Since the early days of agriculture in every part of this country farmers first robbed the soil of its fertility and then resorted to various devices to get a paying crop. A favorite device was to run away from the problem and seek new land; another, to give the land a complete rest from production. In the meantime live stock increased, and barn manure, at first a farm nuisance, was more and more applied to the land, manures were composted, commercial fertilizers were employed, and sod was plowed under every few years. A true conception of the benefit, almost necessity, of rotating crops gained a foothold under the stress of hard conditions, and this expanded into farm practice, even to the extent of raising manuring crops for the sake of plowing them into the soil.

The poverty of the soil and the want of a "money crop," before neighboring urban populations became important, and while farming communities were isolated for want of railroads and navigable rivers, early forced the New England farmers into a varied agriculture and dairying, and the long, inclement winter confined the live stock in yard, shed, and stable. New England is a region of high production per acre.

In proceeding westward from the East, the rule is, the longer the occupation the more developed the crop rotation. A diminution in the degree of rotation hardly appears until Ohio is passed, and then the diminution is gradual until in the longitude of middle Kansas rotation is of the simplest, when existing at all. Agriculture in a great portion of the North Central States began with one-crop or two-crop production.

The one-crop cotton planters in the South followed the new land westward until they could find no more; then they let the land rest, and afterwards used commercial fertilizer for many years, and they have only just begun to enter a phase of simple and effective crop rotation without much aid from live stock.

In the rainy part of the Pacific Northwest the history of crop rotation is about the same as that of the middle and western parts of the North Central States. Little history has yet been made in this matter.
by the arid and semiarid regions; aside from the growing of alfalfa, agriculture remains as it began, except that there is a gradual diminution of soil fertility, even under irrigation, where alfalfa is not grown.

**GENERAL VIEW OF THE PRESENT.**

The present paper has been prepared from reports made by thousands of correspondents of the Department of Agriculture, representing every agricultural county in the United States; the statements regarding customs and farm practices, including crop rotations, in the different sections of the country are summaries of these reports.

Little systematic rotation of crops is found in this country. One-crop farming is still practiced in some parts, as corn on bottom land or cotton in the South, corn or wheat in the North Central States and the Southwest, and wheat on the Pacific coast. The constant cropping of the “corn bottoms” of the South and of the North Central States is sustained to some extent by the annual deposit from freshets. The cotton land receives commercial fertilizer, and much of it is rested every few years, but is in a low condition of fertility. The continuity of wheat or corn in the North Central and Pacific States is broken by complete rest in many counties, and the soil is becoming less productive. Rest for the soil is not a common practice in the North Central States; the extension of crop rotation is preventing this.

Haphazard is a mild word to describe the impression given by the reports of correspondents with regard to the rotation of crops in many counties and parts of counties of the United States. Although there may be an annual change of crop on the same land, this change is so uncertain, so unsystematic, that at first it seems impossible to establish order out of the chaotic mass of particulars. Some fundamentals may be discerned, however, in a broadly general sense.

Throughout the region north of the cotton belt there is a three-crop rotation which may be regarded as a system with innumerable variations. These crops are corn, small grain (wheat, oats, barley, rye), and grass or legumes; and the period covered by the rotation in some of its variations is commonly four or five years and not infrequently extends to eight or ten or more years, the length of the period depending mostly upon the ability of the grass or legumes to remain productive. Sooner or later most of the tillable land that is not bottom land or is not devoted to one crop, fruit or vegetables, passes through this rotation, but often with interruptions or the admixture of other crops in the effort to adapt the products to markets, prices, soil, weather, and the special or general objects of farming.

In some regions which produce considerable tobacco, potatoes, or beans, a portion of the land that would otherwise be given to corn may be given to one of these crops in this general rotation.

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*aThis group of States includes the following: Ohio, Indiana, Illinois, Michigan, Wisconsin, Minnesota, Iowa, Missouri, North Dakota, South Dakota, Nebraska, Kansas.*
This fundamental rotation north of the cotton belt will better be understood by noticing the variations presented in the list of leading rotations contained in this paper.

In the cotton belt, as far as any systematic rotation of crops is discoverable, it is cotton and corn, but this is subject to the repetition of cotton because of larger area than corn, to the resting of the soil for a year, to the inclusion of cowpeas, and of various small crops of sorghum, oats, sweet potatoes, etc., in the course of several years, during which the primary rotation may have occurred two or three times. Variations of the primary cotton rotation will be observed in the subsequent list of leading rotations.

In the arid and semiarid regions, which comprise that part of the country lying west of the one hundredth meridian, except a border on the Pacific Ocean, the crop rotation, outside of vegetable and fruit production, tends to maintain the growth of alfalfa as long as possible. In the reseeding year wheat or other small grain is sown. There is, however, considerable resting of land throughout this entire region as a poor substitute for renewing the fertility of the land by the use of alfalfa, for alfalfa is not grown where grain is the chief product. In western Oregon and Washington, where the rainfall permits the introduction of grasses, the rotation chiefly includes only small grains and grasses, and in some counties only the small grains.

For California, it is impossible to arrive at a fundamental crop rotation on account of radical differences in soil, water supply, and climate. The reports received show the practices to be almost as numerous as the counties, and indeed some counties have several practices in different parts. With regard to wheat and barley the general practice is that the land rests every second or third year, in which it produces nothing but weeds and wild oats. Some Pacific coast rotations are given in the list of leading rotations.

THE MORE GENERAL ROTATIONS IN WHICH SPECIFIED CROPS ARE GROWN.

In connection with the following rotations a few prominent counties are mentioned for illustration, and not because the rotations are confined to them. The States are leading or prominent ones in their geographical divisions. Grass, alfalfa, or the clovers, at the end of a rotation, generally continue as long as they are sufficiently productive.

CORN.

PENNSYLVANIA.—Corn, small grain two years, grass two years (Bucks, Berks, Chester, York, etc.).

ILLINOIS.—Corn indefinitely (Vermilion). Corn two years, small grain, grass (Champaign). Corn, oats, corn, oats, clover (Livingston, Peoria).
CALIFORNIA.—Corn, wheat, oats (Napa).

GEORGIA.—Corn, oats, cotton (Thomas, Laurens). Corn, cotton two years (Burke). Cowpeas are frequent in either case, but are grown in the same year with either corn or oats.

TENNESSEE.—Corn, wheat, clover (Gibson, Obion, Giles). Corn two years, wheat, clover (Weakley). Corn with cowpeas, wheat (Lawrence).

WHEAT.

PENNSYLVANIA.—Corn, wheat two years, grass two years (York, Franklin, etc.). Corn, oats, wheat, grass three years (Chester, Westmoreland).

MINNESOTA.—Wheat two years, oats, wheat, flax (Marshall). Corn, wheat two years, oats (Lac qui Parle). Corn, wheat two years, grass two years (Ottertail, Todd, etc.).

WASHINGTON.—Wheat, rest (Adams).

CALIFORNIA.—Wheat, rest (Solano, San Joaquin, etc.).

MARYLAND.—Wheat, rest (Solano, San Joaquin, etc.). The rotation on dairy and stock farms includes wheat for only one year.

OKLAHOMA.—Wheat without rotation (Grant, Garfield, Kingfisher, etc.). Wheat, corn (Dewey). Wheat three years, oats (Kay).

OATS.

NEW YORK.—Oats two years, hay three years (Jefferson). Corn, oats, rye, hay two years (Ontario). Corn, oats, hay two years (Steuben).

IOWA.—Corn, oats, hay two years (Butler, Floyd, Kossuth, etc.). Corn, oats two years (Cerro Gordo). Corn two years, oats, hay two years (Franklin).

OREGON.—Wheat, oats, corn or rest (Marion). Wheat, oats two years, grass (Linn).

SOUTH CAROLINA.—Corn, oats, cotton (Darlington, Edgefield, Sumter). Corn, oats, grass (Marion, Saluda).

OKLAHOMA.—Oats, corn (Oklahoma).

BARLEY.

NEW YORK.—Corn or potatoes, barley, wheat, grass two years (Orleans, Seneca). Corn, barley, grass two years (Steuben).

MINNESOTA.—Barley two years, clover two years (Wabasha). Barley, corn, oats, corn, wheat (Rock).

CALIFORNIA.—Barley, rest (San Luis Obispo, Monterey, etc.).

RYE.

MASSACHUSETTS.—Corn, rye, grass two years (Franklin). Corn, oats, rye, grass two years (Hampden).
NEW JERSEY.—Corn, rye, grass (Morris). Corn, potatoes, rye, hay, grass (Monmouth).

MICHIGAN.—Corn, rye two years, clover two years (Allegan). Corn, rye, clover (Gratiot).

KENTUCKY.—Corn, rye, clover two years (Clark). Tobacco, rye, clover (Grant).

Rye occupies the same place as wheat in usual rotations, but is adapted to lighter soils.

BUCKWHEAT.

PENNSYLVANIA.—Buckwheat, oats, rye, grass two years (Bradford, Wyoming). Buckwheat, oats, grass three years (Tioga).

WEST VIRGINIA.—Buckwheat, wheat, grass two years (Marshall, Hampshire, etc.). Buckwheat, corn, wheat (Tucker). Buckwheat up to six years without change (Preston).

WISCONSIN.—Buckwheat, rye, grass two years (Juneau). Potatoes two years, buckwheat, rye, corn (Juneau). Corn and rye in two-year rotation, occasionally with buckwheat (Adams).

POTATOES.

MAINE.—Potatoes, oats or barley, grass several years (Kennebec, Lincoln).

NEW YORK.—Potatoes, small grain, grass two years (Steuben, Seneca). Corn, potatoes, oats, rye, clover (Ontario).

WISCONSIN.—Potatoes, grain two years, grass two years (Columbia, Portage, Waupaca). Potatoes, corn, potatoes, grass two years (Wau-shara). Potatoes, wheat, clover two years (Adams).

COLORADO.—Alfalfa, potatoes, wheat, potatoes, wheat (Larimer). Peas, potatoes, wheat, rest (Conejos).

VIRGINIA.—Potatoes two crops in one year, sweet potatoes two years, corn (Accomac). Potatoes and corn the same year, oats plowed in and cowpeas the second year (Northampton).

KENTUCKY.—Potatoes planted on sod, preferably clover (Kenton).

HAY.

NEW YORK.—Corn, small grain, hay three years (St. Lawrence, Delaware). Corn, oats, wheat, hay two years (Chautauqua).

IOWA.—Corn two years, oats, hay two years or more (Dubuque, Ringgold, Johnson, Fayette, and many other counties).

CALIFORNIA.—Largely native grasses mowed indefinitely (Siskiyou, Modoc, Orange, Contra Costa). Alfalfa five years (Los Angeles).

VIRGINIA.—Corn, wheat, hay three years (Shenandoah, Loudoun). Corn, wheat two years, hay two years (Rockingham, Warren, Page, Frederick, Augusta). Corn, oats, wheat, hay two to nine years (Tazewell, Wythe).

KENTUCKY.—Corn, small grain, hay two years (Bourbon, Jefferson).
COTTON.

In all cotton States the crop is grown to a large extent indefinitely on the same land without rotation, but with a year of rest now and then. Cowpeas are often sown in standing cotton or in the corn which alternates with cotton or are grown after small grain in the same year. The following rotations also are more or less practiced:

NORTH CAROLINA.—Cotton, corn, peanuts, or small grain with cowpeas (Edgecombe, Johnson). Corn, cotton two years, small grain (Robeson). Corn, cotton (Sampson).

SOUTH CAROLINA.—Cotton, corn, small grain with cowpeas (Laurens). Cotton three years, corn with cowpeas (Orangeburg).

GEORGIA.—Cotton two years, corn with cowpeas (Burke). Cotton three years, small grain, corn, small grain with cowpeas (Baldwin).

FLORIDA.—Cotton, corn with peanuts (Madison). Corn, cotton, corn, cotton, oats (Jackson).

TENNESSEE.—Cotton three years, corn (Shelby). Cotton two years, corn with cowpeas (Madison). Cotton repeated until the land is abandoned (Fayette).

ALABAMA.—Cotton three years, oats with cowpeas (Wilcox). Cotton two years, corn with cowpeas (Covington). Cotton, corn with cowpeas, small grain (Pike).

MISSISSIPPI.—Cotton, corn (Yazoo). Cotton, corn with cowpeas (Holmes).

LOUISIANA.—Cotton, corn (Iberia). Cotton two years, corn with cowpeas (Grant, Natchitoches).

OKLAHOMA.—Cotton without rotation (Payne, Lincoln, Pottawatomie, Greer, etc.).

ARKANSAS.—Corn, cotton, oats with cowpeas (Lee, Jefferson, etc.). Cotton continuous on bottom lands.

TOBACCO.

CONNECTICUT.—Tobacco without rotation (Hartford). Corn (rye sown), (rye plowed under) tobacco, grass (Litchfield). Tobacco two years, corn, tobacco, clover (Tolland).

PENNSYLVANIA.—Tobacco, oats, wheat, hay (Clinton). Tobacco without rotation (Tioga, Bradford).

OHIO.—Tobacco, wheat, grass two years (Montgomery, Brown, and quite general).

WISCONSIN.—Corn, tobacco three years (Jefferson, Rock). Tobacco without rotation (Crawford, Vernon, Columbia).

VIRGINIA.—Tobacco, wheat, clover two years (Pittsylvania, Halifax, Charlotte, Lunenburg, Bedford, Brunswick, Nottoway, Cumberland, etc.). Tobacco, wheat (Halifax). Bright tobacco, rest (Mecklenburg). New land grows two to five crops of tobacco, then wheat.
NORTH CAROLINA.—Tobacco, wheat, corn (Stokes, Nash). Corn, tobacco, hay, or rest (Pitt).

KENTUCKY.—Tobacco, wheat, clover (Graves, Caldwell, Webster). Corn, tobacco, wheat, clover two years (Christian). On new land, corn, tobacco, wheat (Graves, Logan).

FLAX.

NORTH DAKOTA.—Wheat, flax, oats, barley, rest (Benson). Flax three years, small grain (Ramsey). Corn, flax, wheat, oats (Cass). Flax three years in five (Wells). Wheat two years, flax, wheat, oats (Grand Forks). Flax comparatively new in Ramsey and Wells.

SUGAR CANE.

LOUISIANA.—Cane two years, corn (Avoyelles). Cane three years, corn with cowpeas (Plaquemines).

RICE.

GEORGIA.—Rice, potatoes, corn (Camden).

LOUISIANA.—Rice without rotation (Plaquemines). Rice three years, other crops one year to clear the land of red rice (Iberia, Calcasieu).

PEANUTS.

VIRGINIA.—Corn, peanuts (Nansemond, Sussex, Surry, Isle of Wight). Crimson clover with peanuts, cotton (Southampton). Peanuts, corn, vegetables (Nansemond). The great bulk of the crop is produced with corn in two-year rotation, cowpeas or crimson clover often being sown in the corn.

NORTH CAROLINA.—Corn, peanuts (Hertford, Bertie). Corn with cowpeas, peanuts, cotton two years (Bertie). Corn, peanuts, oats with cowpeas, peanuts (Northampton).

KAFIR CORN.

KANSAS.—Kafir, rye, corn, millet (Rooks). Kafir, corn (Osborne, Russell). Kafir, corn, sorghum (Geary). Kafir after wheat in the same year, as a catch crop (Dickinson). Rotations not systematic; kafir is largely a catch crop.

OKLAHOMA.—Kafir without change (Woods). Corn, kafir, sorghum (Greer). Wheat and kafir in the same year without other rotation (Oklahoma).

DAIRY AND LIVE-STOCK FARMS.

[2, dairy; l, live stock.]

NEW YORK.—(d) Ensilage corn, oats with peas, grass three years (Delaware). (l) Hay and pasture nearly permanent (Steuben).

IOWA.—(d) Corn, oats, grass three years (Kossuth, Winneshiek). (l) Corn, oats, clover (Greene).
NEBRASKA.—(d) Corn, millet, sorghum, oats, alfalfa permanent (Valley); corn, wheat, clover two years (Colfax). (l s) Corn, wheat, with permanent wild grass for hay and pasturage (Buffalo); corn two years, oats, corn, oats (Burt, Thurston).

CALIFORNIA.—(d) Ensilage corn, oats for hay (Sonoma); small grain two years, grass two to six years (Humboldt). (l s) Natural grass exclusively (Santa Clara); natural grass pasture, alfalfa hay—no rotation (Kings).

VIRGINIA.—(d) Corn, soiling crop, small grain, hay, pasturage (Loudoun, Fairfax). (l s) Corn, small grain, grass three years (Fauquier, Shenandoah, Wythe, Carroll, etc.).

KENTUCKY.—(d) Corn, wheat or oats, grass three years (Campbell, Kenton, Shelby).

TENNESSEE.—(l s) Oats, grass indefinitely (Davidson); corn with cowpeas, oats, grass two years (Knox).

MULTIPLE CROPPING.

Multiple cropping was reported by correspondents to an extent that permits a wide survey of the field. For the guidance of correspondents multiple cropping was defined to be "two or more crops usually harvested from the same field in the same year; pasturage is a crop, even if after hay or grain in the same year, and every cutting of grass is a crop." Pasturage, as a second or third crop, is prevalent; two or more cuttings of grass or legumes are common, especially where alfalfa is grown, nine cuttings of this forage plant, making 14 tons of hay per acre, being the largest number reported for irrigated land. A double crop of small grain and clover is numerously reported. Aside from the regions producing alfalfa, triple cropping is more generally found in Florida than elsewhere.

A high degree of multiple cropping in rotation is reached in the hot-house production of vegetables, where the soil never rests; the limit is generally four crops a year in rotation.

The development of multiple cropping has been carried further in China than in any other country. Chan Laisun, in an address in Massachusetts in 1873, gave the following as an example of soil utilization by Chinese farmers and gardeners: "The plains of the southern and middle provinces are made to yield two or three crops in rotation every year; at the north only two. But when patches are laid out for raising vegetables, five, six, seven, and even eight crops are realized."

PRACTICES IN SELECTED STATES.

NEW ENGLAND AND NEW YORK.—Hay twice; hay and pasture; small grain and pasture (little); early potatoes or garden peas and turnips or cabbage; to some extent late vegetables follow early ones. Corn and beans, pumpkins, or turnips, occupy land together. Maine reports two crops of potatoes; early hay and Hungarian grass. New
Hampshire—early hay and field-pea hay or turnips; green rye and peas or oats. Vermont—early hay and fodder corn, beans, green barley, or cabbage. Massachusetts—early hay and millet, barley, or winter squash; oat hay and barley; green rye and corn, oats, or millet. Rhode Island—barley and potatoes; rye and clover; 2 crops of hay and pasturage. Connecticut—corn and rape; 3 crops of clover; hay and fodder corn; green rye and silo corn. New York—hay and buckwheat; clover, 2 crops and seed; potatoes and beans or winter squash.

ILLINOIS.—All grain and grass fields pastured after harvest. Wheat and corn, clover hay, pasturage, clover seed, millet (followed by pasturage), Hungarian hay, peas, or beans. Rye and millet (followed by pasturage) or cowpeas. Winter rye pastured until June, followed by millet. Oats and hay, clover, or cowpeas. Timothy hay and corn or pasturage. Strawberries and corn. Potatoes and millet, turnips, or corn. Clover hay and seed, sometimes followed by pasturage. Clover hay and millet, cowpeas, or beans. Corn and rape or turnips.

WISCONSIN AND MINNESOTA.—Alfalfa, 3 crops; hay, 2 crops; hay and pasturage; clover hay and seed. Double plowing confined to small areas, largely for soiling crops, as rye hay and fodder corn, pasturage and turnips, oat hay and millet, corn and rape. Early cut small grain and rape, millet, buckwheat, or turnips. Early clover hay and potatoes, turnips, fodder corn, millet, or buckwheat.

IOWA.—Substantially the same doublecroppings as prevail in Wisconsin and Minnesota. The pasturing of hay and grain stubble is general and plowing of winter grain stubble for fodder corn, millet, or rape is rather more frequent. Potatoes and turnips or cabbage. Alfalfa to 4 cuttings. Corn and pumpkins, rape, or rye; the latter two, for fall pasturage, grow together.

NEBRASKA.—Winter grain and pasturage, rape, turnips, or buckwheat. Potatoes and millet, rape, or rye. It is common to pasture wheat and rye all winter and then secure a crop of grain. Hay, 2 cuttings, or 1 cutting and pasturage; alfalfa to 5 cuttings; 2 crops of millet, oat hay, and sorghum hay. Rape or rye grows in corn for fall pasture. No double cropping in the semiarid region.

IDAHO AND WYOMING.—Double cropping mostly dependent upon irrigation. Potatoes and turnips. Wheat and alfalfa hay. Small grain and hay, followed by pasturage. Two crops of oat hay, rye hay, potatoes, red clover, and timothy; alfalfa, 3 crops and pasturage.

WASHINGTON.—Two cuttings of clover, mixed hay, or alfalfa. Hay or small grain and pasturage. Peas and oats, potatoes and turnips, turnips and cabbage. No double cropping in eastern Washington, except with irrigation.

CALIFORNIA.—In rainy districts hay or grain and corn, oats, clover, rape, or buckwheat. Strawberries and hay; vetches and corn
or turnips; clover and potatoes; clover hay, seed, and pasture.
Two or more cuttings of hay; 8 months' pasture and hay. Irrigated alfalfa to 9 cuttings; clover and tame grasses, 2 or 3 cuttings. In southern California, small grain and corn, potatoes, beans, pumpkins, turnips, Egyptian corn, or celery. Two crops of peas, potatoes, rye, oat hay, and summer and winter vegetables. No double cropping without irrigation in dry regions, except pasture on hay and small grain stubble.

SOUTH CAROLINA AND GEORGIA.—Small grains (especially oats) or potatoes and corn, cotton, cowpeas, sweet potatoes, millet, peanuts, sorghum hay, potatoes, or watermelons. Potatoes and cabbage, turnips, or other truck crop. All cultivated crops and crab-grass hay or pasture. Corn and cowpeas, turnips, or beans grow together on the same land, and 3 crops are obtained by growing any of these combinations after oats or wheat.

FLORIDA.—Small grain stubbles produce all the crops noted for Georgia, and double cropping is much more general. "A crop of hay grows after all early cultivated crops;" "two or more crops on nearly all land." Three crops are raised in the following combinations: Cabbage, beans, and hay; melons, sweet potatoes, and turnips; potatoes, melons, and peas; 2 crops of hay and cabbage; cabbage, beans, and hay. Peculiar to this region are rice after vegetables, beggarweed hay after corn or cotton, or 2 crops of beggarweed hay. Tobacco is followed by Irish or sweet potatoes, peas, turnips, etc.

KENTUCKY.—Corn and stubble pasture, cowpeas, rape, sorghum, or beans. Wheat and millet, Hungarian grass, crab grass, rape, turnips, corn, sorghum, buckwheat rarely, or cowpeas with clover or with crab grass. Oats and hay, cowpeas, millet, or clover. Rye and millet, soy beans, clover, or cowpeas with rape. Clover hay and seed; bluegrass seed and pasture; millet and corn; clover and sorghum or sweet corn with cowpeas; timothy, redtop, and clover with cowpeas; hay and cane for fodder; cowpeas growing with corn. Potatoes and sweet corn, beans, corn, or turnips. Onions and potatoes with cabbage. Two crops of hay, cowpeas, sorghum, and vegetables; alfalfa 3 to 4 cuttings (little grown). All grain and hay fields are pastured.

LOUISIANA.—Corn with cowpeas and crab-grass hay or pasture. Oats and hay, cowpeas, sweet potatoes, pasture, millet, cotton, or June corn with cowpeas. Wheat and millet, potatoes, or sometimes corn. Potatoes and cotton, turnips, or corn with cowpeas. Two crops—hay, prairie grass, Bermuda grass, and potatoes.

CROPPING IN ORCHARDS.

In orchards there is some secondary cropping. During orchard growth, before fruit bearing, crops are raised in great variety, but after an orchard is five or six years old grass is generally the additional crop. Correspondents report the following crops in the earlier
PRACTICES IN CROP ROTATION.

years: Cotton, sorghum, sugar cane, corn, fodder corn, sweet corn, kafir corn, oats, wheat, rye, rape, tobacco, peas, cowpeas, berries, vetches, barley, buckwheat, beans, velvet beans, flax, castor beans, potatoes, sweet potatoes, turnips, and various vegetables.

The grasses and legumes found mostly in the older orchards are timothy, orchard grass, red clover, alfalfa, Hungarian grass, millet, crimson clover, scarlet clover, bluegrass, crab grass, sedge grass, wild grass.

It is a growing belief among farmers that orchards should not be cropped and that the grass in them should remain.

From some States it is reported that orchards are used as poultry yards, or swine, calf, and sheep pastures. In young orange groves in Florida all crops are raised, but little if anything after the trees begin to bear. In several States, especially in the South, the orchards are neglected and weeds are the chief growth between the trees. Some of the best fruit men in Missouri cut the grass and let it remain on the ground. In the dry orchards of Idaho the ground needs to be cultivated to hold moisture. While various practices may be found in California, the general rule is to avoid cropping orchard land, even when the trees are young; the ground is left entirely free from weeds and grass by constant cultivation with plow or harrow. In young walnut orchards corn is sometimes grown for a few years.

USE OF FERTILIZERS.

Correspondents reported fully concerning the use of fertilizers as an incident in crop rotation. There are still extensive regions in the United States where barn manure is considered a farm nuisance. In a county of Oregon the neighbor is welcome to haul away this manure, and that neighbor is likely to be a thrifty German with a large garden; in other Oregon counties the manure is burned. In a California county the manure is dumped into ravines; it goes to the creek in Oklahoma; it is hauled to a hole in the ground or put on one side of the field in Kansas; South Dakota farmers burn it to be rid of it, and sometimes burn it for fuel. In North Dakota farmers haul barn manure to piles and leave it there until it disappears; farmers in Missouri deposit it by the roadside, and in Idaho scrapers are used, and it is “often seen piled as high as a barn.”

In many counties between the Mississippi River and the Pacific Ocean farmers not only find barn manure a nuisance, but they have a grievance against it, claiming in South Dakota that it produces dog fennel, elsewhere that it produces other weeds, and in various counties that it has such an effect of “poisoning” the soil that farmers are afraid of it. The owner of a large California wheat ranch required a tenant last year to spread the barn manure of the ranch upon the wheat land, but the tenant, after doing so, set fire to the stubble and burned the manure.

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In semiarid regions barn manure needs to be used cautiously on unirrigated land; in the wheat lands of California it is more or less visible for four or five years after its application to the land. The practice of two hundred years ago survives in some parts of the South; cattle are penned upon the land to increase its fertility, and the pen is shifted as the owner desires.

In a large portion of the North Central States barn manure is removed to prevent accumulation and deposited upon the fields throughout the winter, to be plowed under in the spring. In the East it is allowed to accumulate until spring, when it is deposited upon the land just before plowing. The use of this fertilizer for top dressing grass land is very common throughout the principal portion of the United States wherever it is used in considerable quantities.

Barn manure is more generally applied to corn than to any other crop, although a liberal application of it is made to tobacco, potatoes; and vegetables. Commercial fertilizer is liberally used in cotton production, in the more intensive agriculture of fruit and vegetable raising, and in growing small grains, to which it is applied with a seeder at time of seeding. The use of barn manure is greatest in the East, while commercial fertilizers have the greatest use in the cotton belt. The use of any kind of barn or commercial fertilizer is more and more sporadic westward from Indiana, and commercial fertilizer is hardly anywhere seen west of the Mississippi River except on vegetable and fruit farms. The Southern farmers are not sufficiently supplied with live stock, especially that which is stabled, to have much barn manure, and their chief reliance to supply fertility to the soil is upon commercial fertilizer and cowpeas. Farmers plow under green manuring crops, especially alfalfa and other legumes, in all parts of the United States, and the farmers who do not do so are still relying upon what they regard as an inexhaustible fertility of soil, or are cultivating a partly worn-out soil without understanding the cause of their hard conditions.

EFFECTS OF TENANCY.

Farm tenancy is a distinct damage to crop rotation, particularly in the South. This is not entirely due to one-year tenancies, but is partly due to the character or poverty, or both, of the tenant; to the indifference and, also, in a degree, to the poverty of the landlord. These conditions are more especially found in the cotton belt, which often presents the worst situation for crop rotation. Given absentee landlords residing in town and paying little attention to their plantations, living very likely on credit until their cotton can be grown and sold; given tenants who do not know how to rotate crops without constant supervision, and who, like the landlord, are living on the future crop; and still further, given merchants who advance supplies and demand that the security shall be made ample to pay the prospective debt by the production of cotton, which is a ready cash crop—given
PRACTICES IN CROP ROTATION.

all of these conditions, and it can hardly be expected that the rotation of crops will make any progress. Yet, this is the situation throughout a considerable portion of the cotton belt. Hence, the dependence for fertility upon rest from production and upon commercial fertilizers; hence, washed-out and gullied fields, and only one-third of a bale of cotton to the acre.

In the East tenancy has a less effect upon rotation than in other parts of the country, because the landlords more commonly require the customary practice of a change of crops, but the landlords of the North Central States are less careful to protect their farms. The best tenants are found in the North Central States and Pacific Northwest. A Wisconsin correspondent writes that some tenants are well educated and follow a rotation better than the owners. West of the one hundredth meridian tenancy seems to make little difference with rotation. A general observation, gathered from the reports, for the whole country is that while tenancy is bad for rotation, its practices are generally only a degree worse than those of the owners in the same region who cultivate their own farms. As is the landlord, so is the tenant, only worse.

ATTITUDE OF THE FARMERS.

Why do not farmers more generally rotate their crops? The answers of correspondents are varied, and may be thus condensed:

(1) New land; (2) old land still regarded as inexhaustible; (3) reliance upon commercial fertilizer for land without humus; (4) the credit system in the South; (5) the poverty of the farmer, preventing an advancement of soil enrichers; (6) tenancy, with the features of short term, absent landlord, credit, poverty, indifference, and incapable tenant; (7) special inducement to raise one money crop, as corn near distilleries in Kentucky and Ohio, hay near lumber camps in Michigan; (8) the limitations of the semiarid region; (9) contempt for "book farming," and preference for grandfather's "rule o' thumb;" (10) keeping a small number of live stock; (11) when the soil is sick with overcropping, the farmer is not well enough informed to know the nature and cause of the malady; (12) the farmer is in a rut, lacks initiative, and needs help to get out; (13) the cash and cotton rents are so high that the tenant can not get a start in rotation.

Among obstacles to rotation of another sort, which make it more or less incomplete, are drought, insects, fungous diseases, a hard freeze at the wrong time, a bad winter, failure of clover or grass seed to grow, and a change in market demand from one crop to another. Then again in extensive agriculture the small farm is at a disadvantage in rotating crops as compared with the medium or large farm.

The reports of correspondents indicate that there is nearly everywhere in the regions where crop rotation is little practiced at least a fraction of farmers who know the consequences of single cropping, or
what substantially amounts to that. They report worn out pastures, land with its chemical elements not well proportioned and deficient in humus, land uncovered by sod for many years, with its fertility washed into the creek, and with its surface "so gullied that a coon couldn't cross it." They report cockleburs, moss, wild grass, and weeds, with such a foothold that they can not be eradicated without rotation of crops; the ground infested with noxious worms and insects.

To avoid such waste, progressive farmers rotate crops; and there are other motives—the distribution of farm work throughout a longer period, the retention of moisture in the soil, and, as reported from Kansas, four crops for as many years from one plowing, namely, corn, wheat, grass, and grass.

Notwithstanding many a gloomy neighborhood view presented by correspondents, crop rotation is steadily extending and progressing. The South has made remarkable advance within a few years, owing to the cowpea. Among the many thousands of reports of correspondents one great fact stands out prominently, and that is the influence of the experiment stations and farmers' institutes. These are mentioned in almost every State, and with gratitude with the exception of one State, where general agriculture is at a low ebb and the farmers are inert.

The expansion of dairying appears in every direction; it is pushing into the Northwest and taking the place of wheat and other small grains; it has developed rapidly in the humid and semihumid districts of the Pacific coast; it is making a perceptible advance throughout the South; and the dense population of the East is stimulating its growth faster than in any other division of States except the Rocky Mountain and Pacific.

The country never before saw such demand, and such growing demand, for leguminous seeds for sowing—the clovers, alfalfa, the vetches, peas and cowpeas, and soy beans and velvet beans. Numerous reports state that the farmers have just been awakened as from a long sleep, and that they are feeling their way with rotations in which a part is generally taken by a legume, and the awakening is often referred to as beginning at a farmers' institute.

The impression derived from the many reports is that crop rotation is progressing faster in many parts of the South and in western Oregon than elsewhere; and that next in order is that region in the North Central States that lies between the old and the new, but within this region Missouri appears to be making the least progress. Unirrigated lands in the arid and semiarid regions labor under such limitations that they can not be compared with other parts of the country in such a matter as crop rotation. As hopeless as farming operations seem to be in some regions in rotating crops, a general view of the whole country can not help but give one a hopeful impression, because progress preponderates and has never before been so rapid.