

SUPPLEMENT TO WARREN'S ELEMENTS OF AGRICULTURE

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DRY FARMING IN OREGON

BY

H. D. SCUDDER

OF THE OREGON AGRICULTURAL COLLEGE

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DRY FARMING IN OREGON

H. D. SCUDDER, OREGON AGRICULTURAL COLLEGE

Dry Farming Conditions in Oregon. "Dry farming" is a term applied to a special system of farming that is required to produce profitable crops without irrigation where the rainfall is insufficient for production under ordinary farming methods. Generally, where the annual precipitation is 20 inches or less, dry farming methods are required, but seldom will even these methods bring profitable production where the annual rainfall is less than 10 inches.

In Oregon there is a great farming area east of the Cascades, comprising approximately two-thirds of the area of the state, where the annual rainfall ranges from 10 to 25 inches and where either dry farming or irrigation must be resorted to, to secure successful returns from cropping. In this vast territory there are approximately 1,500,000 acres now successfully operated under the dry farming system, and approximately 3,000,000 acres of land suitable for this method of farming yet to be put under the plow. The larger portion of the dry farming land now cultivated in Eastern Oregon is found in the Columbia Basin. These lands at the present time are the chief wheat-producing portion of the state. Some of these Columbia Basin lands have been farmed for thirty years or more, what is called the "summer fallow" method of grain production being used. In this system, a grain crop is grown only every other year, each alternate year

the land being plowed and left fallow through the growing season.

In the Blue Mountain and Central Oregon divisions (see map), hitherto devoted largely to the production of livestock and of hay and grain by means of irrigation, large areas of lands that cannot be irrigated have been in recent years and still are being brought into production by means of the dry farming system.

In the three different divisions of Eastern Oregon, shown on the map, the conditions as to soils, rainfall, elevation, and growing season, and their effect upon dry farming production, vary considerably. In the Columbia Basin region, with the exception of Umatilla County, the average annual rainfall is about 11 inches, the average elevation 2000 feet, and the average growing season 150 days. In the Blue Mountain region, the average annual rainfall is about 18 inches, the average elevation 3000 feet, and the average growing season 120 days. In the Central Oregon division, the average annual rainfall is 11 inches, the average elevation 4000 feet, and the average growing season 100 days. The rainfall in Umatilla County (15 to 25 inches) is considerably higher than that in the rest of the Columbia Basin, owing to the proximity of the Blue Mountains. Thus it may be seen that in the Blue Mountain region, the large rainfall permits heavier production on the dry farm, while in the Columbia Basin the rainfall is so low as to require the most careful methods. In Central Oregon, on the other hand, the elevation and short growing season make frosts the most critical factor in production. Throughout Eastern Oregon, the evaporation is rather high, averaging about 45 inches from a free water surface, while the distribution of the rainfall is not especially favorable to crops, owing to the very scanty precipitation during the summer months.

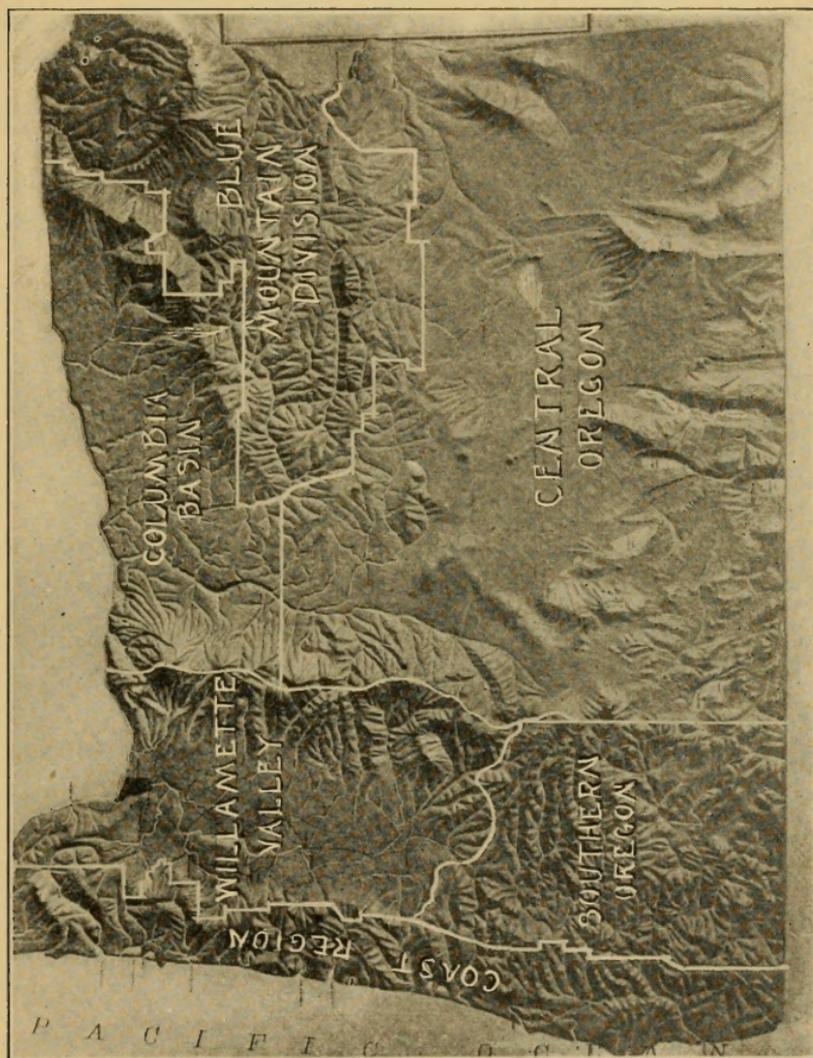


FIG. 1. Rough relief map of Oregon, showing the six natural geographical and agricultural divisions of the state, the boundaries of which follow county lines.

On the other hand, the soils of the Eastern Oregon dry farming area as a whole are very favorable for production. In the Columbia Basin and the Blue Mountain region, the gray silt loam is almost the universal type. This soil, sometimes called "volcanic ash," is a fine-grained fertile soil, excellently adapted to moisture conservation and easy tillage. In Central Oregon, the most common dry farming soil type is the brown sandy loam, easier for tillage operations but not quite so retentive of moisture nor so rich in plant food. In both of these types throughout the region, humus is the constituent in which the soils are most deficient.

Altogether, the conditions for dry farming in Oregon are fairly favorable for successful production, provided the farmer fully understands the problems involved and uses the very best methods to meet them.

Special Dry Farming Tillage Practices. The chief objects of dry farming tillage practices are to conserve moisture and destroy weeds. The highest production is dependent first and foremost upon the fullest use of the rainfall. With the proper tillage methods, fully one-half of the total annual precipitation may be conserved. As every inch of rainfall secured from the soil by the wheat crop will produce approximately 3 bushels of grain, if one-half of the average annual rainfall of 11 inches were conserved for the use of the crop, a yield of approximately 15 bushels per acre could be secured; or, under the summer fallow system, double that yield per acre every other year. On the average Eastern Oregon dry farm at the present time, *little more than half this yield is obtained*, and it is probable not more than a fourth of the total annual precipitation is conserved and used for crop production.

Deep plowing is the first essential in moisture conservation. A deep, rough, loose layer of plowed soil acts like a

sponge in quickly absorbing precipitation and permitting it to get into the soil, where it may be stored for later use. Plowing in the fall is of great advantage, in that it leaves the land rough and loose so that it holds the snow and absorbs the rains of early fall and spring. Very commonly, however, the soil is too dry to plow well in the fall, unless a disk plow is used. Ordinarily the disk plow does inferior work, because it is set too shallow. If disk plowing is done, it should be deeper than moldboard plowing (not less than 10 inches), and more horse power should be used.

Where the land is not plowed in the fall, another practice is very successfully substituted for it. This is the use of the disk harrow on the stubble in the fall after the first rains have come, so that the soil turns well and is not left too much pulverized. Disk harrowing in the fall chops up the grain stubble, aiding in its decay over winter, destroys a great many weeds, and leaves the surface soil fairly rough and loose for the absorption of the winter precipitation. In addition, such land is more easily and effectively plowed in the spring.

Where the land has been left over winter in the stubble, a valuable practice is disk harrowing early in the spring. This has much the same effects as fall disking in chopping up the heavy stubble, destroying weeds, absorbing the spring rainfall, and making the plowing easier and more effective.

Where plowing of dry farming land is done in the spring, either for seeding or for summer fallowing, it is of the greatest importance that it be done as early as possible. Land plowed in April will give a yield of 5 or 6 bushels more per acre than that plowed in June. All spring plowing should be followed immediately with the spiketooth harrow, so that a soil mulch is created at once and the loss of moisture prevented. Evap-

oration losses are very high at the time of the spring plowing, owing to the large surface of moist soil exposed, so that immediate mulching with the harrow is of the greatest value.

The use of a subsurface packer is unnecessary on land that is being plowed for summer fallow. Its chief use is for spring plowed land which is to be seeded at once. Such newly plowed land is often so loose as to dry out quickly, leaving the crop in poor shape to withstand the drouth of summer. The subsurface packer firms the soil in the lower part of the plow bed so that capillary action is new between the plowed layer and the subsoil where the moisture is stored. The use of a surface roller on the dry farm is seldom necessary or desirable.

Practically all seeding on the dry farm should be done with the drill, even the seeding of alfalfa or field peas in rows, and of corn, as well as wheat and other small grains. The modern grain drill can be adapted to the seeding of practically all dry farming crops.

Most of the work of moisture conservation is accomplished through surface cultivation, the object of which is to maintain a good mulch and destroy weeds. The most effective soil mulch is from 3 to 4 inches in depth and is not too finely pulverized. It consists of a dry, loose layer of small clods mixed with more finely pulverized soil. Such a mulch when rain comes is rough and loose enough to absorb rainfall and does not run together and crust and bake and crack as does a very finely pulverized dust mulch. Further, the cloddy mulch will not blow as readily as will a dust mulch, and this is important in localities where some trouble is had with soil blowing. Surface cultivation is given only frequently enough to maintain a good mulch and destroy weeds. It does not need to be given every week, but only when the

rainfall has destroyed the mulch by compacting it and wetting it, so that capillary action is resumed through it and loss of moisture through evaporation takes place. Ordinarily, in Eastern Oregon, two or three harrowings of the summer fallow during the spring, followed by several cultivations with the bar weeder sufficient to keep down the weeds, and a final cultivation in the fall before seeding is generally all that is necessary to maintain satisfactory conditions. Land that is in row crops, such as corn, alfalfa, potatoes, rape, and the like, may be cultivated on the same basis, a spiketooth harrow, or Hallock weeder being used early in the season and later the shovel cultivator. Winter-sown grain may be harrowed several times early in the spring with great benefit, not only to destroy weeds, but to break up the soil crust formed over winter.

A good tillage program for the average Eastern Oregon dry farm would be about as follows, the rotation being — first year, summer fallow; second year, wheat; third year, fallow substitute crop, such as field peas, corn, or the like:

First Year. — Double-disking in the fall after harvest. Fall plowing. Double-disking in early spring. Harrowing two or three weeks later. Harrowing after the next heavy rainfall. Harrowing, or the “bar weeder,” in June. The “bar weeder” in July. Harrowing, or “bar weeder,” in August. Disking in September.

Second Year. — Press-drilling wheat in fall after first rain, but not later than the first of November. Harrowing weedy wheat several weeks after sowing. Harrowing wheat twice at intervals in spring.

Third Year. — Double-disking after harvest. Fall plowing. Double-disking early the next spring. Harrowing in two weeks. Harrowing before seeding. Press-drilling barley, or emmer, or field peas, corn, rape, or sorghum, in rows,

or other "fallow substitute" crop. Harrowing young crop with weeder and cultivating row crops later.

Dry Farming Machinery. The chief object to be observed in the selection of dry farming machinery is to obtain tools that do reasonably good work rapidly and cheaply. Wherever it is possible to use it, the moldboard plow does the best quality of work, the sulky 3-bottom gang plow being the type most used by the dry farmer who wishes to get over the land quickly and cheaply. The disk plow if properly used is especially valuable in plowing hard, dry soils before the rains have come, or in plowing sticky soils that will not scour on the moldboard plow. It is also especially effective in plowing newly cleared sage brush land. The disk plow, however, must be very carefully selected, as it must have a high clearance beam (so that it will not choke), rigid frame, the best of material in the rotary disks (which should have a diameter of 26 or 28 inches), and the best of bearings (preferably on both sides of each disk). Subsoil plows and the special deep tillage plows recently introduced are not considered necessary for the Eastern Oregon dry farmer.

A good spiketooth lever harrow and first-class disk harrow, such as the Double Action Cutaway disk, are indispensable dry farming tools. Rollers and packers are seldom necessary. The best obtainable grain drill, of the hoe type, and provisions for sowing seed of all sizes, and particularly at very low rates per acre, are the most important essentials of the dry farmer's equipment. On poorly prepared or trashy ground, the single disk drill does better work than the hoe drill. For the planting of corn or beans, the single-horse drill or the regular two-row planter may be used. On every dry farm, a first-class 8-shovel riding cultivator with all modern adjustments should be found. Special knife blades for cultivating such weeds as the Russian thistle may

be made for this machine. For early cultivation of row crops, the Hallock weeder is a cheap and indispensable implement for effective work. For summer cultivation, the most effective weed killer is the bar weeder — a home-made machine widely used throughout Eastern Oregon.



FIG. 2. Bar weeder used on Experiment Station at Moro, Ore., for summer fallow cultivation.

For harvesting, the header is the best machine for the modern diversified dry farm. The combined harvester and thresher, although a wonderful machine for harvesting quickly and cheaply on a large scale, is adapted only to the "bonanza" type of farming. For harvesting alfalfa for seed, the self rake reaper, and for field pea seed, the bean puller or special blades on the row cultivator, may be used.

The fanning mill, for cleaning and grading seeds of all kinds, is one of the most profitable pieces of equipment the dry farmer can possess.

Housing undoubtedly at least doubles the life of the average machine, and the dry farmer's entire equipment can be sheltered in a machine shed that can be built for \$200 or \$300.

Dry Farming Crops. In selecting his crops, the dry farmer should choose those crops which require the least moisture (corn); that are deep rooting (alfalfa); that are early maturing or have a short season of growth (field peas and rape); that are adapted to moisture conserving tillage (row crops);

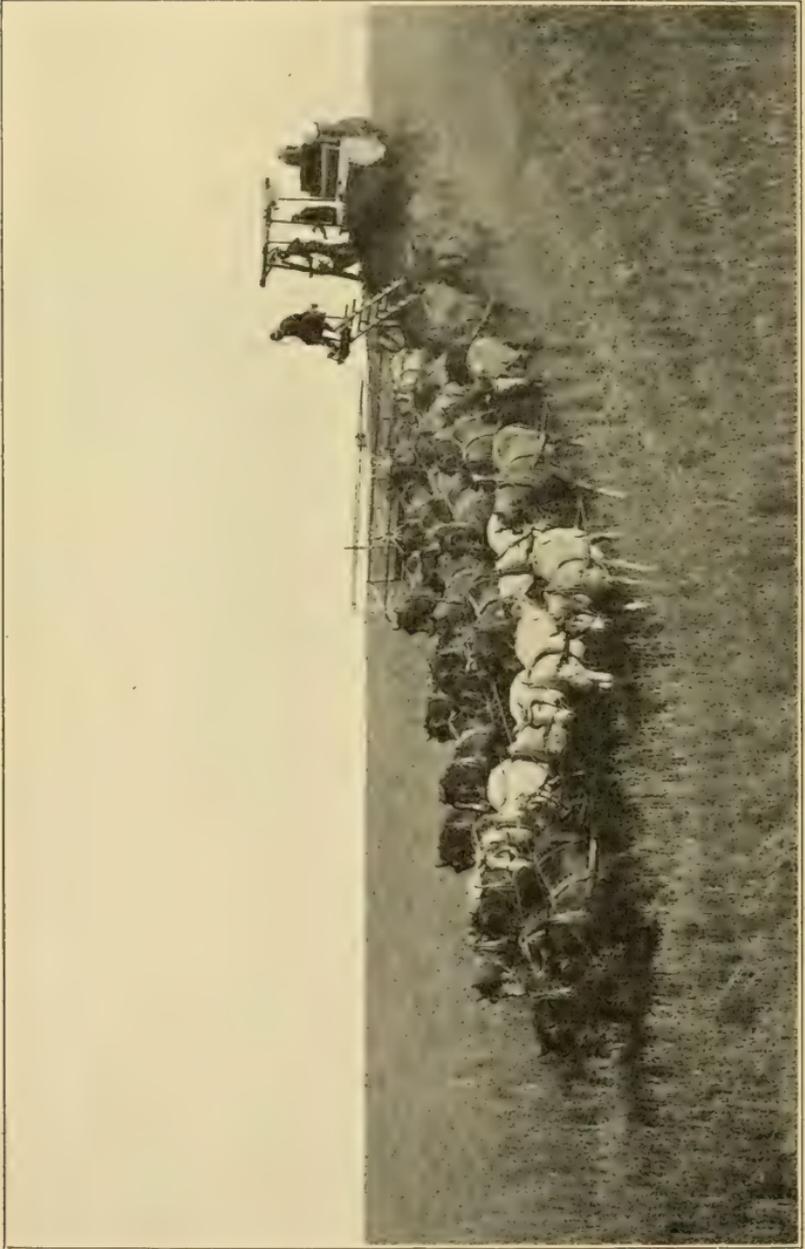


FIG. 3. The 36-horse combined harvester and thresher at work on a dry farm wheat field in the Columbia Basin. Adapted only to the large "bonanza" farm.

that may be cheaply produced (small grains); that are hardy to winter cold or spring frosts (rye and field peas); that are arid-bred; or those that decrease fertility the least or, instead, increase it (alfalfa and field peas).

Winter wheat is now and undoubtedly always will be the chief crop of the Oregon dry farmer. The best variety for Oregon, wherever the rainfall is 18 inches or under, unquestionably is the Turkey. Corn (the Improved Minnesota No. 23), barley (Swan-neck), rye, oats (Sixty-Day), and emmer are the other cereals, and the respective best varieties of each which are successfully grown and of value to the Eastern Oregon dry farmer. Of these, corn alone is not very successfully grown in Oregon over an elevation of 3500 feet. Winter barley and winter emmer are being grown with fair success. Of the spring wheats, the Selected Bluestem is probably the best variety.

New crops recently successfully produced on the Eastern Oregon dry farm are the hardier strains of alfalfa (the Baltic and the Grimm), field peas (the Carleton and the Cossack), rape, artichokes, field beans (at the lower elevations), flax, mangels (at the higher elevations), and several forage crops of minor importance. Potatoes are very successfully grown, both for home use and commercially, on the Oregon dry farming lands, except at some of the highest elevations. Of all the dry farming crops, the hardy alfalfa and field peas grown in cultivated rows for seed production or for hog pasture are the most profitable in Eastern Oregon and are of especial value because of their effect in restoring and increasing fertility. Corn, rape, and artichokes are chiefly valuable if they are utilized by pasturing off with hogs or sheep.

The list of new crops recently developed for the Eastern Oregon dry farmer is now sufficient to permit a much more intensive and diversified, a surer and more attractive,

type of agriculture than that which he has hitherto employed.

Dry Farming Management. The most striking need of the old settled dry farming lands in Eastern Oregon, both from the fertility and economic standpoints, is for a more



FIG. 4. College bred field corn at 3500 feet elevation on O. A. C. Dry Farm, Metolius, Ore. For "hogging down."

diversified system of farming, to maintain or increase fertility. This will permit employing a smaller farm unit and thus increase the population and the social and economic development of the rural districts. The present large size of the dry farms, together with the continuous grain cropping, is reducing the fertility of the soil and does not get the maximum production and use of the land that is possible. Further, the "bonanza" style of wheat farming has larger risks and does not produce as steady an income, while very little of the money obtained by the farmer in this type of farming

is expended on the land or in the country from which the crop is sold. The great need of the entire Eastern Oregon dry farming area is for a much more diversified system of farming, which will permit a higher production per acre, the maintenance of fertility, a steadier and surer income, successful farms of smaller size, and thus a more populous and permanent agriculture.

That diversified dry farming may be carried on successfully in Eastern Oregon on farms of 320 to 640 acres in size has been fully demonstrated in recent years. This has been accomplished by the use of better varieties of grain and improved methods of tillage and seeding, especially with reference to moisture conservation and the control of weeds, so that larger yields of grain crops are obtained. For grain, even on the diversified dry farm, will always be a leading crop.

The chief departure in the diversified type of farming, however, is the introduction of leguminous forage and seed crops, such as alfalfa and field peas, used in rotation with grain and thus increasing fertility through the nitrogen-gathering ability of these plants and the increase effected in the humus content of the soil. Although the alfalfa and field pea may be raised for sale as seed crops, a considerable portion of them is consumed by livestock, particularly pigs and sheep, and thus the income from the land increased and its fertility retained.

On the newly settled or undeveloped dry farming areas of Central Oregon and the Blue Mountain region, the chief problems of the dry farmer are the short growing season, the sandier soil, and the lack of transportation. On these lands, diversified farming is even more necessary than on the old farming areas of the Columbia Basin, and should be adopted from the very beginning.

The most important requirement for the new settler on the Central Oregon dry farming lands is not the clearing of the sage brush or the protection of crops against rabbits, but rather it is the conservation of sufficient moisture by



FIG. 5. Field peas in double drill rows for forage and seed production. Yield 26 bushels per acre, O. A. C. Dry Farming Experiment Station, Moro, Ore.

thorough cultivation the first year so that he can produce a successful crop the second year. A short growing season can be offset by securing hardier varieties of grain and forage, such as those already named; and the distance from the shipping point may be offset by the growing of alfalfa seed, which may be profitably hauled a long distance, and the raising of livestock, which can be sold in the home locality.

As suggested, successful management of the dry farm is dependent on maintaining or increasing fertility through the

growing of nitrogen-gathering and humus-forming crops in rotations, and the feeding of them to livestock.

A comparison of the fertility effects of three of the most important dry farming products will show at once how this problem must be met :

Wheat, one acre, 25 bushels, at 70 cents per bushel, has a market value of \$17.50, costs about \$6 per acre to produce, and takes away from the soil plant foods having a market value of \$6.75, so that the net profit from an acre of wheat is \$4.75. An acre of alfalfa seed yielding 100 pounds at 20 cents a pound has a market value of \$20, costs \$3 to produce, but adds to the soil through its nitrogen-gathering ability \$3.90 worth of plant food, and thus gives a net profit of \$20.90. An acre of land devoted to pigs will produce 300 pounds of pork, at 7 cents per pound, having a market value of \$21, will cost \$3 to produce, and through the alfalfa and field peas fed will return to the land \$2.50 worth of plant foods, and thus gives a net profit of \$19.50 per acre.

With these facts in mind, it is not hard to see how easily the profits per acre and the fertility may be increased by growing more alfalfa and field peas and raising more pigs and growing less wheat or other grain.

In other words, if the Eastern Oregon dry farmer *were to maintain fertility, buying and replacing the plant food consumed*, a half section of land farmed to wheat would give him only a bare living, even with a yield of 25 bushels per acre on the summer fallow system. The money invested in his land would give him a better profit loaned through his bank at 6 per cent than it would invested in his wheat land. Alfalfa or field peas or pigs, on the other hand, would not only give him a good profit on his investment and labor, but would steadily increase the fertility and productive power of his

soil. In other words, when a farmer raises and sells nothing but wheat or other grain, the money he receives comes largely from the direct sale of the fertility of his farm, which in time is bound to become so reduced that it will no longer give him a living.



FIG. 6. Alfalfa in cultivated rows for seed and forage production. O. A. C. Dry Farm, Metolius, Ore.

Every acre of 25-bushel wheat sold is grown at a fertility loss of \$6.75, while every acre of alfalfa grown brings a fertility gain of \$3.90 and a much greater profit on his labor and investment as well; but since every acre of alfalfa enriches the soil each year with an amount of nitrogen (the most valuable of the plant foods) equivalent to that consumed in producing 41 bushels of wheat, it is evident that the dry farmer still may grow wheat and other grains if a good rotation, including alfalfa and field peas and pigs, is used. That such rotations



FIG. 7. Pigs fattening on field pea pasture. O. A. C. Experiment Farm.

are easily and profitably fitted to the Eastern Oregon dry farm, has been fully demonstrated.

In every good rotation plan of any sort, the following features or requirements must be found :

	ON OREGON DRY FARMING LANDS	ON OREGON IRRIGATED LANDS
1. <i>"Money" Crop</i> For cash sales	Wheat or other grains Alfalfa and field pea seed Livestock—pigs, lambs, colts, poultry	Butter fat, pigs, heifer calves Potatoes, cabbage, oni- ons, etc.
2. <i>Legume Crop</i> For fertility — Nitrogen-gather- ing, increasing humus, subsoil- ing effect	Alfalfa, field peas	Alfalfa, clover, field peas
3. <i>Cultivated Crop</i> Improving tilth, making plant food available, destroying weeds	Alfalfa, rape, corn, potatoes, field peas, roots, artichokes	Corn, potatoes, rape, mangels, rutabagas, cabbage, onions, etc.
4. <i>Barn Yard and Green Manures, Straw, etc.</i>	Green manures — Rape, rye, sweet clover	Rape, rye and hairy vetch, crimson clover, sweet clover

For example — several excellent rotations for the average Eastern Oregon diversified dry farm of 320 acres would be as follows :

Field No. 1 — wheat, 80 acres.

Field No. 2 — field peas, 40 acres ; corn, 20 acres ; rape, 20 acres.

Field No. 3 — summer fallow, 80 acres.

Field No. 4 — alfalfa pasture, 40 acres ; alfalfa for seed, 40 acres.

Fields Nos. 1, 2, and 3 would be operated as a 3-year rotation in the order named, while Field No. 4 would be left in alfalfa for the entire 3-year period. The fourth year the field that was in cultivated crops the previous year would be seeded to alfalfa in place of being summer fallowed, while the alfalfa field would be plowed up and summer fallowed, taking the place of the field newly seeded to alfalfa in the regular 3-year rotation. The alfalfa, peas, corn, and rape, of course, would be grown in cultivated rows and pastured off with the pigs. Sheep and poultry could be substituted for pigs, if desired.

A good dry farm rotation without livestock would be as follows :

Field No. 1 — wheat, 80 acres.

Field No. 2 — field peas for seed, 80 acres.

Field No. 3 — summer fallow, 60 acres, potatoes 20 acres.

Field No. 4 — alfalfa for seed, 80 acres.

This rotation would be operated as directed in the first plan. Sheep could be very advantageously included in this plan to consume the alfalfa and pea straw produced, either the straw or manure being returned to the fields and thoroughly disked in in the fall, left over winter, and plowed under the following spring. Following this rotation plan, nearly any combination of different varieties of crop and livestock

products that was desired could be made. Fertility and profits would steadily increase.

The Dry Farmer's Home. No farmer can be considered successful who does not establish a comfortable and attractive home. Almost invariably a highly successful farmer lives in a successful home. An attractive home place is even more desirable on the dry farm than on other farms. The modern farm home may have every convenience that the modern city home has, nor is the dry farmer excluded from the advantages of garden, orchard, and shade trees, such as other farmers enjoy. Where the more drouth-resistant varieties of fruit are selected and plenty of space and cultivation given, the family needs may be successfully supplied, and this is equally true of the dry farm garden and the plantings of shade trees around the farmstead. Often where the depth to water is not too great, an engine pump will supply the limited amount of extra water required to irrigate a small garden and orchard on the dry farm. A well-planted farmstead with conveniently arranged and modernly equipped buildings and yards makes the dry farm home as attractive and successful as that found anywhere.

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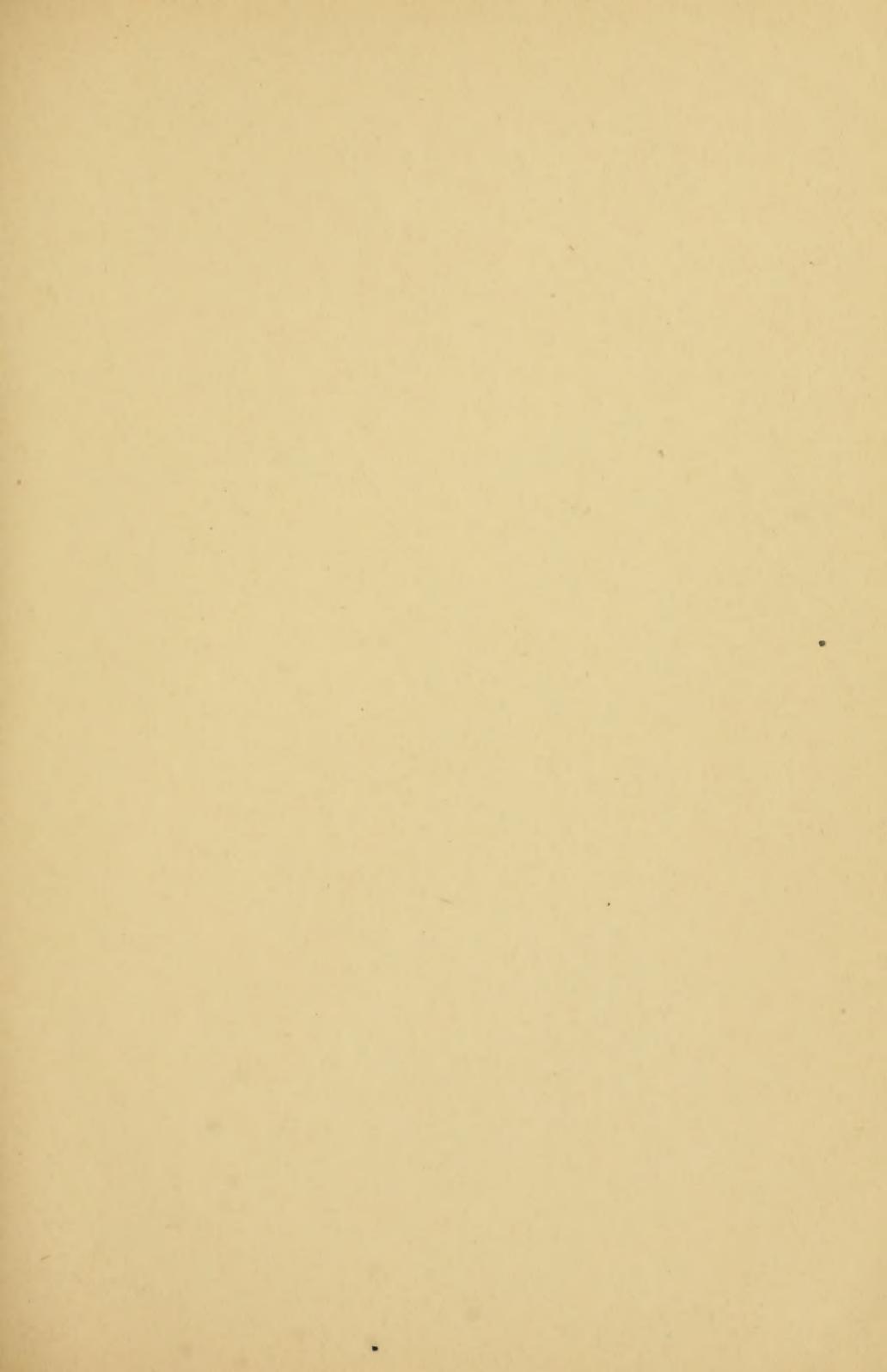
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