of cropland products for fattening. Therefore, the closely integrated use of crop and range lands is of extreme importance in maintaining maximum production of livestock.

These regional characteristics and their influence upon local agriculture serve to show how inseparable, throughout the West, the range and the farm have become. Starting with the independent use of native forage by the pioneer stock outfits, coming on down through the period of intense conflicts between the homesteader, the sheep outfits, and the cowmen, we now find each use so dependent on the other that the elimination of one would seriously handicap the whole economic and social order. Only through the closest kind of coordination can the full potentialities of the land be obtained. Furthermore, the corollary is obvious, that neither phase of this integrated agriculture can suffer serious impairment without seriously affecting the other, and the welfare of a whole region as well.

The wide range of conditions covered by the agricultural patterns only serves to emphasize the need for close correlation. The Mormon community with small intensively used acreages and small but essential herds or flocks, the hay from Snake River Valley fed to sheep and cattle which summer on the public domain or the national forests, the Easter lambs which are finished on the Salt River project, the large herds of the Southwest which give purpose to the irrigation of that region, the beet pulp and other agricultural byproducts which are used to finish livestock in Montana—these are just a few examples of the interlocking of western agriculture.

#### DEPENDENT POPULATION

Since the dawn of civilization the ranging of domestic livestock on native forage has been an important occupation of mankind. It has furnished a large part of the food and clothing and the basis for much of the trade and industry. But integrated crop farming and grazing is a more stable and permanent form of agriculture than grazing alone and this industry furnishes a source of occupation and of economic support to many people in the West today. The druggist, the lumber dealer, the beauty parlor operator, and the garage mechanic in a prosperous stock town are as fully dependent on livestock for a livelihood as is the cowboy or farm hand. Thus the 14,612,000 people in the range country in large measure depend on western agriculture for their welfare and prosperity. The degree of dependence varies greatly with the type of community life but four general groups stand out.

## OUTLYING RANCHES

There are many isolated ranches in the range country located at distances from trading points or post offices, varying from only a few miles to 100 miles or more. The culture and standards of living are in general high, but great variations occur, from ranch headquarters equipped with radios, electrical appliances, and modern sanitation to the dirt-floor shack without any modern conveniences.

The dependency of these ranches upon the use of the range by livestock varies tremendously from the dry farmer eking out an existence on a submarginal farm to the large ranch having heavy capital investments in grazing, subsidiary crop lands, and range improvements dependent upon a sustained profitable production of livestock. Others depend partly upon grazing and crop farming or partly upon other endeavor. "Dude ranching", for example, has assumed considerable importance over the past 15 years.

## COMMUNITIES

Range-land communities vary as widely in character as do the homes of the individual ranchers. The Spanish settlements along the Rio Grande since late in the seventeenth century have used the range continuously. Range lands around such settlements furnish most of the forage for milch cows, milch goats, and meat animals, which supply a major portion of the food, particularly protein foods, of the residents. The Mormon communities of the intermountain and southwest regions are social entities closely knit by ties of church. Many settlements, particularly on arable lands along streams or mountain valleys, and dry-farming areas have their social center and trading point in a combined post office and general store, a public school, an amusement hall, a church, and perhaps one or two additional small business establishments. These little communities, often adequate for the farming and ranching operations they serve, may well form the basis for a high type of American living.

Aside from communities which are largely dependent upon crop farming and livestock, there are many the support of which comes from a variety of other occupations interwoven into the economic complex, such as mining, lumbering, tourist trade, and hunting and fishing. These are of all varieties, from the thrifty modern settlement, with a definite social life and recognized social responsibilities, to the decadent submarginal farming town, with few or no social advantages and with no leadership to assume the responsibility of the community. Both types, and all between these extremes, are in varying degree dependent upon crop farming and livestock grazing for their permanent existence. Individually the hopes, aspirations, and happiness of many people and collectively their social and economic security depend upon the degree to which the range is available as a source of permanent support.

## SUPPLY TOWNS

The characteristic type of supply town which serves the range country may be a distributing point for distances of 100 miles or

more on each side. Even though the populations are small, the total business transacted during the year may be very large comparatively. They embrace sizable wholesale and retail houses, and the ordinary business endeavors. Usually they support one or more churches and two or three fraternal organizations; good schools and reasonable opportunities for social diversions are available.

Although dependent upon a variety of trade, traffic, and industry, ordinarily the range livestock business and other forms of agriculture are among the important sources of their support.

### METROPOLITAN BUSINESS CENTERS

Metropolitan business centers include cities such as Denver, Phoenix, Ogden, Salt Lake City, and others. They are wholesale receiving and distributing points for all commodities used in the range livestock industry, and for the products of that industry as well as other industries represented in the West. They provide stockyard facilities, livestock and agricultural commission houses, and in some cases meat-packing and processing plants, saddlery, harness, and other leather-purchasing and manufacturing concerns.

### BONDS BETWEEN WESTERN AGRICULTURE AND THE MIDDLE WEST AND SOUTH

The extent to which the range livestock industry of the West contributes to the agricultural undertaking of the Midwest and South and industries of the East is not generally appreciated. With regard to the first, the relationship, which is mutually advantageous, rests principally in the furnishing by the West of feeder steers and lambs for fattening on Midwest farms. Western ranges are in general best adapted to the production of feeder stock. Although finishing on farms has increased throughout the West, the production of feeders is still greatly in excess of western requirements. Thus the fattening of range livestock in the Corn Belt offers the best possibility of marketing for this excess.

There are other advantageous features of middle-western fattening of range-produced steers and lambs. It offers Corn Belt farmers an opportunity for bettering their income by converting raw materials, such as hay, corn, and other grain, into finished products for human consumption. It also provides the farmer with the opportunity of turning his slack time into cash and for reducing the cost of finishing hogs that use feed lots with cattle. This is an important source of profit from the entire feeding enterprise.

In some instances, particularly during the fall of 1934 and winter of 1934-35, following the severe drought of the summer, Midwest winter wheat lands have furnished pasturage for large numbers of range cattle. Financially harassed farmers received a good income from this use, and ranchers were able to prevent severe drought losses and maintain breeding stock in good condition.

Conversely, supplemental winter feeding in the West offers markets for large quantities of Middle West shelled corn, oats, and other small grain. The total volume and values involved in such transactions are very difficult to determine, but they are unquestionably of great interregional importance.

The primary relationship between western ranching and the South is through use in the West of large amounts of cottonseed cake, meal, and other products for supplemental feeding of western livestock. To a limited degree the West furnishes foundation breeding stock upon which is being built a higher type of animal husbandry in the South.

Eastern manufacturers provide markets and processing plants for most of the western wools and mohair. Beef and mutton are also marketed mainly east of the range country.

Clearly, a permanently high level of security for the western livestock industry is of real importance to the Midwest, to the South and East, and to the Nation. That maximum benefits have not been obtained is a natural result of the industry's haphazard and planless development. Unsuitable land-settlement policies, misuse of land, disregard for sustained production from range and ranch are among the factors that have given rise to maladjustments which must be corrected if a satisfactory contribution to the social and economic welfare of the West and the Nation is to be realized.

#### EFFECTS OF MALADJUSTED LAND USES AND OF RANGE DEPLETION

##### DRY FARMING OR RANGE HUSBANDRY

Before pioneer conditions of the Middle West would allow other forms of land use, sheep and cattle began to convert annual grass crops into regular market supplies of beef, mutton, wool, and hides. Then in a brief space of years the tall-grass prairies were transformed to waving wheat and corn fields and a solid pattern of farm homes was developed. The changes from ranching to crop agriculture in the Middle West were swift, decisive, and permanent. Because of these changes social and economic opportunities multiplied. In the tall-grass country this form of agriculture has amply justified itself, even though immense areas of fine grassland were plowed up in the transition process.

The contrast is sharp between this earlier and successful settlement effort and the later settlement that occupied the empire of semiarid range land still farther to the west. By the time the Middle West was well settled, the whole country was in the grip of a boom over free land to the west and again cattle were being pushed back by the plow. No systematic effort was made to classify the western lands or otherwise to guide settlers to the better soils or locations. "Let the devil take the hindmost" might have been the guiding principle of the mushroom type of settlement that developed in the range country. "Rain follows the plow" was an oft used argument to answer any who raised questions as to the adequacy of rainfall.

Major Powell's report of 1878 (107) contained a remarkably clear analysis of special problems to be met and essential changes in existing settlement policies needed to meet them. The report pointed out definitely the limited productivity of the semiarid range lands and emphasized the fact that crop agriculture would not yield a dependable family living in most of this area except under irrigation. But, as already explained, the vision and almost prophetic insight into the problem of developing a sound type of western agriculture

based primarily on range husbandry was ignored. Efforts to transplant a Middle West settlement pattern of 160-acre homesteads on the semiarid West continued.

As the wave of Western settlement rose higher and higher, the destruction of native grassland was everywhere accelerated. Settlers flocked deeper and deeper into the West where average annual precipitation dropped from 25 to 20 inches—on into the true range areas of 18, 15, and even less than 12 inches, where, during the growing season of frequent drought years, the precipitation often falls below 5 inches. These dry plains were clothed with grasses, “the most nutritious that livestock ever fed on” (98), but as farm land their limited productivity has in general proved pitifully inadequate to support a family permanently from the products of a quarter-section homestead.

Sometimes a series of two or more abnormally wet years occurred immediately after the sod was first broken up. The thin but rich layer of humus that had accumulated through the centuries, coupled with the high moisture retentive power of virgin soil, yielded bountiful crops under such favorable weather conditions. A period of rising prices for farm products set in at about the turn of the century that continued with some irregularity until 1919. These combined conditions served as a stimulus to more dry farming and greater range destruction by unwise plowing.

A considerable share of the homesteaders were, however, without experience in any form of agriculture, and would have been destined to failure as farmers under far more favorable conditions. On the other hand, the inherent difficulties of farming homesteads of this type were practically unsurmountable, even by those with ability and experience. “The Government bets title to 160 acres against the homesteader’s filing fee that he will starve out before proving up, and the dry farmer usually loses”—is the way the land settlement policies have been aptly epitomized. As rainfall failed and prices fluctuated, more and more of these unwisely created dry-farm homesteads were abandoned. Fading hopes of those who had already invested years of labor and all their capital in a small dry farm were revived temporarily when the Government guaranteed \$2.20 per bushel for war-time wheat. More sod was broken. But again drought, hot winds, hailstorms, grasshopper scourges, and other calamities occurred with discouraging frequency. The income from one good crop was quickly absorbed by living expenses and in buildings, fences, etc., necessary for occupancy of the new land. By the time the next good crop occurred a major portion was required to satisfy creditors, leaving little or no surplus for the inevitable lean years. Isolation, hardships, and want were the common portion of dry-farming families.

Fortune or good judgment enabled many to acquire units of adequate size and to set up a balanced form of agriculture keyed to western conditions, but in competition with established range outfits. Others continued straight dry farming. Slowly at first but at an increasing rate, desertion of dry farms took place even before the World War. Restricted grain exports, curtailed purchasing power, and deflated prices, coupled with an unusually severe drought in 1919, stepped up the rate of desertion to the proportions



of an exodus from many dry-farm counties. Tens of thousands of farmers gave up in despair. Covered wagons cargoed with the meager family household goods and trailed by a gaunt milk cow were on the road—somewhere. The number of farms in Montana declined more than 10,000 in a decade—a reduction of about 18 percent of the 1920 total. Four counties in the Big Bend dry-farming section of Washington lost 18 to 35 percent of their 1910 population by the time the 1930 census was taken. Parts of Colorado, the western portion of the Dakotas, Idaho, Oregon, and certain portions of other States had similar losses. Deserted homesteads, vacant schools, weed-grown cemeteries now bear mute testimony to the unwisdom of small homesteads on semiarid range lands. Such lands are adapted to permanent range use in units of considerable size with the support of some crop feeds, but not to independent dry farming.

#### SUBMARGINAL CROPPING INCREASES FEED AND CROP LOANS

Many unfortunate victims of the dry-farming boom still refuse to accept the inevitable or have been unable for one reason or another to join the thousands who deserted their homes. Thus the Federal Government and certain States have been forced, in a humanitarian effort to relieve acute distress, into the anomalous position of subsidizing these farmers to continue on farms that should be returned to range use.

More than 2,500,000 emergency crop and feed loans, aggregating slightly more than \$287,000,000 have been made by the Federal Government in the 48 States since 1921 in an effort to relieve acute distress arising from numerous agricultural emergencies. The November 1935 Report of the Farm Credit Administration shows that 37.8 percent of the total was then outstanding and unpaid. This compares to 56.1 percent of outstanding and unpaid loans made in the 11 Western States. The higher percent of unpaid loans in the West is a reflection of the greater susceptibility of this region to such emergencies and to the maladjustments that have developed. Submarginal dry farming on land best suited for range use has been an important factor in the number and size of western loans and in delaying repayments.

#### SUBMARGINAL FARMING AGGRAVATES CROP-SURPLUS PROBLEMS

Not only did submarginal dry-farming attempts victimize the homesteaders and the range-livestock producers, but they have added greatly to the wheat-surplus problem. Immense quantities of wheat, produced from such lands during years of optimum weather conditions, competed with that grown on permanent crop land. The possibility of "making a killing" with an occasional bumper crop is a real lure to the operator even though the risk is high.

One \$2,000,000 corporation ripped up 100,000 acres of Montana grassland between 1918 and 1923 (2). This gigantic sod-breaking effort took place on Indian lands leased from the Government at an exceptionally low rental. Hundreds of plow bottoms, scores of wheat drills, and batteries of threshing machines were operated by immense corporation tractors in a grandiose effort to convert semiarid

rangeland to profitable wheatfields. Operations for the first 4 years resulted in a net deficit. Eastern bankers retired with the loss of a substantial portion of their loans. Some profits accrued to the reorganized corporation for a brief period, but crops were so poor during the 1929 to 1934 period that more than \$80,000 in rental fees was due at one time and the net deficit amounted to \$600,000 during these 6 years. Only 20,000 of the 100,000 acres broken up are now being cropped. Through this abortive venture in wheat growing the Northwest has lost 80,000 acres of native grassland to Russian-thistle and cheatgrass. Production at a net loss tends to depress permanent cropland elsewhere into the submarginal class and is detrimental to the national economy.

In 1934-35, in an effort to remove the threat to overproduction, 40 million acres of submarginal cropland on 3 million farms was taken temporarily out of production (175) pending more permanent adjustments. Part of this is located in the West, where it is now estimated that a minimum of 15 million acres which has been cultivated should be permanently diverted from crop farming to pasturage or other forms of use. This area includes 7.2 million acres within "Problem 1" areas of the Resettlement Administration and at least 8 million acres additional in scattered tracts.

#### PLOWED RANGE LANDS REQUIRE REHABILITATION

Submarginal dry farming on land which nature intended for grass had reached its maximum and in many places had begun its decline by about 1920. Biological, social, and economic problems of great complexity are involved in restoring these abandoned dry-farm lands to permanent forms of use.

Nature has begun the process, but her methods of regrassing millions of acres of range land devastated by the plow and erosive processes are painfully slow. A survey to determine the natural rate of regrassing plowed lands of central Montana was conducted by Prof. E. W. Nelson of the University of Montana. He found that land abandoned for 11 to 15 years had a grazing capacity only 46 percent, and for 16 years and more only 57 percent as high as that on nearby native ranges themselves badly depleted by overgrazing. After careful investigations in eastern Colorado, Shantz (125) concluded that 20 to 50 years would be required for the short-grass type of grassland to reestablish itself after being plowed and abandoned. He further estimated that it might take a century for some types to reestablish the original cover where soil conditions were greatly disturbed by wind erosion.

About 78 million acres of native sod in the prairies and plains of the West were diverted to crop uses between 1900 and 1929. Not all of this has proved to be submarginal, as is the previously mentioned 15 million acres which should revert to public ownership. The attrition of the grassland by the plow still continues to some extent. It is probable that at least 20 million acres of plowed land in the West now require restoration to grass before they can contribute fully to the support of the region. Range rehabilitation by its very magnitude has thus become a national problem.

## OTHER MALADJUSTMENTS

The attempts at submarginal dry farming, although an unfortunate and indeed, disastrous land-use practice, is not the only form of maladjustment that has contributed to the present acute agricultural situation in the West. An equally unfortunate practice, already described as a phase of land ownership, is the parcelling out of land in units of inadequate size. These were doomed to failure even on some of the better soils, if we are to judge by the almost universal trend, as shown in table 64 and figure 80, toward much larger units. Although the total area in all farm-ranch units has nearly doubled since 1910, the acreage in the 100-174 acre class has

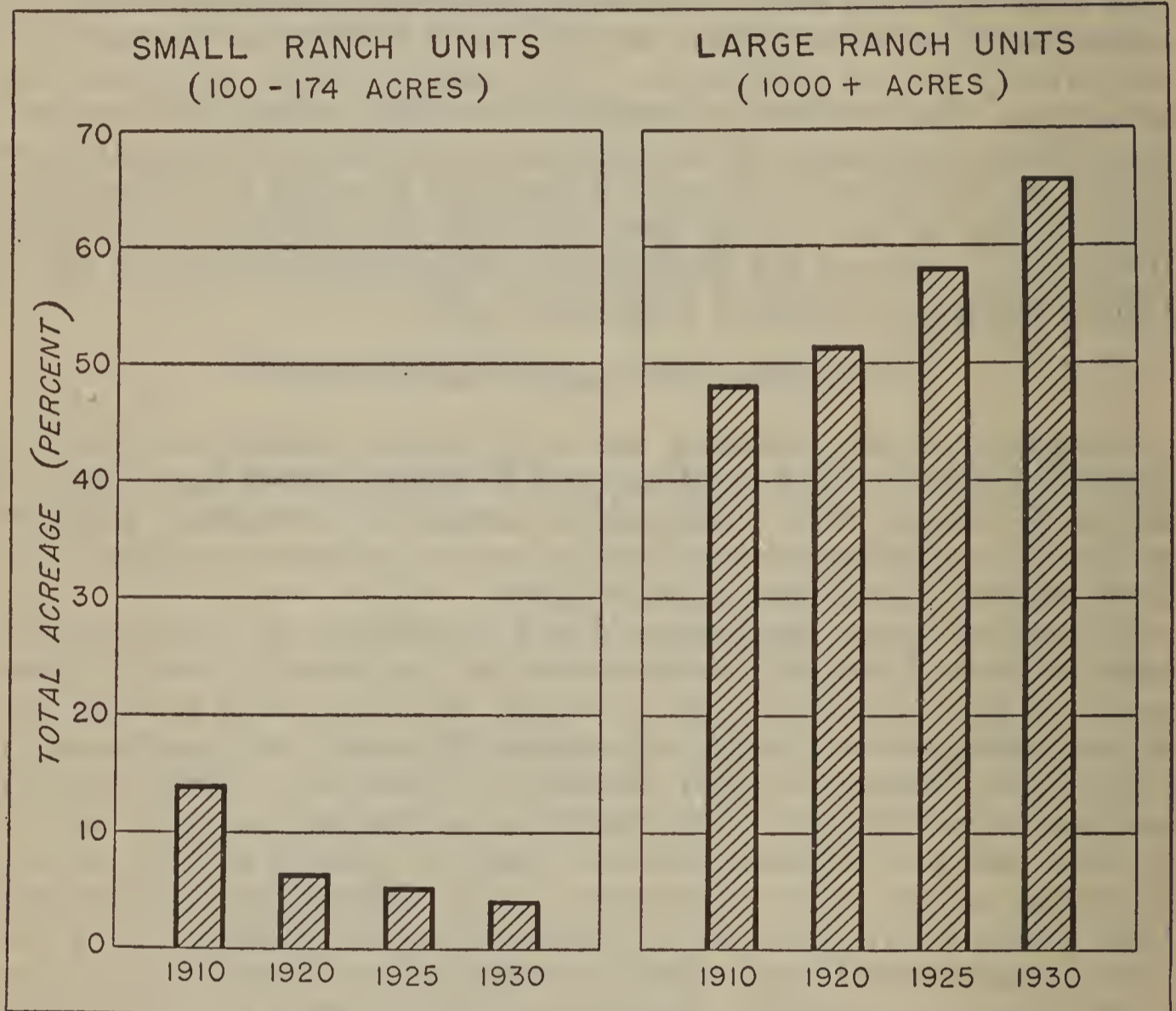


FIGURE 80.—The 20-year downward trend in the percent of total western farm-ranch acreage in small units is more than offset by the upward trend in units of 1,000 acres or more.

fallen off by more than 40 percent, and the number in this class has decreased by more than 37 percent; while in the same period units of 1,000 acres and more have more than doubled in number and nearly trebled in total area. This is strong additional evidence that small homestead units are not adapted to stability of agricultural development in the West and accounts in part for the heavy turnover in the smallest-size permit class of the national forests, as discussed in another part of this report.

TABLE 64.—Trends in number and acreage of small and large farm-ranch units in 11 Western States<sup>1</sup>

[TOTALS FOR ALL SIZE UNITS]

Year	Units		Area	
	Numbers	Percent	Acres	Percent
1900.....	242,908	100	93,796,860	100
1910.....	373,337	100	110,862,209	100
1920.....	478,273	100	173,489,931	100
1925.....	498,979	100	185,947,486	100
1930.....	503,047	100	217,975,170	100

UNITS OF 100-174 ACRES

1900.....	69,463	28.60	10,576,452	11.28
1910.....	102,691	27.51	15,522,057	14.00
1920.....	78,765	16.47	11,445,682	6.60
1925.....	70,715	14.17	10,138,308	5.45
1930.....	64,659	12.85	9,185,047	4.22

UNITS OF 1,000 ACRES AND OVER

1900.....	11,573	4.76	54,781,754	58.40
1910.....	14,500	3.88	53,574,882	48.33
1920.....	25,303	5.29	89,546,295	51.61
1925.....	27,094	5.43	108,390,652	58.29
1930.....	37,309	7.42	142,960,243	65.74

UNITS OF 5,000 ACRES AND OVER<sup>2</sup>

1920.....	3,053	0.64	48,474,057	27.94
1925.....	3,669	.74	65,421,568	35.18
1930.....	4,982	.99	82,445,690	37.92

<sup>1</sup> Data from the Bureau of the Census.

<sup>2</sup> Prior to 1920 there was no separate classification for units of 5,000 acres and over.

A recent study by the Forest Service discloses that 19,528 farm units comprising 2,224,037 acres located inside or adjacent to national forests had been abandoned prior to June 1934. These units averaged considerably less than 160 acres and many of them were located on rocky soil, steep slopes, or at high elevations where climatic conditions preclude successful crop agriculture. They were not only submarginal but many of them were so located as to interfere with lumbering, recreation, grazing, and other land uses on larger adjacent areas.

Although irrigation has been one of the substantial stabilizing factors in western agriculture its effects have not always been favorable. Thousands of acres of land once of the highest productivity have been waterlogged by irrigation developments. The alkali salts which have accumulated not only make the problem of reclamation by drainage extremely difficult, but also seriously impair possible future value of this land for range use.

The 640-acre stock-raising homesteads, previously described, have been another link in a long series of maladjustments that have continually interfered with the development of a balanced type of agriculture. Practically all of the land entered or patented under this law was already in use by established livestock outfits. The final results were to further intensify oversettlement, to increase de-

destructive competition for range resources, and to raise operating expenses to former users without commensurate benefit to those who attempted to establish farm homes based on the products of a 640-acre homestead.

Maladjustment through improper use of land is well illustrated by the complex situation which has developed in an important grazing locality in El Dorado County, Calif., as revealed by a recent economic survey (181). The settlement pattern and land utilization practices that grew up during the gold-rush days and succeeding boom periods no longer meet the changed economic and social needs. One evidence of the change is the decline in the population itself, which has been accompanied by serious difficulties in maintaining local school and road facilities and reasonable standards of rural living. The present maladjustment has resulted partly from or is reflected by such factors as (1) a decrease in grazing values through encroachment of brush and other inferior plants; (2) a one-third reduction in tilled agricultural lands between 1863 and 1930; and (3) a dwindling acreage of virgin timber along with an increase in neglected cut-over land. Overgrazing, fire, and destructive logging have been active forces in this change.

#### EFFECTS OF RANGE DEPLETION ON INTEGRATED WESTERN AGRICULTURE

##### CROPS AFFECTED BY RANGE DEPLETION

One excellent example of the bad effects of depleted ranges on crop production is the enormous periodic losses caused by beet leafhoppers to the sugar beet, tomato, and bean industries of the West. Surveys by the Bureau of Plant Industry and the Bureau of Entomology and Plant Quarantine have determined that Russian-thistle, mustard, and a few other weeds are the favored plants on which the beet leafhoppers survive between beet harvest and the next crop. Large areas of overgrazed range and abandoned farm lands on which these host plants predominate were found adjacent to important irrigated beet-, tomato-, and bean-growing areas in Washington, Oregon, Idaho, Utah, Colorado, and California. It was estimated that the beet leafhoppers reduced the beet crop in 1934 in six south Idaho counties to less than 10 percent of the 1933 crop. Sugar factories in at least two of the nearby cities failed to open in the fall of 1934, with a loss of employment of about 500 men and a loss to the growers exceeding \$1,500,000.

##### OVERCOMPETITION INFLATES LAND VALUES AND PRODUCTION COSTS

Unfortunately, the number of livestock owned rather than the sustained grazing capacity of available ranges has been the main criterion of the wealth of livestock outfits. The lack of a simple and dependable measuring stick whereby stockmen or bankers might determine the grazing capacity has resulted in a tendency to overestimate, and in a general failure to recognize the limits of per-acre productivity. After the range was already stocked to the point where there remained no surplus of forage, new ranches wedged in. Efforts to increase size of herds continued with little regard for supply or cost of feed. As a result, droughts, grasshoppers, and

other emergencies brought acute and frequent feed shortages. In an effort to make up the growing deficiency of range feed for what was really excess numbers of livestock, additional land was brought under cultivation and irrigation expanded, often at unprofitable cost per acre. The resultant overcompetition for both range and crop land led to inflated prices which in turn encouraged heavier stocking and again more land purchase in a vicious circle that often resulted in acute economic distress for the operator and extreme abuse of the range.

That stockmen realize the burden of private ownership and have tried by leasing to escape from it, was shown in the previous discussion of land tenure. The extent of the extra costs is indicated by a survey made by the Forest Service in the 11 western range States from 1922 to 1924. Data were collected on 183 tracts of land comprising more than 625,000 acres owned by livestock producers near the various national forests. Based on taxes and interest on the land investment, the cost of pasturage to the owners of these lands averages \$1.02 per animal-month for cattle, and 17 cents for sheep.

On 1,675 tracts of grazing land aggregating more than 16 million acres leased from others by stockmen in this same region, the cost per animal-month averaged only 18 cents per month for cattle and 6.5 cents for sheep. The cost of pasturage was thus almost threefold for sheep and more than fivefold for cattle to the man who owned his range pasture as compared to the man who leased from others. In other words, range forage on the average cost the man who owned the land \$12.24 for 12 months' pasturage for cattle as against \$2.16 for the man who leased from others. The cost of ownership which the stockmen escapes is, however, borne by the lessor, and thus the loss in community income is in nowise reduced through the cheaper operating cost on leased land. Many foreclosures and bankruptcies might have been avoided during deflation periods in 1921 and again in 1934 had the danger of inflated land prices been more carefully considered.

The owner of land has the advantage of assured use, but such a high differential is an exorbitant price to pay for secure tenure, desirable though it is. He is under a tremendous handicap in competition with the producer who operates on cheaper feed. However, short-term competitive leases are very troublesome because a competitor may bid up the price to an unreasonable figure and actually take over the lease at a critical time. Thus the operator walks a tightrope, striving for stability on one hand and low costs on the other.

#### EXPENSIVE SUPPLEMENTAL FEED REPLACES CHEAP RANGE FORAGE

As the grazing capacity of native ranges declined from both overgrazing and plowing, efforts to maintain or increase numbers of livestock on both farms and ranches have continued without counting the cost of the increased proportion of harvested food required. The livestock industry of the West must in large measure rely on cheap range forage to offset the distinct disadvantage of high cost of transportation to market. Yet, there has been a gradual change from almost complete reliance on the range forage to the use

of immense quantities of hay and other harvested crops, including cottonseed cake and other special products shipped in.

Irrigation and dry-farm forage production on many millions of acres have been essential to provide security against severe winters or drought years. In no other way was it possible to build up an integrated type of agriculture with range husbandry occupying its proper place in the scheme. However, it now seems probable that the increasing use of supplemental feed has progressed beyond the point that yields best profits, as is fully brought out in the discussion of excessive stocking earlier in this report. Harvested crops, concentrates, and irrigated pasture provided 43 percent of the total feed requirements of livestock for 11 western range States in 1935. Saunderson<sup>42</sup> reports a long-time trend toward shortening the period on range forage and lengthening of the wintering period in Montana and that better control and use of range land would allow the shortening of the feeding period by a month or approximately one-third. Similar increases in the use of winter feed have taken place in most sections of the range country, as narrated of conditions in Colorado (25).

In the early days \* \* \* cattle came through the winters in better shape on bunchgrass with little or no hay than they do at the present time when 1½ to 2 tons of hay are fed per cow. \* \* \* Cattlemen in early days were able to round up and ship their beef in July, whereas now no beef can be gathered and shipped till late fall with the exceptions of small bunches that can be kept in special pastures.

The extent to which this situation applies varies by States and by operators. The southern portion of the range country has a shorter feeding period, but here, also, there is the tendency to substitute great quantities of cottonseed cake and other expensive feeds for cheap range forage. Numerous studies of the cost of production agree in general with the conclusion reached in Wyoming (170) to the effect that livestock profits are due to gains made from grazing the ranges and that those operations having the lightest supplemental feed requirements have the greatest opportunities for profits. Thus, failure to adjust operations to reduced grazing capacity of range lands reacts on profits with smashing effect when livestock prices are low.

Safety requires that a substantial supply of supplemental feed be kept on hand even though the cost may be greater than range forage. There are very definite limitations, however, to the use of such expensive feeds for normal range operations. Entirely different considerations apply where it is possible to obtain a price advantage through the use of western-grown feeds in fattening operations, as will be discussed later.

Infectious abortion spreads less readily among cattle on the range than in herds that are crowded together on feeding grounds (67). This is one good reason for keeping range cattle on feed lots no longer than is absolutely necessary. Experienced stockmen commonly believe that livestock will winter in stronger and more healthy condition as a result of using range forage to the maximum than by the use of a high proportion of supplemental feed.

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<sup>42</sup> See footnote 24, p. 208.

## DEPLETION OF KEY AREAS

Pioneer stockmen of the West had the opportunity to use advantageously located key areas essential to best use of adjacent range land. These tracts provided feed, water, and shelter for calving or lambing at low cost or for fattening animals for market without other feed. They served as holding grounds, horse pastures, connecting links between summer and winter ranges, driveways, and otherwise as indispensable aids to economical operations. Dry farming claimed many of these, but questionable range practices are responsible for the depleted condition of many more such key areas. Abuse of the lieu selection laws and subsidized homesteading by employees have allowed virtual monopoly of all available water for miles, which resulted in the range abuses and range wars of varying degrees as narrated in the history of the range. Very careful management on many of these abused areas and in some cases artificial reseeding will be necessary to restore a forage cover.

## UNBALANCED SEASONAL USE OF RANGE FORAGE

Spring and fall ranges perform a particular function in the economical production of range livestock. The end of the winter season is a critical time; livestock become dissatisfied with hay or other dry feed as soon as early spring growth appears. The heaviest death losses of the year may occur after grasses first appear but before they are sufficiently abundant to fully maintain livestock.

Early settlement took place to a very great extent on areas especially adapted to spring-fall range use. As depletion extended progressively farther from the ranch headquarters, the more expensive harvested feeds had to be used earlier in the fall and later in the spring. Gradually the overgrazing extended to the summer ranges at a greater distance. In many places improper use and depletion of spring and fall ranges has progressed to the point that livestock must be held on alfalfa and hay meadows and other high-value crop land so late that these crops have been damaged severely. Depletion of the spring-fall ranges before summer ranges are ready for use has been the cause for one of the most difficult problems in grazing administration on national forests, because of the insistent pressure for grazing these public ranges prematurely.

Improper use of range forage has destroyed much of the value of many splendid ranches that were once highly productive enterprises. The Grasshopper Ranch of about 15,000 acres located in Lassen County, Calif., is one of many such examples. This ranch was purchased about 1900 and with nearby public-domain range it supported about 4,000 cattle and horses for a considerable period of years. During favorable years it produced upward of 3,500 tons of hay and was then one of the most valuable stock ranches in northern California. At one time the owner refused an offer of \$200,000 for it.

Overgrazing coupled with improper seasonal use of the surrounding public domain gradually unbalanced this ranch as a productive unit. It was sold under foreclosure in 1923 and has changed hands several times since at greatly reduced prices. Hay production is now only a small fraction of the former quantity. Even by



grazing the former hay lands it is only possible to obtain feed for about one-third of the animals during the summer that were formerly maintained yearlong on the ranch and the range land tributary to it. Other ranch properties throughout the West have suffered a somewhat similar fate.

Immediate reduction in numbers of livestock sufficiently to restore depleted spring-fall ranges is a grim alternative. This may be avoided by increased use of supplemental feeds, but this course endangers the chances for profitable operations. A third course, ultimately suicidal to the industry, is to relieve the overgrazed spring-fall ranges by still heavier use of ranges needed at other seasons, most of which are already overgrazed. All three courses may serve as temporary adjustments but in the end the situation demands drastic reduction in stocking to restore a balance between livestock numbers and range and crop feeds.

#### DEPLETION AFFECTS MARKETABILITY OF LIVESTOCK

As previously stated the western livestock industry is absolutely dependent upon its one natural advantage over other regions, the availability of cheap range forage to overcome the handicap of extremely high freight rates. Parr et al. (99) give one example of a shipment of two cars of cattle from Arizona to Kansas City that netted only \$4.70 to the owner after freight was paid. Labor, range improvement, and other charges are high and great extremes of weather cause relatively high losses under the best management possible. Range depletion coupled with speculative prices for range lands, high taxes, and other fixed charges have reached a point where the natural advantage of cheap range forage is being destroyed. The following comparison (134) is an apt illustration of this situation:

During the seasons of 1887, '88, and '89, 3-year-old steers were sold on the Denver market for Christmas beef weighing 1,250 and 1,500 pounds, without feed other than grass and native hay. \* \* \* Ten years later steers from the same quality of stock, handled in the same way, on the prairie pastures were sold as feeders, but they weighed only around 1,000 pounds. Under the controlled open range system our heritage was soon wasted and almost destroyed.

Range forage in ample quantities has demonstrated its ability to produce a considerable proportion of grass-fat lambs and steers, classed as "killers" at the markets. This is the class that ordinarily receives the best competition between packers and yields greatest profits to the range producer. Based on a recent 6-year average of Chicago prices during September to November, inclusive, the price per cut for Common steers was \$5.17, for Medium \$6.86, for Good \$8.57, and for Choice \$9.84, in the 900- to 1,100-pound group. Most western range steers, with ample feed, have the breeding and quality to qualify for the Medium and many for the Good grade, but when shipped from overgrazed ranges they fail to reach the weight or grade to which they are otherwise qualified. An increase in weight from 900 to 1,000 pounds or more and in grade from Medium to Good would increase the average price from \$61.74 to \$85.70. The \$23.96 difference represents the premium on ample range forage per animal at a cost of but a fraction of this amount.

Slightly thinner livestock, called "two-way animals", are suitable for immediate slaughter but are also in demand by feeders who

wish partly fat animals that may be finished for higher prices during a short feeding period. The premium to be had by "finishing" this type should more often go to the hay and grain farmer of the West. Even this class generally commands better competition and higher prices than those that are unsuited for slaughter except as "canners" and "cutters" at a heavy price discount. Discarded dairy animals furnish a constant supply of the latter class of cattle. Although it requires more forage to produce the maximum percentage of "finished" and "two-way animals" than it does for poorer conditioned stock, the former may yield far better profits than the larger number of their animals produced from a skimpy allowance of feed.

#### BENEFITS OF IMPROVED BREEDING NULLIFIED

Range users of the West have for a long period of years followed a consistent practice of herd improvement. No other part of the country uses a higher proportion of purebred sires or has culled out low-grade cows and ewes more consistently to improve and standardize herds. The benefits of this herd improvement work have been nullified to a very great degree by the fact that numbers have been too great to develop the potential possibilities with the limited feed resources used. The New Mexico Agricultural College in a recent unpublished report states that cows on a rehabilitated range area develop to weigh about 900 pounds and calves at 9 months to about 380 pounds. On adjacent overgrazed ranges average cow weight is about 700 pounds and calves about 330 pounds average.

During a 3-year experimental period, high-grade Hereford calves from overgrazed ranges in Montana averaged at weaning time 48 pounds or nearly 15 percent lighter than those of similar age and breeding that had a more liberal allowance of range forage. The cows from overgrazed ranges in this same experiment—depending on the time of year—averaged 40 to 90 pounds lighter than those with a more ample supply of range (76).

The relationship between ample feed and good breeding is summed up by Hart and associates (69) in California in the following manner: "Without proper feed supply, our most highly bred animals must revert to scrubs or fail in the struggle for existence." This supports similar conclusions reached in South Africa and in England.

#### LOWERED CALF AND LAMB CROPS AND INCREASED LOSSES

Range depletion has proceeded so rapidly that heavy livestock losses and low calf and lamb crops continue as major handicaps to profitable production. Thus the tremendous expenditures which have been made to provide greater security of operations have been but partially effective.

In a 5-year study of 84 sheep ranches in Montana, Saunderson (121) found a variation from 1 to 15 percent in the death loss, from 50 to 105 percent in the number of lambs matured, and from 55 to 86 pounds in the weight of lambs at marketing time. The condition of the ranges used and the type of management were major factors in these variable results. Walker and Lantow (174)

report a loss of 15 percent of the cattle in a study of 112 New Mexico ranches, 78 percent of this loss being due to starvation directly correlated with poor range conditions during a dry season.

Annual death losses on the Jornada Experimental Range for the period 1915 to 1933 are reported by the Forest Service to be 1.7 percent as compared with 9.63 percent on nearby New Mexico ranges. Corresponding calf-crop percents were 70.5 and 45, respectively (figs. 81 and 82). The direct relation between calf crop and range feed is shown also by the Montana range experiment already mentioned. In

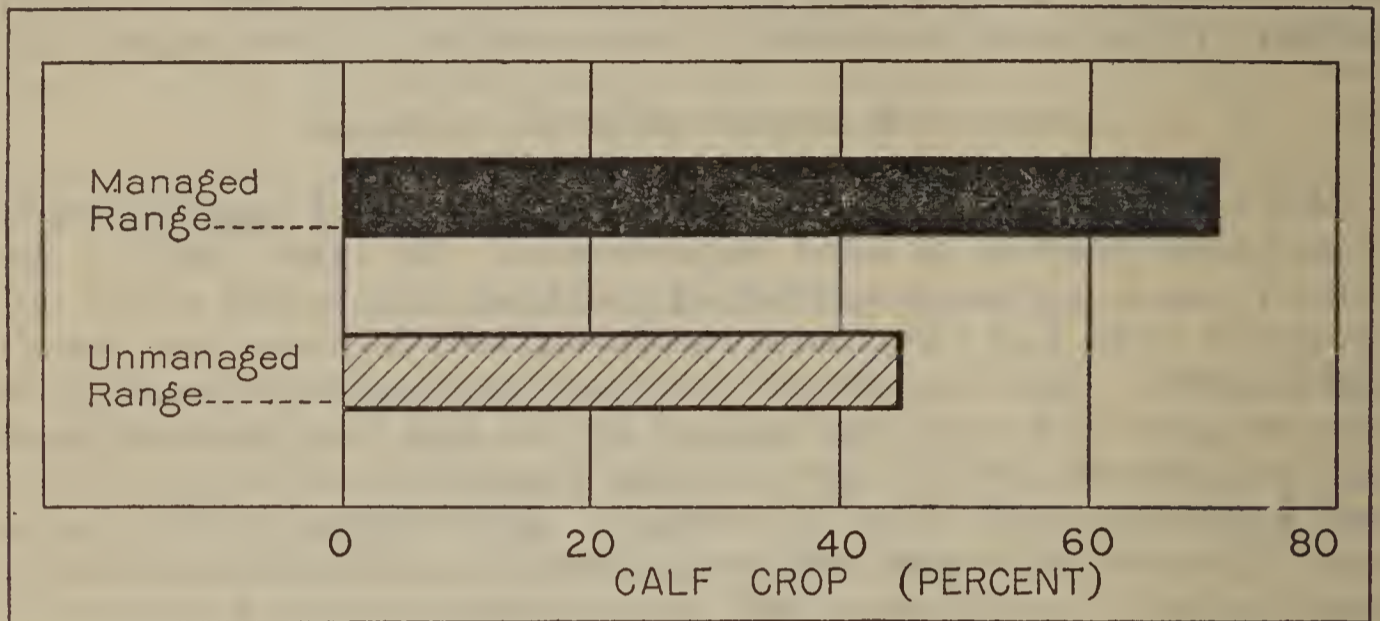


FIGURE 81.—On comparable New Mexico ranges, calf crops during drought were about one-third smaller on depleted range than on nearby managed range.

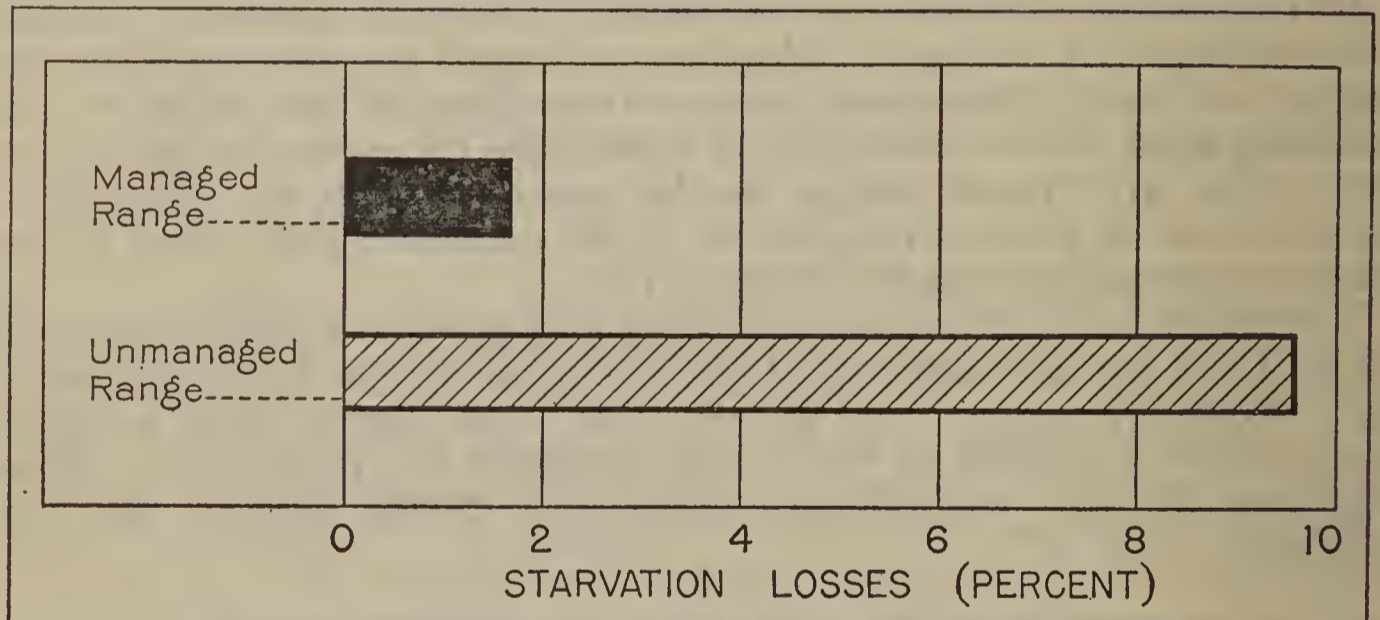


FIGURE 82.—On the same ranges as in figure 81, starvation losses during drought were nearly six times as large on depleted range.

this experiment cows on overgrazed range produced a 70-percent calf crop during a 3-year period, while those of similar age and breeding in adjacent range pastures that were conservatively grazed produced an 81.7 percent calf crop at a lower net cost of feed per pound of calf weight. This tends to bear out the conclusion reached for Wyoming ranges (170), that calf crops can be brought up to 80 percent before the point of diminishing returns is reached. There can be little doubt that reduced breeding efficiency and excessive losses are caused by depleted ranges and poor management.

## LOST SOIL FERTILITY AND INCREASING MINERAL DEFICIENCIES

Permanent agricultural use of most soils requires a systematic return of fertilizing elements that are removed yearly, but this practice has not been followed or considered practicable for range lands. Trainloads of livestock move annually to the feed lots of the Middle West and help maintain fertility there to the net loss of western ranges. There is growing evidence of phosphorus or other mineral deficiencies on numerous widely separated western ranges that tend to curtail profits, through impaired health and breeding efficiency of range animals (97, 123, 182). Range depletion from this source may not yet be widespread or serious, but the constant drain must hereafter be considered in western agricultural practices. Leaving a substantial portion of the annual forage growth to rebuild humus and preserve mineral constituents on the range land, is one way to reduce the present excessive drain on soil fertility.

The need for maintaining the soil fertility of cropped land by the use of manures from feeding hay, certain grain, and other feeds may warrant a far greater development of western fattening operations. This may give a profitable outlet for feed reserves which, for safety of the breeding herd, must be on hand through critical periods, but which may be used for fattening of some animals after the emergency period has passed. There is much to be gained by such a development in maintaining soil fertility on western range and crop lands and as a means to a more orderly marketing practice.

## CHRONIC RANGE EMERGENCIES AND FORCED SALES

Year after year range feed supplies are so low by late summer or early fall that the producer must ship his livestock with little reference to market conditions or the condition of the animals. Holding of market animals so greatly endangers the successful maintenance of the breeding herd that even under usual conditions the transaction too often amounts to a forced sale. Drought, grasshopper infestation, financial deflation, etc., have occurred with such disturbing frequency that range husbandry has gained the reputation of being in a state of "chronic emergency." Scarcely a year has passed since the great "die-off" of 1886-87 that some part of the range country has not experienced some such emergency. The most far-reaching of these catastrophes occurred as a result of the 1934 drought. Resources of the Federal Treasury were called upon to finance the purchase of drought-stricken livestock from 904 counties in 16 of the 17 western States covered in this report, as well as in several eastern States. Table 65, from a preliminary report by the Emergency Drought Relief Administration of May 31, 1935, does not include a minor part of the late purchases. It includes, however, all purchases made in the six Plains States which are but partially within the scope of this report.

TABLE 65.—The 1934 drought-relief purchase program,<sup>1</sup> cattle and sheep <sup>2</sup>

State	Farms and ranches selling—		Livestock out of total inventory certified for payment				Total ewes 1 year old and over purchased	Total payments		Average price per head for cattle
	Cattle	Sheep and goats	Cattle		Sheep <sup>3</sup>			Cattle	Sheep <sup>3</sup>	
			Number	Percent	Number	Percent				
Western States:										
Arizona.....	2,729	110	101,390	19.1	11,347	4.6	1,448,761	22,694	Dollars	14.29
California.....	1,397	162	19,784	13.4	23,207	7.3	305,715	46,414	Dollars	15.45
Colorado.....	16,255	1,288	289,588	26.3	207,196	10.3	4,147,941	414,392	Dollars	14.32
Idaho.....	5,457	897	41,807	21.0	145,677	9.8	522,394	291,354	Dollars	12.50
Montana.....	15,787	2,241	349,926	46.1	491,776	18.6	5,020,116	983,552	Dollars	14.35
Nevada.....	1,019	303	36,272	13.1	99,261	9.3	568,089	198,522	Dollars	15.66
New Mexico.....	16,655	1,486	547,230	27.8	299,372	11.1	7,333,707	598,744	Dollars	13.40
Oregon.....	1,082	548	12,482	10.1	162,779	13.4	194,300	325,558	Dollars	14.77
Utah.....	16,884	2,036	126,095	28.1	205,512	9.3	1,755,458	411,024	Dollars	13.92
Wyoming.....	7,930	1,631	285,714	30.7	586,773	13.9	4,185,257	1,173,546	Dollars	14.65
Total.....	85,195	10,702	1,810,288	27.9	2,232,900	12.3	25,471,738	4,465,800	Dollars	14.07
Plains States:										
Kansas.....	44,946	122	521,043	31.6	9,569	15.6	7,523,967	19,138	Dollars	14.44
Nebraska.....	39,495	237	480,968	27.5	24,671	20.0	6,599,769	49,342	Dollars	13.72
North Dakota.....	67,558	2,662	970,989	51.7	84,026	22.4	13,681,923	168,052	Dollars	14.09
Oklahoma.....	41,266	20	503,475	40.3	2,270	26.4	5,741,912	4,540	Dollars	11.40
South Dakota.....	48,432	2,465	914,839	64.0	148,909	18.5	13,121,455	297,818	Dollars	14.34
Texas.....	149,796	10,019	2,015,618	28.8	1,091,234	13.7	24,541,293	2,182,468	Dollars	12.18
Total.....	391,493	15,525	5,406,832	36.2	1,360,679	14.6	71,210,319	2,721,358	Dollars	13.17
All States.....	476,688	26,227	7,217,120	33.7	3,593,579	13.1	96,682,057	7,187,158	Dollars	13.40

<sup>1</sup> Data not final.<sup>2</sup> Purchases were made in 904 counties in the above States; purchases were also made in other States.<sup>3</sup> In 16 Western and Plains States 350,014 goats (Angora does) were certified for payment at a total cost of \$490,019.60.

Generally speaking, the \$2 flat rate per head paid for sheep was not materially below normal prices, considering the advanced age and poor condition of those purchased. This price for old ewes did not represent a serious loss to the sheep producers, although they lost heavily in other ways as a result of the drought.

The low prices paid for cattle were gladly accepted by the producers with full knowledge that they represented but a fraction of normal values, because it was realized that prices would have dropped to much lower levels and probably to zero for certain classes in the absence of Government purchases. Producers thus suffered only a part of the losses that otherwise would have occurred.

If the average price of \$13.40 per head for these drought-stricken cattle is assumed to be two-thirds of the true normal value, then the loss to the producers amounted to \$6.70 per head or more than \$48,000,000. Even this staggering total makes little allowance for the thousands of purebred cows, heifers, and bulls that were sacrificed at \$20 or less per head along with the scrubs. It makes no allowance for loss of ranch income that must remain below normal for many years, nothing for reduced tax receipts, and nothing for the losses suffered by the Government and hence by the tax-paying public in completing the purchase program.

A substantial part of these losses might have been avoided had the ranges been stocked on a proper, conservative basis and had there been the type of integration between the ranges and farms that would have assured maximum amounts of supplemental feeds for just such emergencies. An occasional ranch located in the heart of drought-stricken areas, which had followed a conservative grazing policy and that had accumulated supplemental feed reserves, weathered the drought without major sacrifices and marketed nearly normal numbers of livestock during 1935 at prices far above those paid in 1934.

Enormous as this tragedy was, there was about it a certain inevitability. Depleted and punished ranges spell economic distress. Overgrazing the range eventually exacts a heavy penalty. Because the 1934 drought came during a general depression the effects were especially severe.

One compensating item may be recorded as the result of the disastrous drought. In certain small sections 80 percent or more of the livestock were removed from the long-suffering overgrazed ranges. Nature may have the opportunity to rebuild the range where reductions were so heavy. In other cases, where the drought reductions were not sufficient to offset the excess stocking, depletion still continues.

Reports are already current that a more favorable growing season in 1935 canceled all traces of the drought and of the half century of overstocking that preceded it. Such reports are dangerous. Severely depleted ranges cannot be restored in one season, highly favorable though it may be. Sample-plot data are presented in the preceding chapter of this report showing that forage cover is far better on protected areas than across the fence where heavy grazing has been the rule. According to records at the Hays, Kans., Experimental Station (122) drought reduced the density of grama and buffalo grasses 44.4 to 74.8 percent, depending on the extent grazed.

The theory of immediate recovery from the effects of drought is disproved by the fact that, after a favorable spring season in 1935, total density of all vegetation on two range areas at Miles City was 67 and 73 percent less than in 1933, based on detailed plot maps.

It will be unfortunate indeed if stockmen and credit agencies fail to grasp this opportunity to build a sound foundation for a stable agriculture by more conservative range stocking, supported by commensurate supplies of home-grown supplemental feed.

#### DECLINE OF POPULATION AND COMMUNITIES

Definite figures are not available to show the relative decline of business activity in towns and communities within the areas where range depletion and unbalanced agriculture exist. It is clear that a serious decline in purchasing power is the cause for a high proportion of vacant stores, garages, banks, and other business establishments in many western communities. The remaining business men in such communities will bear witness to the reduced trade opportunities.

A decline of population is one reliable index from which the economic welfare of the community may be judged. The population of most western counties continues to increase but in many others heavy population losses have been recorded as a result of misdirected agricultural endeavors. Fifteen counties chosen from such areas in 6 States (table 66) lost nearly 25,000 people, or about 21 percent of the total, during 10 years prior to 1930. These losses range from 4.4 to over 40 percent and illustrate somewhat the extent of the maladjustments in western agriculture. The population of Bluff, Utah, has declined approximately 90 percent since 1900 as a result of range depletion and erosion. Numerous other small once-thriving villages have had a similar fate.

TABLE 66.—Population decrease in selected counties of dry-land range regions<sup>1</sup>

State and county	Population		Decrease
	1920	1930	
Washington:	<i>Number</i>	<i>Number</i>	<i>Percent</i>
Douglas.....	9,392	7,561	19.5
Grant.....	7,771	5,666	27.1
Lincoln.....	15,141	11,876	21.6
Oregon:			
Morrow.....	5,617	4,941	12.0
Sherman.....	3,826	2,978	22.2
Jefferson.....	3,211	2,291	28.7
Montana:			
Custer.....	12,194	11,242	7.8
Musselshell.....	12,030	7,242	39.8
Garfield.....	5,368	4,252	20.8
Wheatland.....	5,619	3,751	33.2
New Mexico: Socorro.....	14,061	9,611	31.6
Colorado: Moffat.....	5,129	4,861	5.2
Idaho:			
Owyhee.....	4,694	4,103	12.6
Clark.....	1,886	1,122	40.5
Freemont.....	10,380	9,924	4.4
Total.....	116,319	91,421	21.4

<sup>1</sup> U. S. Bureau of the Census, Population 1930 v. 1 (157).

The full effects of the situation cannot be measured in economic terms alone. A tremendous toll of human wastage is involved in years spent in futile effort to establish a home and a competence. Especially for the women and children, often undernourished, the isolation and the scarcity of schools, medical facilities, and social opportunities have been a heavy cross to bear—too often it has been heavier than could be born. Bright hopes that sustained the pioneers change to despair as the necessity arises to abandon all and seek a new home and a new way of living in an uncertain future.

The number of such families is not known. Were it not for relief and soup kitchens, the tragedies and suffering would be even more distressing. Even though the extent of this human wastage cannot be definitely measured, it is clear that it has been accentuated by planless, unbalanced forms of agriculture in the West.

### RANGE LAND SUBMARGINAL FOR PRIVATE OWNERSHIP

The various maladjustments in the use of land already discussed raise sharply the question of whether the poorer range land is not submarginal for private ownership. A considerable acreage of such land is so low in productivity that whether it can remain in private ownership is questionable. The prevalence of tax delinquency, the amount of land abandonment, the low standard of living, the extent of local rural relief, and the rehabilitation program in many localities serve to force a recognition of the problem.

Two classes of land are involved. These are (1) range land with a very low grazing capacity due either to natural deficiencies of soil and climate or to misuse that has caused a degree of depletion necessitating extremely light stocking for a long period of years to effect rehabilitation; and (2) much of the land on which the native cover has been destroyed by cultivation, which has proved to be unprofitable if not unsuitable for that use, and which must be revegetated artificially in order to restore its forage cover.

Insufficient information is now available to determine just what areas should be classed as submarginal for private ownership. Taking into account, however, the various factors which have a bearing upon the matter, there is little question but that there are several score millions of acres in the first classification. It has been estimated that nearly 25 million acres of land once cultivated is now abandoned to cultivation. Most of this area is of such low productivity that it does not justify private ownership, and on a considerable part the owners have actually moved away.

Although no satisfactory formula has been worked out whereby the exact point at which land becomes submarginal for private ownership can be identified, many of the major contributing factors are well known.

### NATURALLY LOW PRODUCTIVE CAPACITY OF THE RANGE

Range lands which, owing to low average rainfall, poor soil, or other unfavorable natural conditions, have extremely low grazing capacity, are poorly suited to private ownership. Among other things, the relatively higher cost per animal unit of investment in water development and other range improvements and of handling



livestock contribute to the inability of private owners to retain low capacity as compared to more productive range. For example, it has been shown that much of the southern desert-shrub type has a year-long grazing capacity of only about four or five cows per section of land. This range is poorly watered and requires large investments in water development and fencing to make it fully usable. Often deep wells each costing \$5,000, or more, and half a mile of fence per section, costing about \$150, may be required. Assuming that one well to a township would be sufficient, it is obvious that a resulting capital investment of \$50 to \$75 per animal grazed might be required for these two improvement items alone. To develop range at such high cost per head at once places the owner at a disadvantage as compared to the operator on higher capacity land where the same amount of improvements serves a much larger number of livestock. Low productivity coupled with the high frequency of drought in a large degree account for the high percentage of public domain remaining in parts of the Southwest and the intermountain region.

#### DROUGHT OR OTHER CLIMATIC HAZARDS

Private ownership is not attractive in areas threatened with near failure of forage crops by frequent drought or occurrence of blizzards, since these induce heavy losses or high cost of supplemental feeding. Range livestock production is much more hazardous in most of the semiarid Southwest, for example, with a drought expectancy of 2 to 4 years in 10 than in the sand hills of Nebraska with a drought expectancy of 1 to 2 years or less in 10.

#### ACCESSIBILITY TO MARKET

The freight-rate differential from ranch to markets likewise has a great influence on unit production costs and the ability of range areas to support private ownership. At the one extreme are the Illinois farm pastures close to the central market; and at the other is the hinterland extending from Montana to Arizona, where local demand is small and distances to central markets are great. The partial effect of this factor on gross income per unit of salable product is shown in table 67. The Chicago market was chosen for this illustration because prices there quite closely control those on the other midwestern livestock markets. The item of shrinkage in transit is an additional factor which varies with the distance or time enroute, but reliable data are not available.

It seems obvious that, other things being equal, land values for cattle production should be less in Idaho with a \$12.32 per head cost for transportation than in Nebraska with \$6.71 or Illinois with \$3.85 per head. Likewise the value of land for sheep raising will be influenced by the differential of \$0.69 per lamb in South Dakota as compared to \$0.99 in Montana. Certainly, other things being equal, the cost of getting the product to market does influence the value of range land and may reduce it to a point below that attractive to private capital.

TABLE 67.—*Distribution costs to producer from range States<sup>1</sup> to Chicago market*

## CATTLE

State from which shipped	Freight per hundred-weight	Other costs	Total per hundred-weight	Cost per 1,100-pound steer or 70-pound lamb
Idaho.....	\$0.95	\$0.17	\$1.12	\$12.32
Montana.....	.71	.26	.97	10.67
Oklahoma.....	.72	.19	.91	10.01
Nebraska.....	.45	.16	.61	6.71
South Dakota.....	.43	.17	.60	6.60
Illinois.....	.19	.16	.35	3.85

## SHEEP

Idaho.....	\$1.17	\$0.55	\$1.72	\$1.20
Texas.....	.97	.66	1.63	1.14
Montana.....	.98	.44	1.42	.99
Nebraska.....	.76	.39	1.15	.80
South Dakota.....	.64	.34	.98	.69
Illinois.....	.24	.20	.44	.31

<sup>1</sup> Bureau of Railway Economics (26). Based on record of 108 sales days. Three weeks' periods in fall, 1924-29, inclusive.

## TAXES AND TAX DELINQUENCY

Theoretically, the tax on land is based on its productive capacity and should be equalized accordingly. Actually, it is too often the case that range lands are grouped in one or two valuation classes for the purpose of taxation, and the poorer land must support a tax per animal unit of grazing capacity many times greater than the better lands within the same valuation class. For example, in some counties a uniform tax of 5 cents per acre is assessed on all range lands, whereas, based on grazing capacity a tax ranging from 2 to 10 cents per acre would be more equitable. The operator whose range will support only 1 animal year-long for each 100 acres at 5 cents per acre pays a tax of \$5 for each animal unit, whereas the operator on range which will carry one animal for each 20 acres pays only \$1. Adjustments in the tax base would remedy this situation, but changes have been made so slowly as actually to make taxation a factor operating to defeat private ownership.

This inequitable system, coupled with other range-land disadvantages due to naturally low productivity, depletion, and allied factors, combine to multiply tax delinquency. As already brought out, in Montana, Colorado, and Oregon, where studies of the tax problem on farm and range lands have been made, a serious situation prevails. These are but examples; practically all western States are affected in an important degree.

Several million acres of range land has already reverted to States and counties for tax delinquency. That this reversion, as well as the remaining area making up the total of 65 million acres in State and county ownership, together with nearly 150 million acres of usable range in the public domain and minor reservations to which the stock-raising homestead law applied, are still in public ownership, clearly indicates that there is a large acreage submarginal for private ownership. Another indication of submarginality is

the failure of homesteaders to prove up on nearly 20 million acres of unperfected entries still on the records.

#### COST OF RESTORATION AND REHABILITATION

The extent to which the native forage cover has been depleted is a major factor in the suitability of range land for continued private ownership. Where the grazing capacity has been so far reduced that a large acreage per animal unit is required, the possible returns from the productive capacity are likely to be so low that the land cannot support taxes, interest, and other costs and afford a return to the owner. The added heavy expenses required for rehabilitation increases the capital investment beyond the possibility for private ownership.

Much of the now depleted privately owned range land probably never was suited to private ownership. It has been successfully held during the depletion period because returns were then based on a yield in excess of the sustained productivity. In effect, there was a using up of the necessary capital reserve in vegetation and soil. The resulting depletion has reduced productivity far below the former sustained yield possibilities. Increases in prices and other charges have added to the burden against the land until it can no longer be carried at a profit. The ability to produce in excess of sustained yield for a considerable period obscured the fact that the land was submarginal for private ownership; but now depletion accentuates the submarginality.

The cultivation of range land completely destroys the natural vegetation, and restoration of the native species is a slow process. As shown elsewhere, such lands in Montana, after 16 years' abandonment had a grazing capacity only 57 percent as great as that on nearby unbroken ranges which were badly depleted by overgrazing. Restoration by artificial means of the abandoned cultivated fields and similarly depleted range land seems to be the only way to reclaim them within a reasonable time. But experience has shown that this will cost from \$3 to \$3.50 per acre or from \$50 to \$100 for sufficient range to carry one cow for a year. This investment added to the other costs of production makes private ownership questionable on other than the very best of such land.

Range land which, although not requiring or justifying artificial reseeding, has been depleted to a degree that necessitates drastic reductions in use of livestock for range rehabilitation presents a serious difficulty for retention in private ownership. Where grazing capacity is so far reduced that 5 or 10 acres are required to carry one cow for a month, for example, the cost of ownership may be excessive.

#### USE OF PUBLIC RANGE CONCEALED SUBMARGINALITY

With public range available for use without charge, many lands have been held in private ownership which could not alone have sustained such ownership. In many instances the owner of a water hole or other strategic key area has been able to control the use of enough range to maintain an economic herd. In some instances where other settlers came in and crowded the range and caused depletion, productivity declined to such an extent that the private

land has not been able to maintain itself. If a reasonable fee is charged for the use of public lands, it is possible that some of the private lands which now control public range areas will not be able to continue returning sufficient profits to the owner to justify their retention.

#### UNSATISFACTORY SOCIAL CONDITIONS

The unsatisfactory social conditions now prevailing on many private range lands, and which have existed in the past on a still larger scale, are but another indication of submarginality. The toll of human wastage on poor land indicated by ranch abandonment, isolation, and scarcity of schools, medical facilities, and other social opportunities; by the undernourished character of the families; the heavy feed and crop loans which have had to be made by the Federal Government and which have been repaid only in small part; and, more recently, by the high proportion of such rural population on relief, illustrates clearly the inability of low-quality range lands to afford a satisfactory living.

#### OTHER CONSIDERATIONS

Many other factors contribute in varying degrees to feasibility of such land for private ownership. The suitability of a tract or region to furnish special products such as baby beef and Easter lambs; the amount of supplemental feed which must be used; the expected loss from poisonous plants and other similar causes; and the availability of credit for meeting emergencies are among the considerations. Generally no one factor will decide. It is the total effect of all factors on production costs as compared to returns on a long-time sustained yield basis which gives the final answer to this problem.

Just where the breaking point comes for any given range area is not now known. Economic studies are urgently needed to aid in developing a reliable formula for general application to bring about the orderly adjustment of the ownership difficulties which have been built up and to facilitate retention in private ownership of all land sufficiently productive to redeem fully the obligations which such ownership should entail.

#### GREATER SECURITY POSSIBLE FROM BALANCED AGRICULTURE

Sudden riches rather than conservative use with a permanent high standard of living have too often been the goal of stockmen and bankers in the development of the range resource. That use on a sustained-yield basis is the only approach to economic and social security for the range country, has received too little recognition.

Sustained use of the range resource means more than conservation of the range. It includes a permanent stabilized system of crop agriculture as well. Throughout the West, as has been shown, the range and the ranches are inseparable and both go to make up the agricultural development. In planning for a permanent high level of use, not only the forage on the range but the supplemental feeds from farm pastures, hay fields, sugar beets, and other farm sources must be considered fully. Only in this way can a balanced use de-

signed to meet the limitations which arise from shortages in feed for critical seasons or years be obtained.

Under such a system the recurring curse of drought years can be largely avoided. The light demand which is made on the grass and supplemental feeds during good years will build up reserves of feed, improve the soil, and provide the haystacks necessary to prevent excessive forced shipment of breeding stock during drought years. Similarly, it leaves to the operator some option as to shipping dates, thus avoiding the annual dumping of stock on glutted markets.

Ranch and range credits are likewise made more secure. A permanent resource and a steady income go far to remove the speculative feature from range financing and therefore justify a lower rate of interest.

Livestock losses have in the past too often canceled possible profits. That this debit entry is largely avoided by good range management coordinated with good ranch operation is no secret. Yet the issue has not been faced squarely. Rule-of-thumb management has not considered this feature. Likewise, the relation of calf and lamb crops to the availability of range forage and to possible profits is too often misunderstood or ignored. A calf crop of 50 rather than 80 percent or a lamb crop of 65 instead of 100 percent or greater is a high price to pay for improper management. The capital investment in the breeding herd is the same in both instances. No business can stand such an unnecessary reduction in units of output and prosper.

Improved breeding has been stressed as a possible way to increase the chance for profit. Good sires have been supplied while low-grade cows and ewes have been culled ruthlessly to get the benefits of quality production. But the full influence of inadequate forage has been overlooked and the benefits of improved breeding have not been fully realized. Investments intended to increase the weight and quality of steers and lambs pay best dividends only when the animals are supplied with ample feed.

Unfortunately, the range country carries a handicap in its location. In this, some areas, such as parts of California, Oregon, and Washington, are exceptions. Elsewhere, a freight barrier must be hurdled if the West is to compete successfully. The one outstanding favorable feature whereby the West can recoup this differential is in cheap range forage. Good-quality livestock ready for the block or commanding a premium price as feeders help to overcome this handicap. Here again, coordinated sustained yield production from the range and ranch is required. Ample cheap feed, fed to good stock, should and will overcome the handicap of distance.

The economic home-unit principle is generally recognized as a sound social objective in distributing the use of the range. It must be appreciated, however, that this does not necessarily mean ownership of all of the range which is needed to run the required number of stock. In fact, the evidence previously presented indicates that forage from leased land or from permits to use public land costs the livestock operator less than does ownership in fee simple, even though in the case of leasing the landowner must pay the excess costs. The minimum requirement should be security in the use of ample range, regardless of ownership, for the number of stock, whether

it be 150 cows or only the few head needed to supplement other cash farm income.

In literally thousands of cases throughout the West it has been demonstrated that with an adequate number of stock, an owned ranch producing supplemental feeds commensurate with the operation, and a permit on a nearby national forest with assurance of enough reasonably cheap range forage, a high plane of living is possible. For more than 25 years this has been the objective, although it has not always been attained, in the distribution of grazing privileges on the national forests. It is to these homes that the radio and washing-machine salesmen rather than the relief agent and social worker make their calls.

Conversely, as discussed in another section, national-forest experience also proves that where numbers of stock grazed per permittee are too low, the sound social values which should flow from the range are not realized. It is in this group of permittees with the fewest numbers of stock that turn-over is greatest.

After a study of 304 ranches in the northern Great Plains and discussion with a large number of ranchmen, M. L. Wilson and associates (187) concluded that a strictly economic unit for a cattle ranch in that region must support at least 150 head of breeding cows and should own or control 5 to 7 sections of the prevalent type of dry range. Where there are other major sources of income the number of stock may be correspondingly smaller. The fundamental requirement was found to be consolidation of sufficient land into suitable units of operation. Vass and Pearson (170) from a similar study in Wyoming found that those ranches with less than 200 head of productive units were losing on the average 3.79 percent, while the large outfits were making 2.53 percent profits above all costs. The economic unit will vary in size, depending on the location and the type of ranch.

Ranch operations in the sand hills of Nebraska are considered to be among the more stable and successful in the West. Hedges (72) reports that the early failure of 640-acre homesteads under the Kinkaid Act of 1904 enabled the stockmen to consolidate holdings into units of substantial size. His study of 47 ranches, varying in size from 1,360 acres and 111 cattle to 29,280 acres and 1,868 cattle, and averaging 6,681 acres, disclosed few forced sales, a small percent of tax delinquency, and a livestock industry close to normal. In this particular locality the constant threat of blowouts in the sandy soil has effectively discouraged overstocking and depletion of the range. The same soil condition has discouraged crop farming other than hay production. Here again plenty of range forage, ample wild or tame hay for winter use, and units large enough for economic production have resulted in a stable livestock industry and a well-balanced agricultural enterprise.

In a recent survey of economic conditions on the Ashland Division of the Custer National Forest, it was found that among ranches with more than 130 head of cattle there were no relief cases, relatively little tax delinquency, and a fairly adequate net income per person. Below 130 head, the social and economic situation rapidly became worse.

Here and there throughout the West, are equally successful outfits operating in large measure on private lands. In each of the

States there is a small minority of livestock operators who have realized the value of protecting their ranges and have profited thereby. They seem to have attained security with well managed ranges and ranches in spite of the handicaps of finances, climate, and markets.

Despite maladjustments, mistakes, and thoughtless exploitation, the agriculture of the West is a splendid enterprise, with its magnificent grain fields and its specialized crops ranging from cotton fields of the Imperial Valley to hardy hay crops able to mature in high frosty meadows. Beautiful towns and cities are embraced by its broad plains and splendid valleys, but surrounding and enveloping all is the range—the original crop that supports and nurtures the West. Where soil is too thin or slopes are too steep, or where the climate is too harsh for cultivated crops or other higher land use, are the grasslands, needing not be sowed—only reaped. Persistent, long-suffering, now badly depleted and eroded, the range is still the essential ingredient of a balanced way of living in the West. Surely, it is not too much to ask that the management of ranges and ranches be so coordinated that greater social and economic security may be enjoyed by future generations.

#### THE PROBLEM OF INTEGRATION OF WESTERN AGRICULTURE

Realization of the full benefits possible from a well-balanced western agriculture depends upon finding some solution of the problems which arise from the maladjustments that have developed from the haphazard use of range and closely related crop land. In reaching a desirable solution, range forage and crop production, the quality of livestock products best suited to a region of comparatively high freight rates, and the effect of all on the social structure and well-being of the West must be considered. Thus the best development of rural life of the West seems to hinge on finding a lasting solution for the following six groups of problems which naturally are closely interrelated.

(1) How, in the light of the cost of restoration, can the very great acreage of abandoned, submarginal dry-farm lands be restored to productive range use in a reasonable period of time?

(2) To what extent and how best can a better balance between the use of range forage and of farm-grown feeds contribute to the solution of overstocking of the western ranges?

(3) How can key areas, such as lambing grounds, water holes, driveways, and holding grounds be restored to a status of ownership and productivity which will insure their maximum contribution to orderly range management?

(4) How far can farm-grown feeds and ranges now used at other seasons be substituted for the badly depleted and insufficient spring range?

(5) How can stockmen generally be made to realize that insufficient feed either on the range or on the feed lot, tends to cancel investments in improved breeding herds by reducing weights, and calf and lamb crops?

(6) What integration of public and private ranges with farms and ranches will aid most effectively in establishing the livestock industry on an economic unit basis whereby a reasonably high standard of living will be assured?