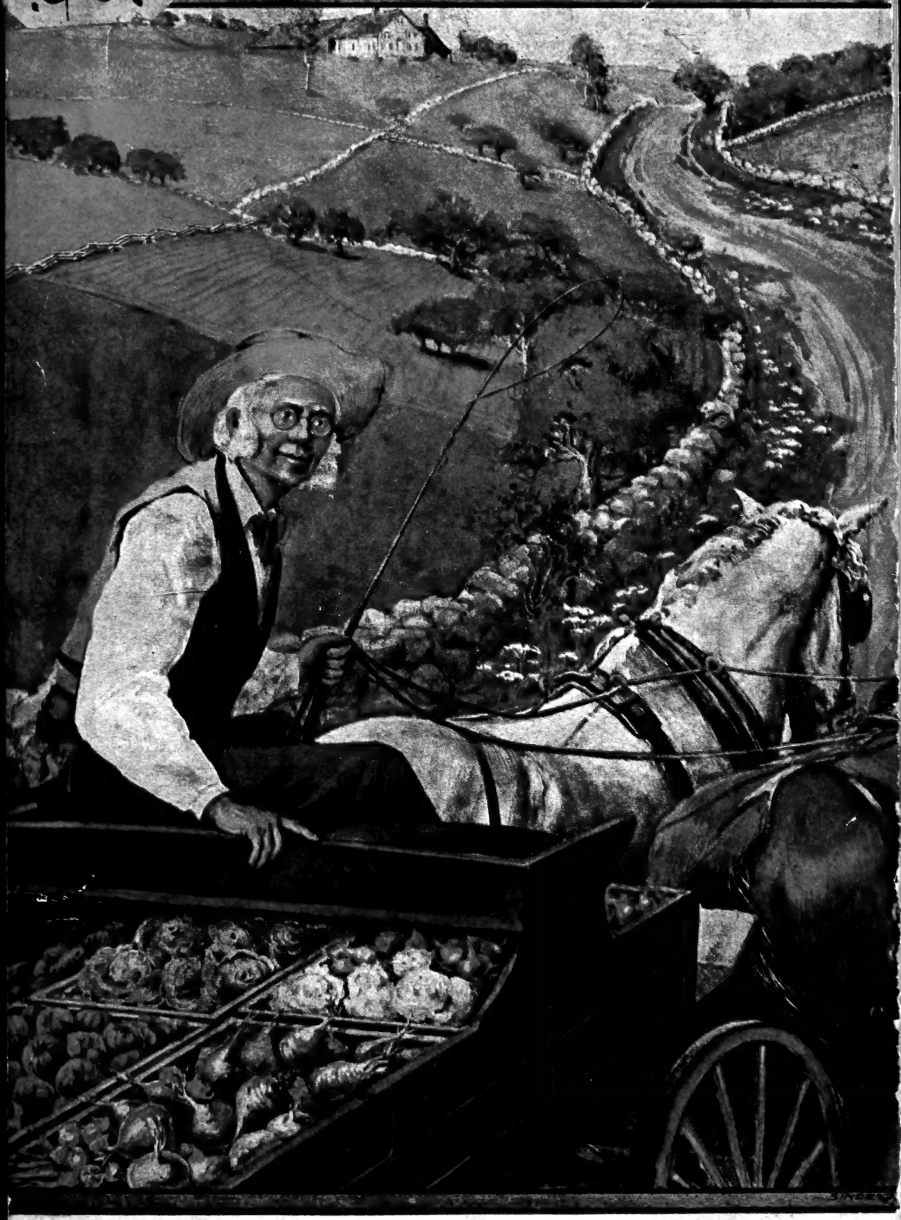
RMERS' GUIDE



FARMERS' GUIDE.

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PREFACE.

IT is now five years since a little book entitled "Farmer's Guide" was first published, and put in the hands of our farmers. The book was a success from the first. It seemed to be just what the farmer needed as a "Guide to Profitable Farming."

All this has been shown by the steady demand for this book from farmers everywhere—from Maine to California, from Canada to Mexico and even from planters in Europe and other foreign countries. Up to date more than 225,000 copies of the book have been printed and distributed.

The present edition of the "Farmer's Guide," is different from the former edition in many ways. It has been largely rewritten; many important parts and facts have been added, and in other respects the book has been greatly improved.

In conclusion, we hope that this book will prove useful in the hands of our farmers, and that it may guide them in producing the largest and best crops.

INTRODUCTION.

DURING the past twenty-five years, farmers have paid more and more attention to increasing their crops by the use of the all-important plant-foods which are supplied by fertilizers. The result has been the raising of larger and better crops, a material improvement of the farm itself, and a bettered financial and social standing of the farmer.

The chief object of this handbook is briefly to present various facts concerning the need and use of fertilizers in growing different kinds of grain, fruit and vegetables. Some farmers still have vague and uncertain ideas about the use of fertilizers: they above all others need to study the composition and nature of their soils and the requirements of each crop cultivated. In the following pages, special attention is given to the fertilizer requirements of each individual crop, and illustrations given by quoting freely from the official bulletins and reports of the experiment stations of the various states. The practical results obtained at the different experiment stations and by successful farmers, as set forth in this book, furnish reliable and wise instruction to those who wish to learn.

FERTILIZERS AND THEIR SOURCES.

THE various artificial manures, called fertilizers, have come into general use since the year 1840. In that year the famous German Chemist, Baron Von Liebig, published his epoch-making book on agricultural chemistry. Every farmer should bear in mind the principles underlying the use of commercial fertilizers, which were first defined by Liebig, as follows:

(1) "A soil can be termed fertile only when it contains all the materials requisite for the nutrition of plants in the required quantity and in the proper form.

(2) "With every crop a part of these ingredients is removed. A part of this part is added again from the inexhaustible store of the atmosphere; another part, however, is lost forever if not replaced by man.

(3) "The fertility of the soil remains unchanged if all the ingredients of the crop are given back to the land. Such a restitution is effected by manure. (It may be stated that there is some loss due to leaching and a change of availability of food applied).

(4) "The manure produced in the course of husbandry is not sufficient to maintain permanently the fertility of a farm. It lacks the constituents which are annually exported in the shape of grain, hay, milk and live stock."

Practical experience has proved that, as a rule, Nitro-

gen, Phosphoric Acid and Potash are the substances most needed to be applied to soils, to make or to keep them fertile, and that many soils are improved by the mere addition of lime. In conjunction with these elements, soils must contain a certain amount of humus or decayed organic matter, to maintain them in a proper mechanical condition.

NITROGEN.

Nitrogen is necessary for the production of protoplasm, (the physical basis of life). Without it there can be no plant growth; it is a powerful stimulant, and, *when present in excess*, causes a rapid and excessive, but watery and unnatural growth, which is made at the expense of fruitfulness. Too much nitrogen on wheat shows its ill-effects in such a rank growth of the plant, and, later, of straw, as to be unable to sustain its excessive weight until the grain is matured; on cotton, by great growth of plant and but few blossoms, which mature fewer bolls; on fruit trees by a rapid and sappy growth which produces little fruit.

Leguminous crops, (such as clover, beans, peas, etc.) draw their supply of nitrogen from the air, and, therefore an artificial application of nitrogen fertilizer to this class of plants is rarely needed.

The more common sources of nitrogen in commercial fertilizers are nitrate of soda, cotton seed meal, sulphate of ammonia, dried blood and tankage. Fish scrap, castor pomace and other materials are also used.

The nitrogen in nitrate of soda and sulphate of ammonia acts a little more quickly than that in dried blood, tankage and the organic substances. Being easily soluble, it is best to use nitrate of soda as top dressing at time of planting, or in case of wheat, when active growth begins in April—other nitrogenous fertilizers may safely be applied at time of planting—the nitrogen will become available as it is needed by the growing plant. The following table gives the composition of the more common nitrogenous fertilizers.

COMPOSITION OF MATERIALS USED AS SOURCES OF NITROGEN.

	NITROGEN.	EQUIVALENT TO AMMONIA.	POTASH K_2O.	PHOS. ACID TOTAL.
Nitrate of Soda	15 to 16	18 to 19½	———	———
Sulphate of Ammonia	19 to 22	23 to 26	———	———
Dried Blood (high grade)	12 to 14½	14½ to 17½	———	2 to 3
Dried Blood (low grade)	10 to 11	12 to 14½	———	1½ to 2
Tankage	5 to 9	6 to 11	———	9 to 16
Dried Fish Scrap	7 to 8	8½ to 9½	———	8 to 9
Cotton Seed Meal	6½ to 7½	7½ to 9	1½ to 2	2 to 3
Castor Pomace	5 to 6	6 to 7	1 to 1½	1½ to 2
Tobacco Stems	2½ to 4	3 to 4½	5 to 8	½ to 1

PHOSPHORIC ACID.

Phosphoric acid is necessary for the healthy growth of plants, and is essential to the best production of straw and seed. Its deficiency in a soil is shown by the want of vigor in its plant life. To produce its full effect, however, it must be used on a soil already rich in nitrogen, or be asso-

ciated with nitrogen in the fertilizer; otherwise it will produce a tall, pale and spindling growth of straw with very small increase of grain or fruit. It has a marked effect in hastening maturity and should be used freely on all crops which it is desired to ripen early.

The principal commercial sources of phosphoric acid are raw phosphate rock, acid phosphate, or dissolved phosphate rock, dissolved bone black, bone meal, dissolved bone and Thomas slag. In ground phosphate rock, or floats and bone black, the phosphoric acid is insoluble or unavailable, so that these materials produce effects very slowly. They are used occasionally for composts, but cannot be recommended for direct application to the soil. Bone black, and raw phosphates are treated with sulphuric acid, which renders the phosphoric acid soluble, and the material is then known under the general name of superphosphate, or acid phosphate. All phosphoric acid, when once available, is of equal value; phosphoric acid in dissolved rock to that from dissolved bone, and there is no difference as to value on account of the source from which it is derived.

In the following table is given the composition of the more common phosphatic fertilizers. Acid phosphate and dissolved bone and bone-black also contain large quantities of lime, which is valuable on such soils as would be improved by the use of land plaster, while dissolved bone also contains nitrogen, which gives it an additional value.

GENERAL VIEW OF FRUIT DEPARTMENT, EXPERIMENT FARM, SOUTHERN PINES, N. C.

COMPOSITION OF MATERIALS USED AS SOURCES OF PHOSPHORIC ACID.

	TOTAL.	AVAILABLE.	INSOLUBLE.	NITROGEN.	EQUIVALENT TO AMMONIA.	POTASH K_2O.
Acid Phosphate.....	16 to 19	15 to 17	1 to 2	———	———	———
Carolina Phos. Rock.	26 to 27	———	26 to 27	———	———	———
Dissolved Bone Black	17 to 19	15 to 18	1 to 2	———	———	———
Bone Meal	20 to 25	5 to 8	15 to 17	2½ to 4½	3 to 5½	———
Dissolved Bone	15 to 17	13 to 15	2 to 3	2 to 3	2½ to 3½	———
Thomas Slag.....	22 to 24	———	22 to 24	———	———	———
Peruvian Guano.....	12 to 15	7 to 8	5 to 8	6 to 10	7¼ to 12	1½ to 4

In the above table but a small part of the phosphoric acid in bone meal, and none of that in Thomas slag, is classed as available, for, while it is true that these carriers of phosphoric acid show but little solubility under the methods of analysis generally applied to phosphates; nevertheless, they rank with apparently available phosphates when finely ground. The explanation is that the animal matter in bone meal favors rapid decay, and that the phosphoric acid in Thomas slag exists in a different form from that in material derived from bone or rock. In actual practice, the phosphoric acid in this slag is found to furnish food for the growing plant.

POTASH.

Potash is found in large proportions in all plants. It is essential to the production of starch fiber and the growing parts of the plant; without it there cannot be full development of plant or seed. In combination with Nitrogen and Phosphoric acid, Potash contributes to the full and perfect development of plants. Excess of potash does not show

any special effect on the plant, but a weakened growth, a lack of fruitfulness, and especially a slow and unsatisfactory development of starch and woody fiber follows its deficiency in the soil.

The greatest potash supply in the world is found at Stassfurt, Germany, where soluble potash salts are mined in large quantities. Muriate of Potash is the cheapest form of Potash, but not best suited for certain crops, like Tobacco and Oranges. Then Sulphate of Potash, or the sulphate of potash and magnesia, should be used. Kainit is another potash salt containing chlorine, and is especially valuable for use on sandy soils, not only for its fertilizing qualities, but also for its peculiar property of retaining moisture, and its power of destroying insect life and preventing plant diseases, such as Cotton Blight. It is valued highly on the cotton lands of the south.

Wood ashes are also a valuable source of potash, though the amount contained is small and variable. Ashes made on the place should be kept dry and used on the heavier soils. When potash must be purchased it is less expensive in the German salts than in ashes.

One fact, clearly demonstrated by the work of the Experiment Stations, is that "soda cannot take the place of potash as a form of plant food." Plants cannot grow without potash, but are indifferent to the presence of soda, indeed they can thrive in a soil which contains no soda at all. When potash is lacking, no amount of soda will produce growth.

AVERAGE COMPOSITION OF STASSFURT POTASH SALTS.

Name of Salts. In 100 parts are contained	Sulphate of Potash. K_2SO_4	Muriate of Potash. KCl	Sulphate of Magnesia. $MgSO_4$	Chloride of Magnesia. $MgCl_2$	Chloride of Sodium. NaCl	Sulphate of Lime. $CaSO_4$	Substances insoluble in Water.	Water.	Calculated to Pure Potash K_2O	
									Average.	Guaranteed.
A. Crude Salts. (NATURAL PRODUCTS.)										
Kainit	21,3	2,0	14,5	12,4	34.6	1,7	0,8	12,7	12,8	12,4
Carnallit	—	15,5	12,1	21,5	22,4	1,9	0,5	26,1	9,8	9,0
Sylvinit	1,5	26,3	2,4	2.6	56,7	2,8	3,2	4,5	17,4	12,4
B. Concentrated Salts. (MANUFACTURED PRODUCTS.)										
Sulphate of Potash 96%	97,2	0,3	0,7	0,4	0,2	0,3	0,2	0,7	52.7	51.8
Sulphate of Potash 90%	90,6	1,6	2,7	1,0	1,2	0,4	0,3	2,2	49,9	48,6
Sulphate of Potash-Magnesia	50,4	—	34,0	—	2,5	0,9	0,6	11,6	27,2	25,9
Muriate of Potash 90/95%	—	91,7	0,2	0,2	7,1	—	0,2	0,6	57,7	56,8
Muriate of Potash 80/85%	—	83,5	0,4	0,3	14,5	—	0,2	1,1	52,7	50,5
Muriate of Potash 70/75%	1,7	72,5	0,8	0,6	21,2	0,2	0,5	2,5	46,6	44,1
Manure Salt, min. 20% Potash	2,0	31,6	10,6	5,3	40,2	2,1	4,0	4,2	21,0	20,0
Manure Salt, min. 30% Potash	1,2	47,6	9.4	4,8	26.2	2,2	3,5	5,1	30,6	30,0

Potash in the form of wood ashes and cottonseed hull ashes consists largely as Carbonate of Potash. Carbonate of Potash is useful as plant food, but cannot safely be mixed with organic nitrogenous fertilizer materials, as this form of Potash rapidly decomposes organic matter, accompanied by more or less loss of ammonia.

LIME.

Lime improves the condition of swampy and peaty soils, which consist largely of humus and are consequently rich in nitrogen, but this nitrogen is unavailable, owing to the slow decay of the humus in some of these soils, so lime furnishes the conditions necessary for a more rapid decay. Such soils sometimes need phosphoric acid and potash as well as lime.

Lime also performs a valuable office in the sweetening of soils. When a soil betrays excess of acid, by turning blue litmus paper red, lime is needed. It also makes heavy clays light and more porous, and renders the plant food in them, as well as in muck, more available. Quicklime, marl and burnt oyster shells are the more common source of lime. To produce the results above noted quicklime from stone or oyster shells is more effective.

STABLE MANURE.

Barnyard or stable manure is often regarded by farmers as being a "complete fertilizer," and the only fertilizer needed on any soil. This is correct only so far as such manure contains all three of the fertilizing elements, but

they are rarely found in the proportions needed by different crops. There is usually an excess of nitrogen and not enough phosphoric acid and potash. When stable manure is allowed to decompose by exposure to the weather, a large part of the nitrogen, its most valuable element of plant food, is lost in the form of ammonia. This loss, however, can be largely prevented by scattering Kainit over the surface of the manure as it accumulates, using about one pound per day for each cow or horse, or for each eight head of sheep, The kainit will save more than its cost in the value of the nitrogen it prevents from escaping in the form of ammonia gas, and will still possess all its original value as a plant food. When stable manure is treated in this way, the addition of phosphoric acid will make it a complete fertilizer of the very highest quality.

ANALYSES OF FARM MANURES.

(*From Bulletin 56, Cornell Experiment Station.*)

Kind of Manure.	Nitrogen Per cent.	Phosphoric Acid Per cent.	Potash Per cent.
Sheep	.767	.391	.591
Calves	.497	.172	.532
Pigs	.84	.39	.32
Cows	.426	.29	.44
Horses	.49	.26	.48

GREEN MANURING.

Leguminous crops, such as peas, beans, alfalfas, vetches, clovers, cow-peas, etc., gather a part of their nitrogen from the atmosphere, which circulates in the upper stratum of the soil. They accomplish this by means of microscopic

organisms which inhabit the small tubercles found on their roots. When plowed under, they not only furnish nitrogen to the soil, but also humus, which is equally important, The heavier the growth of the clover or pea crop, the larger will be the amount of nitrogen which it will gather, and of the yield of the succeeding crop. Any soil which has produced a heavy crop of clover or cow-peas, can be depended on the following season to produce a correspondingly heavy crop of corn or cotton. A rank growth of legumes can be secured on even barren soils by a liberal application of a fertilizer containing phosphoric acid and potash with a little nitrogen as a starter. It is much more profitable to use such fertilizers to secure a heavy growth of legumes than to have that crop starved, and these same fertilizers applied to the following crop. On sandy soils, and in a hot climate, it may not be advisable to plow under a heavy growth of these green plants as their rapid decay often causes a souring of the soil. However, such souring can usually be prevented by the application of from 30 to 50 bushels of lime per acre just before the plowing is done. A more rational plan than the plowing under of these crops is to cut and feed them to live stock and return the manure to the land, as in this way both the feeding and the manurial value is secured.

WHEN TO APPLY FERTILIZERS.

It is often advisable to apply the mineral fertilizers, that is, phosphoric acid and potash, several weeks, or even months, before they are needed by the crops which they

are to benefit. Some of the more soluble nitrogenous fertilizers become available for plant food within a few days. Nitrogen, in the form of nitrates, is very soluble and readily leaches through the soil. Cotton seed meal decays very quickly, and if not consumed by growing plants, its nitrogen is liable to be washed away by rains. Such materials should be used in the Spring, and are specially valuable for use as a top-dressing for crops which are in active growth. Fish-scrap, dried blood, tankage and similar materials decay much more slowly, and are often better just before planting. The less soluble forms of phosphoric acid, such as ground bone or Thomas Slag, should be applied in the Fall, while the more soluble forms, acid phosphate, dissolved bone, etc., may be applied in the Spring. Phosphoric acid will not leach through a heavy soil, but much of it may wash through sandy soils, on which a Spring application may prevent such loss.

Potash is not so liable to leach through the soil, and it is often preferable to apply during the Fall, but if this time be not practicable, it should be made early in the Spring. When muriate of potash or kainit is to be used, the earlier application is often advantageous, as the potash will be held in the soil while the chlorine, which is injurious to tobacco and a few other crops, will be washed away.

Stable manure should be applied whenever ready to be hauled away from the buildings. Decay adds nothing to its constituents, and, if allowed to decay in the yard and exposed to the weather, much of its value is lost. When

spread in the field, nearly all that is washed out of the manure by rains is caught and retained by the soil. If plowed under as soon as spread, the decay will be more rapid than when left on the surface. For cultivated crops, it is best to plow under in the Fall. At the North, where there is comparatively little rain in the Winter, and the ground is generally frozen, it is well to apply all fertilizers, except nitrogenous top-dressings, in the Fall. At the South, where winter rains are excessive and the ground is seldom frozen, fall plowing is rarely a good practice and nearly all fertilizers are more economically applied in the Spring.

WHAT FERTILIZERS TO USE.

The kind and amount of fertilizers which can be most economically used on a certain crop or on a certain soil, can be determined only by an actual test. No chemical analysis of either the soil or the plant will show this accurately. The kind of fertilizing needed will depend more upon the natural character of the soil, its previous treatment, and its present mechanical condition, than upon the actual plant food taken up by the growing crop. The following suggestions as to the amount and composition of the fertilizers needed for different crops are based on the experience of Experiment Stations, and of successful farmers in different parts of the country. The figures here given represent the averages which have been found most profitable on ordinary soils in fair condition. The kind and amount of fertilizer

required, depend in a measure on the preceding crop. Thus the crop following clover or cow peas needs less nitrogen; while the one following the cereals, timothy, sorghum, or millet, demands a liberal supply.

In nearly all cases, the amount of nitrogen needed depends on the kind of crop to be grown and what has preceded it ; while the amounts of phosphoric acid and potash depend more on the natural character of the soil. In general a soil rich in lime, needs little phosphoric acid, and is greatly improved by potash, both of which are essential to the production of plentiful crops. Phosphoric Acid and Potash are fairly permanent and when an excess is applied they remain in the soil, available as food for future crops,

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ALFALFA.

(Lucerne.)

Alfalfa, or Lucerne, is a perennial, of the legume family, upright and branching, from one to three feet in height, with purple, pea-like flowers.

Soil. It thrives best on a light, sandy loam, with loose subsoil and must have good drainage. It is easily injured by drouth, even though it sends down tap-roots, averaging from 10 to 12 feet, and profitably repays irrigation with the accompanying good drainage.

Cultivation. The best results are obtained after the first year's growth, therefore, in planting Alfalfa, select land that may remain in grass several years. The young plants are tender, and easily smothered, so it is wise to plant after

a clean cultivated crop. After a deep plowing the soil must be thoroughly worked until pulverized smooth and even. Seed is usually sown in the spring in the north, but it needs to be delayed until the soil is thoroughly warmed. In the south the sowing must be early enough in the fall to give the young plants at least six weeks growth before frost. If sown for hay, more seed is used than if to be harvested for seed. There is little danger with closely growing plants of woody growth after the crop is established. If sown broadcast, from 20 to 25 pounds of seed per acre are required, but with a drill, 15 to 20 pounds are sufficient.

Fertilizing.—Being a leguminous plant, Alfalfa is able to gather nitrogen from the air and to add value to the soil by leaving it there in its roots and stubble, to be absorbed in large quantities by the following crops. As is the case with all legumes, alfalfa is a heavy potash-feeder, for its chemical analysis shows nearly as much potash as nitrogen and nearly four times as much potash as phosphoric acid. An annual crop of four tons of cured hay per acre removes from the soil:

Nitrogen, . . .	190 pounds.
Potash	175 "
Phosphoric acid, .	60 "

It is not always advisable to compound a fertilizer in the exact proportions shown by a chemical analysis of the crop itself, chiefly because the phosphoric acid and potash in fertilizers have a tendency to take insoluble (and unavailable) forms in the soil. Good results come from the

use, per acre, of 600 pounds of a fertilizer containing:

Available Phosphoric acid, . 7 per cent.
Actual Potash, ... 9 " "

Soils rich in lime require a rather larger proportion of potash than that indicated above.

Suggestions. For hay, alfalfa should be cut as soon as the first blossoms appear, and must be cured with as little handling as possible, as otherwise there is a great loss of the leaf during the curing process. The number of yearly cuttings varies from two or three in New York and Pennsylvania, to seven, eight, or even more in California and the states bordering on the Gulf of Mexico. On favorable, well-fertilized soils Alfalfa yields with ordinary care and cultivation from one to two tons of rich, nutritious hay every four or five weeks. It deteriorates rapidly after the third year if not amply fertilized every year.

Cattle and sheep cannot safely be pastured on it when it is young and tender, as green or wet alfalfa, fed to these animals, is liable to bloat them, but there seems to be no such danger with horses and hogs. Pasturing always causes deterioration in alfalfa through packing the soil, etc., while soiling, which is more profitable, does not. As a cover-crop for light, suitable soils, this crop is unsurpassed.

ALMOND.

The general conditions of Almond culture are identical with those suited to the Peach.

APPLES.

Under this head are considered only apple trees in bearing. (For proper treatment and care of young trees see "Nursery Stock.") The apple, which is too well known to require descriptive mention here, may be grown in the south with reasonable success, but it thrives best in the northern half of the country or in the cooler altitudes.

Soil. A rich, well drained clay loam is best for the apple. Wet soils, or those subject to flooding, as well as hard, dry clays should be avoided. Dry hillsides are generally less favorable than lower and flat land, which is only rolling enough to insure free drainage, and that which slopes to the north is to be preferred to that having a southern exposure. Light, thin soils do not yield fruit satisfactorily in quantity or quality, unless liberally supplied with fertilizer and thoroughly cultivated.

Cultivation. When apple trees have reached bearing age, the land is often seeded to grass, which should be mown several times each year, leaving cuttings to decay where they fall, unless the better practice can be followed of pasturing with sheep. In sections tending to dry, hot summers, orchards are best plowed early in the spring and cultivated through the summer until August, when crimson clover is planted. The object of the tillage is to hold all possible moisture by means of earth mulch, and the clover serves as a winter soil-cover, and to store up nitrogen fertilizer for the next season's use, or growth. Young apple trees are planted after from one to four years' growth in

APPLES, UNFERTILIZED. EXPERIMENT FARM. SOUTHERN PINES, N. C.

APPLES WITH COMPLETE FERTILIZER, POTASH, PHOSPHORIC ACID AND NITROGEN. EXPERIMENT FARM, SOUTHERN PINES, N. C.

the nursery row. There is no advantage in planting trees of over two years' growth, and they should be set from 30 to 40 feet apart each way in the north, that is, 27 to 48 trees per acre; but in the south, where they grew less vigorously 25 to 30 feet is a proper distance,—that is, 40 to 70 per acre. While trees are young, the orchard may be planted in corn, or any clean cultivation crop, but it must be clearly kept in mind that two crops are being grown, and that both demand liberal feeding with fertilizer.

Fertilizing. When trees are first planted a vigorous growth is desired, which necessitates a fertilizing treatment different from that of trees in bearing. (See title "Nursery Stock.") Trees in bearing draw from the soil annually for two crops, the one the yield of fruit, and the other the tree growth of new wood and leaves. A careful study of the fruit, wood and leaf growth of an acre of apple trees, (35 trees) shows an annual demand of fertilizer as follows:

Nitrogen, ...	67 pounds.
Potash, ...	95 "
Phosphoric acid . .	26 "

As the annual growth actually requires the above quantities of fertilizer, that which is used should show some relation to the same. From 600 to 1,000 pounds per acre should be applied each year of a fertilizer containing:

Nitrogen, ...	2 per cent.
Actual Potash, . . .	9 "
Available Phosphoric acid,	7 "

This amount of fertilizer may seem excessive, but a study of the soil-exhaustion of the crop shows that it is all

needed. A half-starved orchard gets "scrubby," produces only a little ill-flavored fruit, and lives but a short life.

Suggestions. The bearing orchard should have an application of one ton of slaked lime, broadcast, every three years. In regions where the ground is covered by snow any great length of time, young trees are often injured by rabbits gnawing the bark; this may be prevented by fastening two-feet sections of corn stalks around the base of each tree, or by smearing the tree trunk with blood from the refuse in butchering. Mulching should not be applied in the fall, as it affords a harbor for mice, which are as destructive as rabbits. Apple trees should be sprayed regularly with Bordeaux mixture and Arsenic, to hold in check the apple scab and codlin moth. Full directions are given by most of the Experiment Stations.

ARTICHOKE.

In the United States the tuberous root of a species of sunflower is called by this name, although it is in no sense an artichoke. The plant resembles the sun-flower in its habit, and is hardier than the potato. It is an excellent root for hogs, as it yields from 400 to 600 bushels per acre, and the crop is grown with very little cost in the middle and southern states.

Soil. This artichoke, so-called, requires about the same soil as the Irish or white potato, a rich loam neither heavy nor light. The crop stands drouth well, but will not flourish on a dry, hard clay.

Cultivation, The planting should be in drills four feet apart and two feet apart in the drill like that of potatoes, with about the same amount of seed, (from 8 to 12 bushels) per acre, cut in pieces like potatoes. Two cultivatings are usually all that is needed, as the plants soon completely cover the ground.

Fertilizing. This, like all tuber crops requires liberal potash fertilizing. Having in mind the manurial requirements of the crop, and the common experience with all tuber crops, a good fertilizer for it would be from 400 to 800 pounds of the following fertilizer:

Nitrogen	3 per cent.
Actual Potash, ...	8 "
Available phosphoric acid,	7 "

Suggestions. When the crop is matured, a few rows should be plowed out, selected, and saved for seed, which should be gathered and buried in the same manner as potatoes are sometimes stored, before the hogs are turned in to harvest the main crop. Many farmers will not grow artichokes for fear they will become troublesome weeds. This fear is not well founded, for a single plowing in midsummer after the old tubers have become exhausted, and before the new ones have formed, will completely destroy the plants.

ASPARAGUS.

Asparagus is a branching, herbaceous plant, growing to a height of 3 to 7 feet from perennial root stocks. The root stock, or crown, makes a new growth each year of

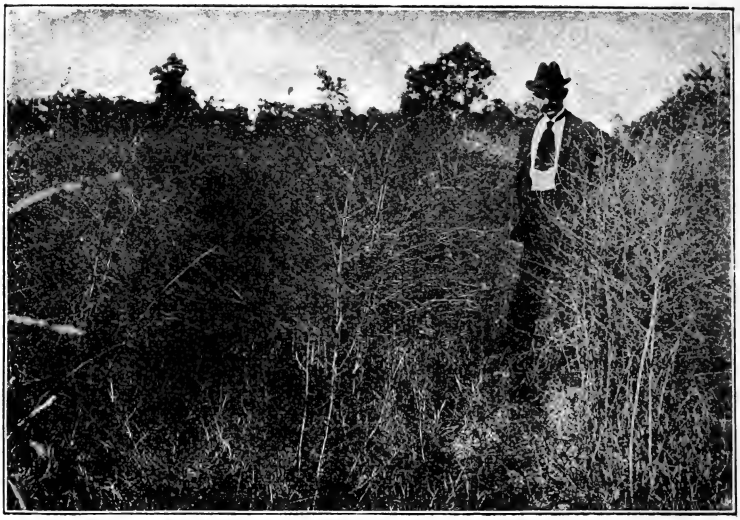
from one to three inches extending horizontally, and generally in a straight line. Through use of seed from strong shoots from superior roots, the size and yield of asparagus has been improved.

Soil. Asparagus will grow in almost any ground, and yield large crops even on stiff soils ; but for market gardening a light sandy soil, fairly fertile is much to be preferred, both for the sake of earliness in producing marketable shoots, and of ease of cultivation. Of course, any soil, if otherwise suitable, may be fit by a thorough system of underdrainage. An occasional over-flowing, or even submergence of the beds for several days, is not injurious, provided the drainage, either natural or artificial, be good. The soil should be free from roots, stones or anything that will not easily and quickly disintegrate or that will interfere with the growth of the shoots.

Cultivation. As the Asparagus crop will occupy the land for several years after planting, the preparation of the land should be very thorough. It should follow a clean cultivation crop and begin with deep, thorough fall plowing. Trenching is needlessly expensive and no longer practised. Planting is best done in the spring, but may be extended or delayed until the last of June, and in some southern sections it is done in the autumn. Early in the spring rows should be marked off 4 to 6 feet apart, and opened up with a plow, making a wide furrow from 8 to 12 inches deep. The crowns are set in these furrows, the distance between crowns varying from 18 inches to 5 feet,

ASPARAGUS, UNFERTILIZED. EXPERIMENT FARM, SOUTHERN PINES, N. C.

ASPARAGUS WITH COMPLETE FERTILIZER, POTASH, PHOSPHORIC ACID AND NITROGEN, EXPERIMENT FARM, SOUTHERN PINES, N. C.



ASPARAGUS, UNFERTILIZED. J. W. KILLEN, FELTON, DEL.
YIELD 1,186 LBS. PER ACRE.

ASPARAGUS WITH COMPLETE FERTILIZER, POTASH, PHOSPHORIC ACID AND NITROGEN. J. W. KILLEN, FELTON, DEL.
YIELD 1,780 LBS. PER ACRE.

Careful weeding and loosening of the soil at frequent intervals is necessary ; in the fall, when the tops are mature, they should be cut and hauled off the field.

Fertilizing. As Asparagus is grown for its succulent stems only, the fertilizer used should be very rich in nitrogen and potash, to encourage strong and rapid growth. The common practice is to use large quantities of well-rotted farmyard manure, preferably applied in the autumn as a top dressing, but many of the most successful market gardeners never use farmyard manure. They depend wholly on chemical fertilizers, and claim that the quality is more regular by such treatment. The heavy application of salt is of little practical value and is gradually being abandoned. Use per acre from 800 to 1,200 pounds of a fertilizer containing

Nitrogen, ...	5 per cent.
Actual Potash, ...	9 "
Available phosphoric acid,	7 "

Suggestions. Early in the spring of each year, after the plants are old enough to cut, a ridge should be made over the rows to blanch the shoots, if white asparagus be desired for market or the table. The ridging needs renewing every week or ten days during the cutting season. The grower of "green" asparagus has about the same work, without the ridging and plowing down. After the cutting season, a cut-away harrow run twice diagonally across the rows loosens up the soil and destroys weeds without injury to the crowns, although some spears may be broken off.

BARLEY.

Barley is chiefly grown for malting, or for winter pasture. It has much the same climatic requirements as wheat, and in the farm rotation, should follow a clean cultivation crop, such as corn or potatoes.

Soils. A rich, moist loam is the best soil for barley, and it usually makes a good yield after corn or potatoes, which have been well fertilized. Low and wet soils, as well as hard and dry clays, are to be avoided. If the soil contains much decayed vegetable matter, the growth of straw is excessive and results in lodging.

Cultivation. The general method of seeding and working is similar to that for wheat and other grain crops.

Fertilizing. When grown for brewing purposes, special attention must be given to fertilizing the soil properly in order to obtain the best results. A manure too rich in nitrogen causes severe lodging, and reduces the malting value of the grain. The following fertilizer, applied at the rate of 500 to 1,000 pounds per acre is correct:

Nitrogen, ...	5 per cent.
Actual Potash, ...	9 "
Available phosphoric acid,	7 "

Bulletin 33 of the Indiana Experiment Station says, "With the exception of Sulphate of ammonia, the plots which received commercial fertilizers generally produced a larger proportion of grain than those to which stable

manure was applied." This was on soil which had been in corn preceded by clover.

Suggestions. There are three distinct kinds of barley in cultivation, the "two-rowed" and the "six-rowed" both bearded, and the "Beardless." Of each of these there are winter and spring varieties, but there appears to be no uniform difference in the yields, each variety seeming best suited for certain soils and climates.

BEANS.

The varieties of beans are very numerous, and include several distinct species. The Horse Bean (Vicia faba) an erect plant, two feet or more in height, with very large seeds, is often grown as a forage crop in Europe and to some extent in Canada and the northern states. In this country, on account of blighting when the weather becomes very warm, it is not extensively cultivated.

The Lima Bean (Phaseolus lunatus) is a popular pole and bush variety. It is tender, and should not be planted until there is no danger of late frosts. Plant in rows 4 feet apart, using 3 to 4 seeds every 3 feet. It is well to start the plants in inverted sods in the hot bed.

The Bush Bean (Phaseolus manus) which furnishes the "White Navy" and many other similar sorts, is a very popular variety, as it grows fairly well on very poor soil, makes a quick crop, and leaves the soil in an improved condition. For snap beans, the "Wax" varieties are the most

popular, as the pods are so thick, fleshy and transparent as to give them an attractive appearance.

The Pole Beans (phaseolus vulgaris) including such varieties as the "Red Speckled," "Horticultural," and "Southern Prolific" yield more freely than do the bush varieties, and many think them of better quality. Where there is an abundance of room, the bush varieties are more profitable, but where the ground is limited more can be secured from an equal area by planting the pole varieties.

Soil. Beans will grow and make a fair yield on a poorer soil than almost any other crop. They may be grown on any soil which is not too wet, but succeed best on a light, sandy loam.

Cultivation. Beans are planted both in hills and drills and given clean cultivation. The seed should not be planted until the soil is well warmed in the spring, because they are liable to rot in a cold, moist soil.

Fertilizer. If the beans are grown for ripe seed, the fertilizer need contain but little nitrogen, but must be rich in phosphoric acid and potash; that is, per acre, applied in the drill from 500 to 1,000 pounds of a fertilizer containing:

Nitrogen, ...	1 per cent.
Actual Potash, . . .	9 "
Available phosphoric acid,	6 "

If the crop be grown for snap beans, the percentage of nitrogen should be as high as 3 per cent, the other ingredients remaining as above.

Suggestions. The profitable culture of beans, either

for seed or snap beans, is largely a matter of nearness to market. For growing seed beans on a large scale special machinery is required for harvesting, etc. In small quantities, seed beans are sometimes grown for home use by late planting in corn rows, this late planting being to escape the weevil. If beans must be stored, they should be treated with carbon disulphide as a protection against the weevil. The chemical can be purchased of any druggist, full directions for using accompany it.

BEETS.

The beet, especially the mangel or mangold, is for American what the turnip is for the English farmers. It thrives on a warm, dry soil; the turnip does not. It is hardy and may be grown in almost any part of this continent, but the young plant is easily destroyed by a severe frost.

Soil. The best soil for beets is a rich, sandy loam, and one quite sandy and light will prove satisfactory if highly fertilized. It will not succeed on a dry and lumpy soil or on one too heavy.

Cultivation. On account of its long tap-root, the beet requires a mellow, deeply worked soil. The seeds can be planted broadcast after plowing and harrowing in. Frequent cultivation is necessary. In some locations and climates ridge-planting is not practiced, as flat-planting and cultivation give better crops. About 6 to 12 pounds of seed per acre are about right.

Fertilizing. A crop of 20 tons of beets including tops per acre (not an unusual yield), removes from the soil 145 pounds of nitrogen, 256 pounds of potash, and 40 pounds of phosphoric acid. Apply per acre 1,000 to 2,000 pounds of a fertilizer containing:

Nitrogen, ...	5 per cent.
Actual potash, ...	9 "
Available Phosphoric acid,	6 "

Bulletin 61 of the Maryland Agricultural Experiment Station says: "Nearly all soils, especially those which have been under cultivation for a long time, require generous fertilization in order to produce a paying crop of beets. Barnyard manure should be avoided, or if applied at all, should be applied the previous year in an almost rotten state.

Suggestions. When beets are grown for the table, the turnip shaped varieties are better for early use; and the long rooted ones for winter use, because they mature later and keep better.

THE SUGAR BEET.

The sugar beet reaches its highest development in north temperate latitudes. The mere growing of a large number of tons per acre can be accomplished far south, but beets grown in such localities are less rich in sucrose and yield less sugar than those grown farther north.

Soil, The sugar beet is not particular as to kind of

soil, but does not take kindly to stiff clays and virgin soils or those especially rich in organic matter or alkaline salts. The best soil is a sandy loam containing a happy blending of organic matter, clay and sand. In general, cultivation and other circumstances being the same, any soil which will produce a good crop of Indian corn, wheat or potatoes, will produce a proportionately good crop of sugar beets, however, it must be well drained and should be reasonably level.

Cultivation. Sugar beets do best after wheat, or some other cereal, on land plowed in the fall, not less than 9 inches in depth and stirred several inches deeper by a subsoil plow. In the spring it should be cross-plowed, and worked until reduced to perfect tilth. The seed is planted in drills, as described for field or garden beets, and as soon as the plants are large enough to mark the rows, cultivation, with horse or hand hoe, should commence and be continued at least once a week, until the foliage of the growing crop will cover the ground, which should be left practically level by the last cultivation.

Fertilizing. Manuring with farmyard manure is suitable for sugar beets. Potash used in fertilizers should be in the form of sulphate rather than muriate. The fertilizer constituents actually removed by a crop of 10 tons of sugar beets per acre, are as follows:

Nitrogen, ...	110 pounds.
Potash, ...	195 "
Phosphoric acid, ...	40 "

Dr. H. W. Wiley, in treating on this matter in a report to the U. S. Government, says: "As to the relation which the quantity of material returned to the soil should bear to the quantity abstracted by the beet, it may be said in general that it is desirable to return as much nitrogen, from one and a quarter to one and a half times as much potash, and two and a half times as much phosphoric acid as have been removed by the roots. Greater additions of potash and phosphoric acid have no disadvantageous effect upon the crop." Good practice indicates an application per acre of from 1,500 to 2,000 pounds of a fertilizer containing:

Nitrogen, ...	5 per cent.
Actual potash, ...	9 "
Available phosphoric acid,	6 "

The fertilizer should be broadcasted, and mixed with earth so that seed and fertilizer do not come in contact.

Suggestions. The time for harvesting varies in different localities, and should be postponed as long as practical, provided there be no danger of a second growth or of exposure to a freezing temperature. The leaves of the ripened beet change from a rich to a yellowish green, droop, settle closely on the earth and many of them die. The harvesting is easily accomplished by first loosening the beets with a plow and then removing them by hand.

BLACKBERRY.

The wild blackberry grows in all parts of the country, but the cultivated berries are so much larger and finer that

the crop is a profitable one for market wherever the expense of shipping is not too great.

Soil. The blackberry needs a good sandy loam, neither wet nor dry. On a wet soil (containing too much nitrogen) the plants make a rank growth but bear little fruit; on a dry soil, the fruit is small and of poor flavor.

Cultivation. The plants should be set four feet apart, in rows six feet apart, and cultivated sufficiently to keep down weeds and prevent sprouts from filling the spaces between the rows. The cultivating, as well as the gathering of the fruit, will be much easier if stakes four feet long are driven into the ground ten feet apart, and a foot from the side of each row, and a wire stapled to the tops so that the bushes will be confined within a space about two feet wide.

Fertilizing. The plant food requirements of blackberries, indicated by the chemical composition of the crop, are one part of phosphoric acid and two of nitrogen and three of potash. The following fertilizer is used by extensive growers, applied at the rate of from 500 to 1,000 pounds per acre:

Nitrogen, ...	3 per cent.
Actual potash, ...	8 "
Available phosphoric acid,	5 "

The general practice is to apply the fertilizer broadcast, or, in the rows where the young plants are to be set.

Suggestions. The trailing varieties, known as dewberries, though not so highly flavored or so good for preserving, ripen earlier than the bush varieties and always

bring good prices. They will grow on thinner, dryer soil than the others, are less subject to rust, and are the best small fruit we have maturing just after strawberries are gone. The bush varieties of blackberries are more hardy, make a heavier yield on good soil, have smaller seeds, and in the north are more popular than the dewberries. Unfortunately they are liable to a red rust which is often very destructive and for which no remedy is known. The only effective treatment is to watch closely, and, at its appearance, dig up, cut out and burn every diseased plant. Some hybrids, between the trailing and the bush varieties, have been found very valuable for the middle and southern states, but they are not sufficiently hardy for the extreme north.

BROOM CORN.

This crop closely resembles sorghum, and has the same general characteristics.

Soil. Broom corn grows best on such a rich and sandy loam as would make a heavy growth of sorghum or Indian corn. A soil too moist causes blight, and makes the "straw" coarse and brittle, while one too hard and dry yields light and inferior straw.

Cultivation. It is planted and cultivated like ordinary sorghum. As soon as the heads are fully grown, while the seeds are still watery or becoming milky, they should be "tabled," to prevent the mature seed from bending the straw downward and making the brush crooked and unfit for use.

The tabling is done by breaking the stalks about three feet above ground and lapping two rows together so that the heads will support one another in a horizontal position.

Fertilizer As the seed is of little importance, and a heavy growth of straw the only thing wanted, the fertilizer should be rich in nitrogen to stimulate growth, and in potash to make the straw strong and elastic, while a moderate supply of phosphoric acid will satisfy the needs of the plants. Use, per acre, from 400 to 600 pounds of a fertilizer containing,

Nitrogen, ...	5 per cent.
Actual Potash, . . .	9 "
Available Phosphoric acid,	6 "

Suggestions. As soon as the seed is nearly matured, the crop should be gathered by cutting the heads with about a foot of the stalk. The brush should be dried in the shade, as drying in the sun injures the straw by making it more brittle, and robs it of the bright green color characteristic of straw of the best quality. After being thoroughly dried in the shade, the brush is often sunned for one day to remove moisture. The seed is beaten off, and the crop is then ready to pack for market.

BUCKWHEAT.

Soil. Buckwheat will grow on almost any soil which is not so wet as to drown the plants. Good crops can be made on light, sandy soils, or those so rich in vegetable

matter as to be almost peat. Often there are low, undrained places on the farm, too wet to be plowed in the spring, which will make excellent buckwheat if plowed as late as June.

Cultivation. Buckwheat is usually sown broadcast, and has the same general requirements as oats, or spring wheat.

Fertilizers. Buckwheat has the property of making the most of a poor soil, but it does correspondingly better when properly fertilized. A crop of 30 bushels removes from the soil in grain, straw, etc., 30 pounds of nitrogen, 44 pounds of potash and 16 pounds of phosphoric acid. Use per acre from 300 to 500 pounds of a fertilizer containing:

Nitrogen, ...	4 per cent.
Actual potash, ...	9 "
Available phosphoric acid,	8 "

If the crop follows corn, the percentage of nitrogen should be at least 5 per cent.

Suggestions. Buckwheat grows on almost any soil, may follow any crop, matures in two months from sowing, and so it is valued as a "catch crop" for land which would otherwise be vacant a part of the summer. It is grown much more extensively in the north than the south, though along the Atlantic coast, it is often sown in July or August as a nurse crop for crimson clover.

CABBAGE.

This section includes also *Braccoli*, *Brussels Sprouts*,

Cauliflower, *Collards*, *Kohl Rabi* and other forms of *Brassica Oleracea*.

Soil. The cabbage family includes a large number of very distinct forms, which need practically the same soil, fertilizer and culture, and therefore, are treated under the same heading. The soil should be deep, mellow, moist but well drained, and can not well be too rich; reclaimed swamps and newly plowed clover lands are excellent.

Cultivation. Any crop which leaves the soil in good condition may precede cabbage, but this family will not thrive in the same soil two years in succession, because of its becoming infested with diseases and insect pests peculiar to the crop. The plants are generally started in hot beds or cold frames, and transplanted to about fifteen inches to two feet apart in rows from two and one-half to three feet apart. Thorough and clean cultivation are essential.

Fertilizer. The cabbage requires rich soil and should follow some other heavily fertilized crop. The plants are grown for their succulent leaves and stems, so nitrogen is the important element in the fertilizer, and should be given in liberal quantities. Use per acre from 1,000 to 2,000 pounds of a fertilizer containing

Nitrogen, ... 4 per cent.
Actual Potash, ... 9 "
Available Phosphoric Acid, 7 "

A fair crop of 31 tons per acre removes from the soil 150 pounds of nitrogen, 360 pounds of potash and 180 pounds of phosphoric acid. The potash in form of sulphate

has often been found better for cabbage than the muriate.

Suggestions. The cabbage will bear a moderate frost without injury. In the extreme south, it is common to plant in the field from September to December a crop which is ready for marketing from January to March. This is grown during the cool season, when nitrification progresses slowly, and should be planted on the lightest and warmest soil, supplied with the most stimulating fertilizer.

The late planting, which is to occupy the ground during the summer, should be on a heavier soil, less stimulatingly, though abundantly fertilized. "Clubroot" is a disease which often destroys the roots of the plants, when cabbage is grown year after year on the same land. The remedy is rotation of crops. The troublesome green cabbage worm may be killed by dusting with Persian insect powder (Pyrethrum). This substance is death to the cabbage worm, but harmless to men. Paris green should never be used on cabbage.

CANTELOUPE.

(See Muskmelon).

CARROT.

In general characteristics and culture, this crop resembles the beet. Its culture is much the same in all essentials, and is fertilized the same as beets.

CASSAVA.

Cassava is a tuberous-rooted plant, which resembles the castor bean, and belongs to the same family. It thrives best on sandy soils containing plenty of humus. The roots from 15 to 30 inches long, and from 1 to 3 inches in diameter, are used in the manufacture of tapioca and glucose, and as a winter grazing for hogs. The factories pay about six dollars per ton for the roots. Tests at the Florida Experiment Station (reported in Bulletin 49) show that hogs digging the roots for themselves, can be fattened and made into pork on them at a cost of less than 2 cents per pound, which makes it even as a pork producer a profitable crop.

The plants are propagated by cuttings of the stems, which are kept buried through the winter and in the spring are planted in rows 4 feet apart. This crop thrives only in the southern part of the country, being at its best in Florida and along the Gulf, and needs the same cultivation as corn. The fertilizer recommended for sugar cane is suitable for Cassava, and the same care must be observed that the *fertilizer is free from chlorides.*

CASTOR BEAN.

This plant is a half hardy annual, and from its seeds, castor oil is produced. It is but little less hardy than Indian corn.

Soil. A light, fertile, sandy loam is best for it; a soil frequently watersoaked, or a dry, hard clay is entirely

unsuitable. New prairie land or clover sod produces the best yields, as will any soil suitable for corn.

Cultivation. Although the plant becomes a tree in the Tropics, in the United States it is an annual. The seeds are planted two or three together, three or four feet apart in rows five feet apart, every seventh row being left vacant for a road. The cultivation is the same as that of corn. Harvesting begins as soon as the first clusters are ripe, in July or August, and continues weekly until the plants are killed by frost.

Fertilizer. Phosphoric acid and potash should be given liberally in about equal amounts. Too much nitrogen induces a rank growth of plant, made at the expense of its fruitfulness; if the other elements are deficient, the seeds are few and small. Use per acre from 400 to 600 pounds of a fertilizer containing

Nitrogen, ... 2 per cent.
Actual Potash, ... 8 "
Available phosphoric acid, 8 "

(The application is made as described for Indian Corn.)

Suggestions. In harvesting a wagon or sled is driven along the vacant rows and the ripe clusters on the three rows on each side are cut just before the pods are ready to open. The gathered clusters, to the depth of not over a foot, are scattered over a floor, or a smooth, hard place on the ground, which must be surrounded by a close board fence 6 to 8 feet high. As the pods are dried by the sun, they burst open and throw the beans out with so much

force that many of them would be lost if it were not for the fence. All the pods open in three or four days, when the stems are raked off, and the beans run through a winnowing mill to clean them and fit them for market. The yield is about the same as that of corn, while the price per bushel is from two to three times as much.

CELERY.

Celery is a biennial native of England, found in its wild state in marshy places and ditches along the coast.

Soil. A black, peaty marsh soil is best for celery, though it will not succeed there without the most thorough drainage. A moist clay loam will not produce quite so large a yield, but imparts a finer flavor and often brings better prices. Provision should be made for irrigation, where there is danger of even a moderate drouth, for want of abundant moisture gives the plants a severe check, and renders them more liable to disease.

Cultivation. Celery is grown from plants, propagated in hot beds or cold frames, transplanted, thoroughly cultivated and kept free from weeds. The trenching system is no longer used. The setting is usually six to ten inches apart, in rows four feet apart, but some growers make the rows only 12 inches apart. As the growth advances, the outer leaves have a tendency to spread flat out upon the ground, just enough earth should be banked around the plants to counteract this tendency and hold the leaves up-

right. The grower who makes a specialty of celery should study a good book on the subject.

Fertilizing. On a richly peaty soil little nitrogen will be needed in the fertilizer, but on clays, nitrogen should be given liberally to induce rank growth. Peat contains little potash, which must be supplied in large amounts to give the plants strength for bleaching and solidity for winter keeping. But little phosphoric acid is needed. Fresh stable manure tends to cause rust and to make the leaf stems coarse, stringy and inferior in flavor. Use, per acre, 1,600 to 2,000 pounds of a fertilizer containing :

Nitrogen, ...	5 per cent·
Actual Potash, ...	8 "
Available phosphoric acid,	6 "

Suggestions. Celery is a cool weather plant, uninjured by light frosts, but killed by a moderate freezing or by long and intense heat. The fact that the young plants cannot endure much heat, makes it difficult to raise them from seed in the extreme south, where they must be grown in July and August for September planting. Most southern gardeners find it less expensive to buy northern plants than to care for home-raised seedlings so as to keep them in condition through the winter months.

CHERRY.

Under the head of "Apple" have been given suggestions of general application to all fruit trees.

Soil. Like other stone fruits, the cherry does best on a somewhat sandy, well drained soil, and is more successful in the north than in the south. Thrifty and productive trees are found on rocky hillsides, but never where water stands at the roots.

Fertilizing. From the time the trees are planted until they are of a size to bear good crops, vigorous growth should be secured and maintained by applying a complete fertilizer to each tree, of 8 to 16 pounds of a fertilizer containing :

Nitrogen, ...	2 per cent.
Actual potash, ...	9 "
Available phosphoric acid,	7 "

When a tree has reached full bearing age, from 2 to 6 pounds of fertilizer per year is sufficient for it. Cherry trees should stand from 12 to 20 feet each way, which means from 302 to 108 trees per acre, varying the number to conform to the varieties, sizes and habits of the trees grown. Naturally the smaller fertilizer application per tree is given to those kinds which are most thickly planted.

Suggestions. While the trees are young, the ground needs good regular cultivation. Corn, potatoes or melons may be grown in the young orchard, but when bearing size and age is reached it is better to seed the land with clover or alfalfa, and to use it as a hog or calf pasture. If only a few trees are grown, (about the house) chickens should be allowed to range under them to destroy the curculio and other insects.

CHICORY.

This plant is extensively grown in Europe, where its fleshy roots resembling those of the dandelion, are employed as a substitute for coffee. Its height, under cultivation, is from two to six feet.

Soil. A deep, clay loam, rich in lime, dry rather than wet, is best for chicory. It will not grow well on hard clay or on soil which runs together and packs after every rain.

Fertilizer. As chicory is grown for its fleshy roots, nitrogen and potash are the elements most needed in the fertilizer, accordingly, a good dressing of stable manure strengthened by the addition of potash salts, gives the best results.

Suggestions. Chicory has been grown extensively in Europe for many years, and large quantities of it are imported annually, but, until recently, it has attracted little attention in this country. The few tests, made at the New York, Nebraska and other experiment stations, indicate that it may be made a profitable crop here, although it is so persistent that it may become a troublesome weed if not watched closely.

CHUFA.

This is a species of "earth-nut" grown in the south to fatten hogs, but not to be mistaken for nut-grass.

Soil. Chufas need a light, sandy soil, not too dry and makes a fair yield on those too light for most other crops.

Fertilizer. The starchy roots, the parts of the plant

wanted, indicate a rich potash fertilizer. On land which was in peas the previous season, or where a sod has recently been turned over, it requires no fertilizer excepting potash; otherwise, apply, per acre, from 200 to 400 pounds of a fertilizer containing:

Nitrogen, ...	3 per cent.
Actual Potash, ...	9 "
Available phosphoric acid,	6 "

Suggestions. The chufa is the best root crop that can be grown for hogs on soils too thin and sandy for artichokes, but is not suited to heavy soils. The plants shade the ground but little and need cultivating the entire summer. The yield is large, 172 bushels per acre being reported by the Alabama Station. The roots may remain in the ground through the winter, and be harvested when wanted.

ALSIKE CLOVER.

This is a perennial, and makes a good growth on wet soils, where other clovers fail more or less.

Soil. Alsike clover grows best on a deep, rich, moist and heavy soil, doing well on ground too wet for any other clover, but it should never be planted on that which is light, sandy or dry.

Fertilizing. Being a legume, this crop requires little, (if any) nitrogen, but potash must be used freely. This clover is commonly sown with other grasses, to lengthen the period in grass. The fertilizer used on ordinary red clover

suits the Alsike. Lime must be supplied unless the soil has plenty of this constituent.

Suggestions. This is excellent to mix with red-top, fowl-meadow and other wet ground grasses, and should always be sown on the wet places in pastures. It bears frost better than most other clovers, and so gives good winter grazing in the south.

CRIMSON CLOVER.

This member of the valuable clover family is a member of Southern Europe. It is annual, and consequently, must be re-seeded for each crop.

Cultivation. Seed may be sown from July to October, after the land has been well prepared, and the young plants should be protected by the shade of a good growth of cow-pea vines, or a corn or cotton crop. It is commonly used as a winter cover-crop, its growth being made in the cool wet part of the year.

Soil. It thrives on a lighter and sandier soil than any other clover, as it requires little humus, and comparatively little moisture.

Fertilizer. Crimson clover is often grown for green manuring and the ranker its growth the more satisfactory will be the succeeding crop. Excepting on soils which are already fertile, use, per acre, 600 pounds of a fertilizer containing:

Actual Potash, ... 9 per cent.
Available Phosphoric acid 8 "

On very poor soils, an addition of one to two per cent. nitrogen will help to make a catch more certain.

Suggestions. This clover is of recent introduction, and is peculiarly well adapted to the sandy soils of the southeast. It flourishes along the Atlantic coast from New Jersey to Florida, but is generally less valuable in the Mississippi Valley, where the Hairy Vetch seems better. It should be sown, 20 lbs. clean seed or 80 lbs. in chaff per acre, sufficiently early to make a good root growth before cold weather. A few oats sown with it protect the young plants from sun-scorching. It should be cut for hay soon after it begins to bloom, for the stems grow hard and woody as soon as the flower spikes become elongated. In the south it should not be sown before August or September.

JAPAN CLOVER.

This clover, sometimes called Lespedeza, is a tender annual, from Virginia southward, which, though not suitable for crop rotation, should have its growth encouraged on waste and wood lands.

Soil. Lespedeza succeeds best on rich, clay loam, not too dry, but it will make a good growth for pasture on dry, hard clay. It is of little value on light and sandy soils.

Fertilizing. It is fertilized as for red clover, except that only about two-thirds of the quantity is used, keeping in mind its need of a liberal supply of potash.

Suggestions. Lespedeza has become thoroughly nat-

uralized in the region south of Virginia and the Ohio River, but, being an annual maturing its seed late in the season, it is not likely to be grown much further north. In the region where it grows it is one of the most valuable pasture plants, "coming in" on the hard, bare clay by the roadside, on the tops of the rain-washed hills, in woodland pastures and wherever it can find a clay foundation. When grown on good ground it will often yield 2 tons per acre of even better hay than clover, since it has no coarse stems and does not drop its leaves.

RED CLOVER.

This is the most widely known and regarded as the best member of the clover family for rotation purposes.

Cultivation. In the north it is usually sown in the spring on ground which has already been sown in wheat or oats, or in late summer in standing corn, or alone after an early harvested crop. In the south, it is much better to sow it alone in September or October. From this fall sowing a heavy cutting of hay may be made the following May, and one or two lighter cuttings later in the course of the season. The following May it will give another heavy cutting which may be taken off in time to plant the land in corn. In the north it is often sown with timothy and other grasses, to form permanent meadows, but such mixtures do not succeed well in the south.

Soil. A deep, clay loam is best for red clover, but if a supply of mineral food be present it will grow on other

soils. Limestone clays are especially favorable to it, and it will grow even on peats; but it usually fails on newly broken prairies and sandy soils deficient in lime.

Fertilizing. The plants when well established draw sufficient nitrogen from the air. A fair crop say 2 tons of cured red clover hay per acre, removes from the soil:

Potash, . . . 96 lbs.
Phosphoric acid, 28 "

Nitrogen may be disregarded in manuring the crop, but potash and phosphoric acid are important, for these two elements by themselves supply a certain amount of necessary plant food, and, by making a rank growth of the clover, increase the amount of nitrogen taken from the air. Use, per acre, from 600 to 1,000 pounds of a fertilizer containing

Available phosphoric acid 8 per cent.
Actual potash, ... 9 "

On land where past experience has shown much difficulty in obtaining a seeding, the fertilizer should contain 2 per cent. nitrogen. An addition of lime in the form of quicklime, or sulphate, (land plaster) is beneficial on soils deficient in lime. A top-dressing of one ton per acre of fresh, water-slaked lime, or waste lime of any kind, has a wonderful effect.

Suggestions. Wherever red clover can be grown it is most valuable in all crop rotation. It is the best crop to precede corn, wheat and other grains. The deep-growing

roots leave the soil in excellent mechanical condition, and their decay furnishes a large yield of corn, wheat, or other grains when planted on the inverted sod. In the north the life of the plant is about two years, but in the south it lives longer if on strong soil, or liberally fertilized.

SWEET CLOVER.

Although Melilotus, or "Sweet Clover" is regarded as a weed in the north, it is a valuable biennial, self-reseeding hay and pasture plant, and the best of the clover family for green manuring on soils so sterile, or in such poor mechanical condition, that other crops fail. The decay of the large, deep roots, not only supplies plant food for succeeding crops, but also leaves the subsoil in a greatly improved mechanical condition. Its hay is much like Alfalfa, and is a valuable plant for increasing the quantity and improving the quality of the hay on lands where Johnson grass is grown. It grows only on a soil well supplied with lime, and thus it grows well on the white rotten lime stones common in many parts of the south. It should be fertilized as recommended for Japan Clover.

WHITE CLOVER.

White clover, too dwarf for hay, is more useful for lawns and sheep and cattle pastures than elsewhere. It is excellent for bee feeding, and usually "comes in" in old pastures having suitable soils, In the north it is exceedingly com-

CORN, UNFERTILIZED. EXPERIMENT FARM, SOUTHERN PINES, N. C.

CORN WITH COMPLETE FERTILIZER, POTASH, PHOSPHORIC ACID AND NITROGEN. EXPERIMENT FARM, SOUTHERN PINES, N. C.

mon in permanent pastures and in trodden lawns ; but in the south its growth is uneven and irregular, sometimes covering the ground with a dense green mat ; and often almost disappearing for a season. It is fertilized as recommended for Japan Clover.

COCOANUT PALM.

Soil. The cocoanut palm needs a moist, sandy soil, with plenty of vegetable matter, and thrives only near the seacoast and where there is no frost.

Fertilizer. The chief fertilizing material needed is a mulch of seaweed, which is always convenient and abundant, to which should be added an occasional dressing of lime and potash.

Suggestions. This palm can be grown to advantage in only the southern coast of Florida in the United States.

INDIAN CORN.

This crop is of common cultivation all over the country.

Soil. A mellow loam, inclining more to sand than clay, is most suitable. It should contain an abundance of vegetable matter and be dry rather than wet.

Cultivation. The five principal types of corn are : the dent, flint, flour, pop and sweet. Of these, the dent varieties, white and yellow, form the bulk of the crop in all parts of the country. The method of planting varies with localities. Drill planting is to be preferred and many believe this is best as well as in culture for grain.

Fertilizing. A sod of clover or meadow grass, top-dressed the previous year with stable manure, affords a good basis for corn, though a crop of cow peas or soy beans is nearly as good. On such a field, but little extra nitrogen will be needed, since the growth of corn is made during the hot season, while bacterial nitrification is active in the organic matter of the soil. When planted on any excepting sod land, no crop will better repay heavy applications of stable manure reinforced by phosphoric acid and potash fertilizer. A moderate crop of 50 bushels per acre, actually takes from the soil 67 pounds of nitrogen, 80 pounds of potash and 31 pounds of phosphoric acid. Apply, per acre, from 800 to 1,000 pounds of a fertilizer containing

Nitrogen, ... 2 per cent.
Actual Potash, ... 7 "
Available phosphoric acid, 6 "

The following extracts from the bulletins of experiment stations may be of interest: Bulletin 10 of the New Hampshire Station, gives the results of tests in that state with corn in seven localities, showing that the fertilizer giving the most profitable results contained 4.7% of Nitrogen, 9% Phosphoric acid and 10.7% of Potash. The seventh report of the Delaware Station says: "Potash produced the largest crop in 1894, and the greatest increase over the crops of 1889. The effect of phosphoric acid has been marked, but is on the whole rather less than that of Potash."

Bulletin No. 33 of the Kentucky Station reports the

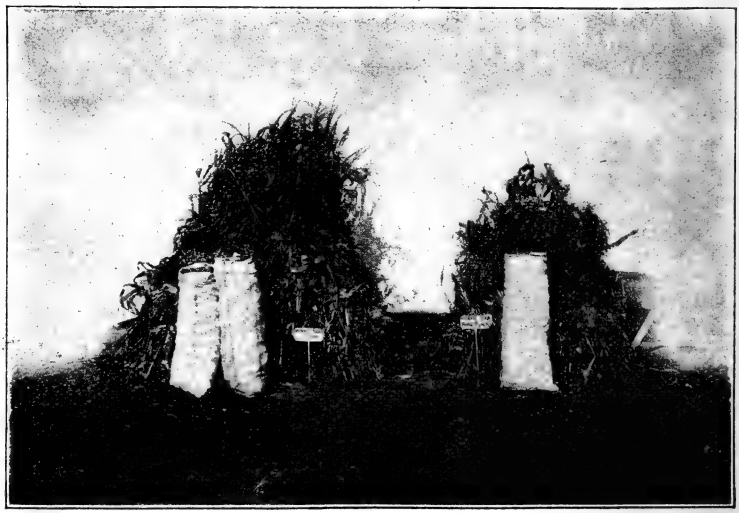
CORN, UNFERTILIZED. OHIO EXPERIMENT STATION.

CORN TREATED WITH COMPLETE FERTILIZER, POTASH, PHOSPHORIC ACID AND NITROGEN. OHIO EXPERIMENT STATION.

CORN SHOWING YIELD FROM APPLICATION OF MURIATE OF POTASH ALONE.

CORN SHOWING YIELD FROM UNFERTILIZED PLOT.

MASSACHUSETTS EXPERIMENT STATION.



CORN SHOWING YIELD FROM APPLICATION OF NITRATE OF SODA AND MURIATE OF POTASH.

CORN SHOWING YIELD FROM APPLICATION OF NITRATE OF SODA AND BONE BLACK.

MASSACHUSETTS EXPERIMENT STATION.

work of three years in trials of fertilizers for corn, and says: "That there was a profit in the use of fertilizers in every instance where potash was one of the ingredients, the largest net profit arising from the use of a mixture of nitrate of sodium and muriate of potash. That there was a loss by the use of fertilizers where potash was not one of the ingredients."

Bulletin No. 14 of the Missouri Station says: "So far it appears from the trials that potash is the element most desired by the corn on our land."

COTTON.

Cotton is grown in the United States, almost anywhere south of the 37th parallel of latitude: a line drawn from Old Point Comfort, Va., through Cairo, Ill., practically coincides with this parallel.

Soil. Cotton and corn need similar soils, though cotton will make a fair yield on heavy clays too thin for corn. On soils containing an excess of vegetable matter, the cotton plant grows to an immense size, but produces few bolls. On farms where both are grown, corn should be planted on the soil containing the greatest amount of humus, and the cotton on that which is less fertile.

Cultivation. The soil is thoroughly prepared, as for all clean cultivation crops, and marked out in the same manner as for corn. Planting is done from March 1st to May 20th, according to location. Cultivation, which com-

mences as soon as the young plants are well up, continues regularly up to the time of the formation of squares, when all working stops.

Fertilizer. If the meal and hulls from the seed are returned to the soil, cotton is not an exhaustive crop. Planting the same land with cotton year after year works ruin to the soil, not as some planters suppose, because of the exhaustive nature of the crop, but by the constant exposure of the soil to the hot sun during the summer, and the washing by the heavy rains of winter. With a carefully planned rotation of crops and moderate fertilization, cotton lands will not deteriorate. An application of a few hundred pounds of commercial fertilizer often makes the sharp difference between a profit and a loss on the crop. A ginned crop of 300 pounds removes from the soil in lint seed, stems, etc., about 44 pounds of nitrogen, 49 pounds of potash and 12 pounds of phosphoric acid. Use per acre from 400 to 800 pounds of a fertilizer containing :

Nitrogen, ...	3 per cent.
Actual potash, ...	4 "
Available phosphoric acid,	8 "

Where commercial fertilizers are used, their proportions vary greatly in different localities, and it is impossible to recommend any single mixture which will be the best for all sections. The following extracts from the bulletins of experiment stations may be of interest: The South Carolina Station, Bulletin No. 2 (New Series) says: "Cotton requires nitrogen, phosphoric acid and potash. Potash,

COTTON UNFERTILIZED. FROM FARM OF T. J. ADAMS, EDGEFIELD, S. C.

COTTON WITH COMPLETE FERTILIZER, 6% POTASH, 8% PHOSHORIC ACID AND 3% NITROGEN. FROM FARM OF T. J. ADAMS, EDGEFIELD, S. C.

like nitrogen, is of little value to cotton when applied separately; it must be combined with other constituents."

Suggestions. In sections where crimson clover will grow, it is a good practice to sow 15 pounds of the seed per acre, at the last cultivation of the cotton. This protects the soil from washing during the winter, gives a considerable amount of fine winter grazing, and provides nitrogen for the succeeding crop. The varieties of cotton are almost as numerous as those of corn. Those producing the longest lint have highest market value.

A common and fatal disease of cotton is the "rust" which often attacks the plants just as they begin to mature.

In 1891, Prof. Atkinson, then of the Alabama Experiment Station, called attention to the preventive effects of kainit, and, in Bulletin No. 36, gave a full statement of the action of the disease and the beneficial results he had secured from the use of Kainit. Prof. L. S. Earle, Biologist of the Alabama Station, in a recent letter says: "There can be no doubt that in some cases, on sandy lands, potash has a remarkable effect in preventing cotton rust." Similar results in preventing rust by the use of potash salts have been secured at other stations.

COW PEAS.

The cow-pea, in habits and characteristics, is really a bean. It is grown principally as a forage crop, or as a soil cover.

Soil. The cow-pea will grow on any soil not too wet

and even make a fair crop on that too thin and sterile for other cultivated crops. It makes its best growth on a rich, mellow loam, such as is desirable for corn, but, as it is grown chiefly as a restorative crop, it is usual to plant it on the poorest soil on the farm.

Fertilizing. Although the cow-pea is the best restorative crop known, and the best to plow under for green manuring, it responds quickly to an application of fertilizer. The plant gathers nitrogen from the air, so little of that element need be given, but phosphoric acid and potash should be used in liberal amounts. A fertilizer containing 8 per cent. each of potash and phosphoric acid, 400 to 600 pounds per acre will be found most effective.

Suggestions. Cow-peas, of which there are many varieties, may be used to precede or follow any crop which leaves the land unoccupied during any two months of warm weather. The Browneys, Coffee and New Era are dwarf and bushy, and mature within sixty days after planting, while others, like the Unknown or Wonderful, require the entire season for their growth. The early maturing varieties are occasionally grown as far north as Ohio and Illinois, while in the south they are usually planted in the corn field at the last cultivation. The crop is valuable for grazing, for hay and for green manuring. It is one of the most efficient of the nitrogen collecting crops, and in regions where it will grow will do more for the improvement of the soil in one season than red clover will in two.

CRANBERRY.

The Cranberry, a native of swamps, will grow only on a peat or marsh soil. Under cultivation it must be given similar general conditions by covering an artificial bog with 3 to 6 inches of sand.

Fertilizing. Like other plants grown for fruit, it needs moderate amounts of nitrogen, but a liberal supply of phosphoric acid and potash. On old bogs use, per acre, from 400 to 800 pounds of a fertilizer containing

Nitrogen, ... 2 per cent.
Actual Potash, ... 8 "
Available phosphoric acid, 6 "

On newly planted bogs, use more nitrogen and less phosphoric acid, say 4 per cent. of each, with the 8 per cent. of potash.

Suggestions. Successful cranberry culture necessitates such a situation and control of the water supply that the entire bog may be easily and quickly flooded. A bog located by the side of a stream is most desirable, so that by opening and closing gates at a higher level, the inflow of water may be regulated; and the drainage effected by opening lower gates. An occasional flooding is necessary, because the plants need the water and likewise as a protection against insects, disease and frost.

CUCUMBERS.

(See Melons.)

CURRANTS.

Soil. The currant grows best on a deep, rich sandy, moist but well drained loam.

Fertilizing. A complete fertilizer is needed, as the amount of fruit produced is large in proportion to the size of the plant. On ordinary soils use, per acre, 1,000 pounds of a fertilizer containing

Nitrogen, ... 3 per cent.
Actual Potash, ... 9 "
Available phosphoric acid, 7 "

Suggestions. Currants succeed well north of the Ohio River, but, in the extreme south, because of the long hot summers, the bushes are short lived; planting on the north side of a fence and keeping the ground well mulched will increase their productiveness and prolong their lives in hot, dry climates or places. Careful pruning and removing old and stunted wood generally improves the size and quality of the fruit.

DEWBERRY.

(See Blackberry.)

DURRA CORN.

(See Kaffir Corn.)

EGG PLANT.

Soil. Egg plants and tomatoes need the same, light, sandy loam, made very rich. A garden which has been

heavily manured and well cultivated for some years, is in good condition for this crop.

Fertilizing. To secure abundant and large fruits, heavy fertilizing is needed. Even on rich soil use, per acre, at least 2,000 pounds of a fertilizer containing

Nitrogen, ... 4 per cent.
Actual Potash, ... 9 "
Available phosphoric acid, 5 "

Broadcast and work into the soil.

Suggestions. As the earliest crop is the most profitable, plants should be started in boxes in the house or in the hot bed, and as soon as they have four leaves, transplanted to flower pots or strawberry boxes, from which they may be transferred without disturbing the roots. When planted on very rich soil and well cultivated, egg plants are among the most profitable market garden crops.

ENDIVE.

The soil and fertilizer should be same as for chicory.

FIGS.

Soil. Figs do best on a rich, sandy loam.

Fertilizing. It is a gross feeder, demanding heavy fertilizing, which must contain more nitrogen than is desirable for most other trees, so that liquid manure is especially suited to its hunger. For small trees use monthly, from March to August, one pound per tree of a fertilizer containing

Nitrogen, ... 5 per cent.
Actual Potash, ... 9 "
Available phosphoric acid, 9 "

The amount used for each tree should be increased by at least one pound yearly.

Suggestions. The fig needs very peculiar treatment to make it satisfactory. It is easily propagated by cuttings of ripened wood, planted either in fall or early spring, and such cuttings will often bear some fruit the first season. The young trees are tender, and a large proportion of them in frosty localities, are killed by the first winter, but they increase in hardiness as they become older. By giving winter protection they may be grown as far north as Virginia or Missouri; along the Gulf coast they do not succeed in large orchards; even though a few protected trees, planted near buildings, bear immense crops, sometimes 1,000 pounds of fruit per tree.

FLAX.

Common flax, an annual, having blue flowers, and reaching a height of about three to four feet, is of the most important fibre plants of the temperate zone.

Soil. For its best development, flax requires a rich loam a moderate amount of heat, and abundant rains during the growing season.

Cultivation. Little attention is paid to rotation with flax, but the crop should follow clean cultivation.

Fertilizing. Stable manures, which are sure to contain

weed and grass seeds, should not be used directly on the crop. The value of the crop depends on the length of the stems, therefore a rank growth should be promoted by using per acre, 600 to 800 pounds of a fertilizer containing

Nitrogen, ... 3 per cent.
Actual Potash, ... 9 "
Available phosphoric acid, 8 "

Suggestions. It is grown either for the seed or the fiber in the bark, if for seed, it should be sown thinly, using about ¾ bushel of seed per acre; if for fiber, more thickly, using 1½ to 2 bushels per acre. A crop seldom makes a satisfactory yield of both seed and fiber. "The more weeds the less flax," so the flax should be hand weeded 6 to 8 inches high.

GINGER.

Soil. Ginger should have a deep, sandy and peaty soil, free from stagnant water, which never suffers from drouth.

Fertilizing. On such a soil, no nitrogen is needed. Use per acre from 400 to 600 pounds of a fertilizer containing

Actual Potash, ... 9 per cent.
Available phosphoric acid, 8 "

Suggestions. The ginger of commerce is the creeping root-stock of the plant, grown largely in the West Indies and to a limited extent in the extreme southern part of the United States.

GOOSEBERRY.

In soil, fertilizer and general treatment, the requirements of the gooseberry are the same as those of the currant. The European varieties are much larger and finer than the American, but suffer so much from mildew that they are seldom cultivated in this country. Bulletin No. 36 of the New York (Geneva) Station says: "The mildew can be prevented by using a solution of the potassium sulfide, (one-half ounce in a gallon of water). This should be used as a spray, beginning as soon as the leaves expand, and applying it at intervals of 2 weeks during the growing season.

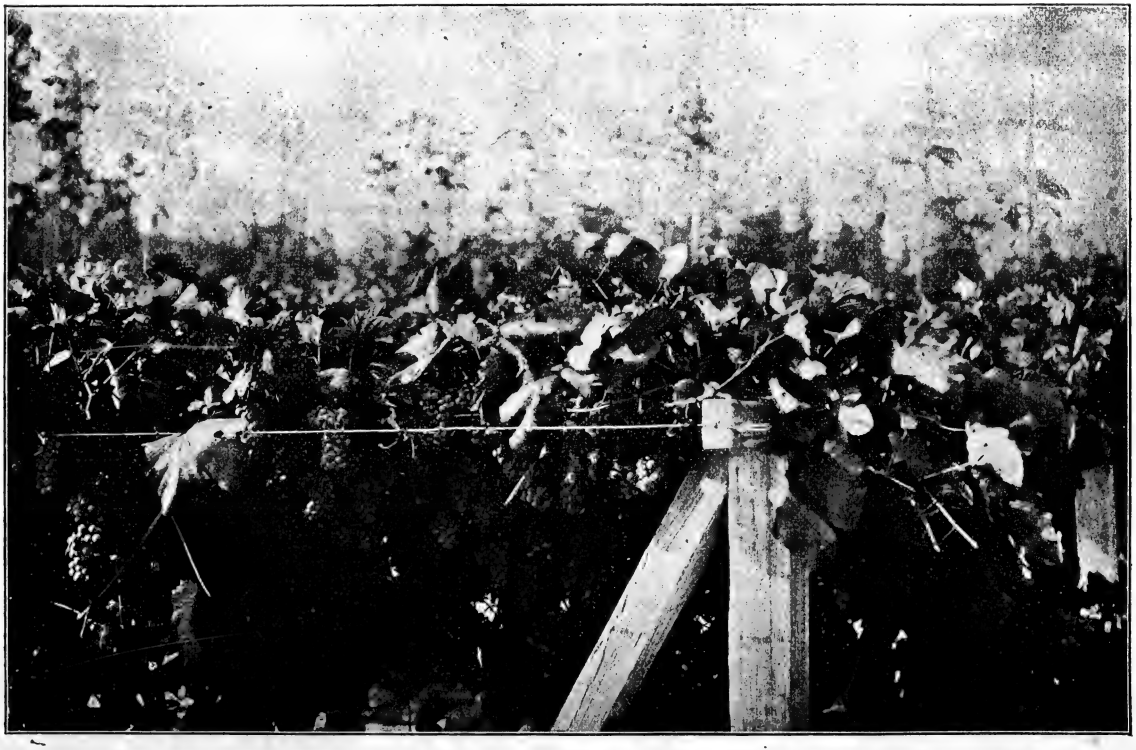
GRAPES.

Soil. Grapes need a well-drained soil, with a subsoil so porous that the roots can go downwards to a considerable distance. A rocky hillside, somewhat sandy or gravelly, rather than stiff and heavy, is an excellent location.

Fertilizing. A crop of clover or cow-peas, before the vines are planted, leaves the soil in good mechanical condition, and furnishes a good part of the fertilizer needed for the first one or two years. It is a frequent practice east of the Rocky Mountains, to grow leguminous crops between the rows of vines to supply the nitrogen needed; it is doubtful, however, if this method be advisable on account of injury produced to the vines by the roots of these crops, especially during dry spells, and the nitrogen obtained in

GRAPES, UNFERTILIZED. EXPERIMENT FARM, SOUTHERN PINES, N. C.

GRAPES WITH COMPLETE FERTILIZER (MEDIUM FERTILIZATION), POTASH, PHOSPHORIC ACID AND NITROGEN. EXPERIMENT FARM, SOUTHERN PINES, N. C.



GRAPE WITH HEAVY APPLICATION OF A COMPLETE FERTILIZER, POTASH, PHOSPHORIC ACID AND NITROGEN.
EXPERIMENT FARM, SOUTHERN PINES, N. C.

this manner is not sufficient for the proper nourishment of the vine.

Five hundred to 800 pounds per acre of a fertilizer containing 10% of potash, 8% of phosphoric acid, and 3% of nitrogen would be an average application.

Suggestions. Grapes of one variety or another may be grown in all parts of the country. The growing of grapes both for table use and wine making has become a large and profitable industry in several parts of the United States, especially in North Carolina, Virginia, New York, Ohio and California. The grower who aspires to success in producing grapes on a large scale or for market must make a special study of this vine, and familiarize himself with all its habits and requirements. A few grape vines may be grown without special care in the garden for private use.

GRASSES.

Grasses of some kind flourish on every kind of soil, and in every part of the country, but no one kind of grass can be grown everywhere. Grasses should be selected to suit the soil. With more than 800 species native to North America, it is not difficult to make a selection.

Fertilizing. Like all other plants, grasses need fertilizing when grown continuously on the same land. Permanent pastures usually secure a sufficient supply of nitrogen from the droppings of the stock and from leguminous plants which form a part of the sward to keep it in good

condition, but a fertilizer containing 8 per cent. phosphoric acid, and 8 per cent. potash, at the rate of 500 pounds per acre should be added annually.

Permanent Pastures. Permanent Pastures are usually located on that part of the farm least available for cultivation, and having poorest soil. On the lime soils of the middle and northern states, Kentucky bluegrass, (Poa pratensis) is the foundation of all permanent pastures, while on those containing little lime, Virginia bluegrass, (Poa compressa) is more satisfactory. To these should be added Rhode Island bent grass, orchard grass and perennial rye grass. In wet places red top and alsike clover should be sown. In the southern states, Bermuda grass, (Cynodon dactylon) takes the place of the blue grass, and is equally good, but does best only on a rich soil. Lespedeza is an excellent legume for general use for dry hills in southern pastures, while on wet ground, redtop, alsike, large water grass and others may be added to the Bermuda. On very sandy soils of the southern coast region, carpet grass is superior to Bermuda. It requires as good soil and as much care and preparation to make a good permanent pasture, as for any other crop. In selecting the seed, the aim should be to secure such a variety as to have at least one of the kinds chosen at its best at every changing time of the year.

Permanent Meadow. In a permanent meadow, care should be taken to select varieties which mature at the same time. In the middle and northern states, the time-honored timothy is unrivalled for yield and salable quality,

HAY FROM PLOT WITH COMPLETE FERTILIZER. EXPERIMENT BY S. K. CROSBY, CATONSVILLE, MD.

HAY FROM UNFERTILIZED PLOT. EXPERIMENT BY S. K. CROSBY, CATONSVILLE, MD.

and is the standard. It grows well on all excepting wet soils, where it is replaced by redtop. Red clover is often sown with timothy, and though it adds to the yield the mixture is not wholly satisfactory, because the two do not mature at the same time. On the clay uplands a mixture of orchard grass, tall meadow fescue and tall meadow oat grass makes the heaviest crop and the best hay. On low bottom lands and prairie soils Johnson grass makes more good hay than any other grass, but when once established, is very difficult to kill, spreads rapidly by both roots and seeds, and so often becomes an exceedingly troublesome weed. Bermuda does well on similar lands, and makes a good yield of fine hay. On the sandy lands along the southern coast, the advisability of attempting to make permanent meadows is doubtful, and there annual grasses are usually more satisfactory and profitable. The long season enables the farmer to grow two crops on nearly all excepting his cotton lands, and if one of these is a volunteer grass crop, his hay costs him nothing except the gathering.

Lawn Making. For the middle and northern part of the country there is nothing better than Kentucky blue-grass, and for a really fine sod, it should be grown strictly without mixture. When a new lawn is to be formed, the surface should be made fine, smooth, and even. To a sandy soil add clay, and fertilize with ground bone and muriate of potash. Sow the seed at the rate of five bushels per acre, cover the seed with a heavy roller, and leave the ground perfectly smooth. Blue-grass rarely succeeds in the south,

its place is supplied by several other sorts. Bermuda, the best and most common, makes rather a weak growth on light, sandy soils unless heavily fertilized. Carpet grass and St. Augustine grass are also used along the southern coast, but because of their much lighter color, are not so attractive. Regular and frequent cutting with a lawn mower is essential to a good lawn anywhere, and the cut grass should be allowed to remain on the ground as a mulch.

HEMP.

Soil. Hemp requires a soil naturally rich, which does not suffer from stagnant water. River bottom lands, formed by repeated overflows, are especially suited to its growth.

Fertilizing. It is a gross feeder and needs heavy fertilizing. Like all plants grown for fiber it must have an abundance of nitrogen and potash, while phosphoric acid seems less important. On ordinary soils, use, per acre, from 700 to 900 pounds of a fertilizer containing:

Nitrogen, ...	5 per cent.
Actual potash, ...	9 "
Available phosphoric acid,	6 "

Bulletin 27 of the Kentucky Station says: "A fertilizer containing a large percentage of potash and nitrogen, and a small quantity of phosphoric acid is the kind to use on our soils for hemp."

Suggestions. Hemp is grown more extensively in the

central part of the country, from Kentucky to Missouri, than elsewhere, though its cultivation is gradually extending south and west. The further south the crop is grown the heavier the yield; but the fiber is coarser and less valuable. It is often injured by a parasitic plant known as "broom-rape," which grows upon its roots. Rotation of crops, burning over infected fields, care in collecting seed for planting, and a liberal use of fertilizers, are suggested as means for preventing the development of the parasite.

HOPS.

Soil. Hops grow wild in nearly all parts of the United States, and are found on rich, sandy, well-drained river banks. They do best when planted on a high dry loam, similar to that to which they are native.

Fertilizing. An excess of nitrogen and phosphoric acid produces large hops of inferior quality, which do not bring high prices, but a liberal use of potash improves the quality and price. As the plant is a perennial, a large proportion of vines and leaves remain on the soil. The first year use, per acre, 800 to 1,000 pounds of a fertilizer containing:

Nitrogen, ... 3 per cent.
Actual potash, ... 10 "
Available phosphoric acid, 8 "

After the first year, the percentage of nitrogen and phosphoric acid may be reduced about one-half.

Suggestions. Hops are propagated by slips or cuttings

of the roots, set in hills from 8 to 10 feet apart, from 3 to 5 slips in a hill. The first year the land is cultivated sufficiently to keep it free from weeds, and the vines are allowed to trail on the ground. The second spring, poles for the climbing vines must be provided, one pole, 15 to 20 feet long set in each hill. When such poles cannot be procured without too great expense, those 8 to 10 feet long may be used, and their tops connected by heavy wire or twine, to which the vines may cling. The hop for market is usually gathered as soon as matured and then dried in kilns.

HORSERADISH.

Soil. A deep, rich loam is best for horseradish, which utterly refuses to grow in hard clay, or any soil not in "good heart." The soil should be moist, but not wet; heavy crops are often grown on ditch banks.

Fertilizing. The soil cannot be made too rich. Use per acre from 800 to 1,000 pounds of a fertilizer containing:

Nitrogen, ...	4 per cent.
Actual potash, ...	9 "
Available phosphoric acid,	7 "

Suggestions. Horseradish can be grown on ground from which cabbage, beet or other early crops have been harvested, and if the soil was well fertilized for those crops, not more than half the amount of fertilizer above recommended is needed. Small roots, 4 to 6 inches in length, $\frac{1}{4}$ to $\frac{1}{2}$ inch in diameter, are used for planting. These are set

16 to 18 inches apart between the rows of other vegetables, and by fall will be nearly a foot in length, 1 to 1½ inches in diameter, and in their best condition for market. Digging can be done at any time before the ground freezes. The side roots and branches are broken off for planting, and the large roots packed away for selling at any time during the winter.

JUTE.

Jute requires the same soil and fertilizer as hemp. It has been planted to some extent in the southern states and California where no trouble has been experienced in securing a heavy yield when planted on strong, moist soil. The great obstacle to its general cultivation is the want of a suitable machine for separating the fiber from the stalk.

KAFFIR CORN.

This is the most common of the many forms of non-saccharine sorghums, such as Dhourra or Durra Corn, Egyptian Corn, Jerusalem Corn, Millo Maize and other similar varieties, all of which need the same soil, fertilizer and treatment.

Soil. A deep, rich, sandy loam is best, though it does fairly well on somewhat heavy soils, and is often grown on those comparatively dry.

Fertilizing. The plant makes a rank growth and produces a heavy crop of seed, and should be given a good

supply of a complete fertilizer. Use, per acre, from 400 to 600 pounds of a fertilizer containing:

Nitrogen, ...	2 per cent.
Actual potash, ...	9 "
Available phosphoric acid,	6 "

Suggestions. The planting and cultivation of Kaffir corn and its allies are the same as for sorghum. The crop is rapidly becoming popular, especially in regions subject to severe drouth. It not only makes a heavy yield of good forage, but also of seed much greater than that of corn. even in seasons so dry as to make ordinary corn a failure, The seed is used in the place of corn and is worth fully three-fourths as much for feeding purposes. The report of the Kansas Station for 1898 states that "on the college farm, for the last nine years, the average yield per acre of Kaffir corn has been 45.9 bushels as against 34.2 of ordinary corn. When both crops were used for fattening hogs, the Kaffir corn gave 454 pounds of pork per acre, and the ordinary corn 402 pounds."

KALE—KOHL RABI.

(See Cabbage.)

LETTUCE.

Soil. The soil for lettuce should be a rich, mellow loam, and if somewhat sandy and gravelly it will be better than if too heavy. The ground must be well drained, and if level, is better made into narrow beds so that water from

heavy rains will run off quickly. Lettuce is now grown under glass extensively, for which purpose the soil should be two parts well rotted sod, two of thoroughly decayed stable manure, and one of coarse sand or gravel.

Fertilizing. Neither stems nor seeds are desired, and crispness and quality depend largely on the rapidity of its growth, hence the fertilizer should contain a large proportion of nitrogen, as compared with potash or phosphoric acid. Use, per acre, 1,000 pounds of a fertilizer containing:

Nitrogen, ...	3 per cent.
Actual potash, ...	9 "
Available phosphoric acid,	6 "

When it is grown under glass, use for each 3 x 6 sash, at least two pounds of the above fertilizer.

Suggestions. In the open, it may be planted between early cabbage and cut out before the cabbage needs all the space. The greatest difficuly in growing lettuce under glass is the drop, which is often very destructive, but which may be prevented by keeping the lettuce cool and well cultivated, to stimulate a vigorous growth, with sub-irrigation instead of surface water, and care in ventilation, the rot may be kept under complete control.

LUCERNE.

(See Alfalfa.)

LUPINE.

Soil. Lupines do best on a light, sandy soil, which is

poor in lime. Heavy loams and clays are not favorable for the yellow varieties, though the other varieties do fairly well on such soils.

Fertilizing. Being a legume, lupine does not need nitrogen in the fertilizer, and is benefitted by phosphates. Lime is somewhat injurious, and the best fertilizer would be about 400 pounds per acre of a mixture containing 8% potash and 8% phosphoric acid.

Suggestions. It is a valuable forage crop, but is grown principally for green manuring. It often makes a poor growth when planted for the first time, but continued planting on the same ground usually adapts the soil to the crop. According to experiments made by the Experiment Station at Bremen, Germany, the soil was made fit for lupines by the addition of small quantities of soil containing clover roots from a field where clover had been successfully grown.

MANGEL WURZEL.

(See Beets.)

MELONS.

Canteloupes, cucumbers, melons, pumpkins and squashes, need practically the same kind of soil, fertilizer and treatment.

Soil. A light, rich, sandy loam is best for these crops, and satisfactory yields can never be secured on a wet heavy soil, or one which has not been well fertilized. Newly

cleared timber lands are excellently suited for melon ground.

Cultivation. The hills are made by crossing furrows at right angles or squares. The hills should be from ten to twelve feet apart for watermelons, pumpkins, etc., for canteloupes and cucumbers, six feet.

Fertilizing. Farmyard manure is useful in growing this crop. Use, per acre, about 1,200 pounds of a fertilizer containing:

Nitrogen, ...	3 per cent
Actual Potash, ...	8 "
Available Phosphoric acid,	8 "

This should be applied—a large handful in each hill.

Suggestions. It is desirable to have melons and cucumbers mature as early as possible, and many growers hasten them forward two or three weeks by planting the seed in flower pots placed in cold frames. Melons, squashes and cucumbers should be planted as early as it can be done and still have them safe from late frosts. Squashes and pumpkins can be grown on somewhat heavier soils than melons.

MILLETS.

Millet is a general term used to designate certain cereal and forage grasses. In some countries, certain sorghums are included under the name millet, while in this country several grasses of an entirely different character are locally so called.

Soil. A fertile, mellow soil is preferable, and loams with little clay and not too much sand, give good results. The crop will grow well on good corn, wheat or oat land.

Fertilizer. Millets are gross feeders, and a liberal fertilizing which produces a rapid growth, makes a much better quality, and greatly increases yield of hay. Use, per acre, 600 to 800 pounds of a fertilizer containing:

Nitrogen, . . , . . . 3 per cent.
Actual Potash, ... 8 "
Available Phosphoric acid, 8 "

Suggestions. Of the several varieties of millet, differing principally in size, the one known as "German" millet grows from three to five feet high, and makes a large yield on heavy soils. The "common" millet grows 2½ to 4 feet high, and is the best variety for light soils. The "Hungarian" is the smaller and earlier maturing than those just named. Seed may be sown at almost any time during the summer and the crop will be ready to harvest in from 40 to 45 days from sowing, and should be cut as soon as the heads appear, and before the seed becomes milky; when cut too late, the hay will be of poorer quality and unsafe for horse feed. "Pearl Millet," "Texas Millet," "African Millet," "Japanese Millet" and many others are cultivated occasionally, but they are not true millets, and few of them are of general value. "Japanese Barnyard" is one of the most valuable varieties for green forage or ensilage.

MILLO MAIZE.

(See Kaffir Corn.)

MINT.

Soil. A rich loam or peaty soil, not too wet, is best for mint.

Fertilizing. Mint is a perennial plant, so the soil should be made rich by growing clover or some other crop for green manuring before planting it. Use an annual top-dressing of 700 pounds per acre of a fertilizer containing:

Nitrogen, ... 4 per cent.
Actual Potash, ... 7 "
Available Phosphoric acid, 7 "

Suggestions. It is grown principally in New York and Michigan with a little in Mississippi and other southern states. The soil on which it is grown affects the quality of the oil in a marked degree, and tests should be made on small lots before large areas are planted. Where it does well it is very profitable.

MUSTARD.

Soil. Mustard will grow on almost any soil, even the very light and sandy.

Fertilizer. Not much fertilizer is needed when it is grown after clover, early potatoes and other crops which have left the ground in good condition, but it pays to add a little when the seed is sown. When grown for seed, use, per acre, about 300 pounds of a fertilizer containing:

Nitrogen, ... 3 per cent.
Actual Potash, ... 8 "
Available Phosphoric acid, 7 "

Suggestions. Mustard is often grown for green manuring, as it can be grown very quickly after early crops have been gathered. It does not, like a legume, assimilate nitrogen from the air, and so is less valuable for plowing under than plants of the pea family. It may, however, be an important agent in conserving nitrogen, as it prevents loss of that element by leaching in late fall or early winter. Its rapid growth and large size enables it to supply humus in larger amounts than could be secured from most other quick crops.

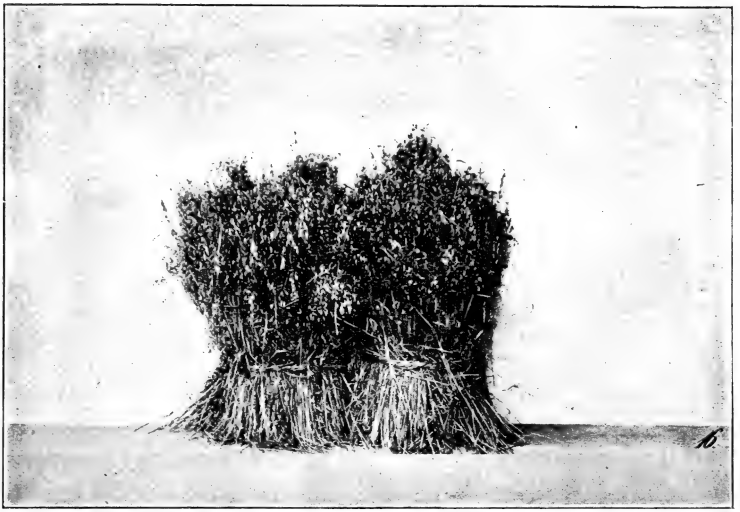
OATS.

Soil. While oats do best on a rich mellow loam, they will adapt themselves to almost anything, from thin uplands to reclaimed swamps. On dry soils, they produce much less straw in proportion to the grain than on those containing an abundant supply of moisture.

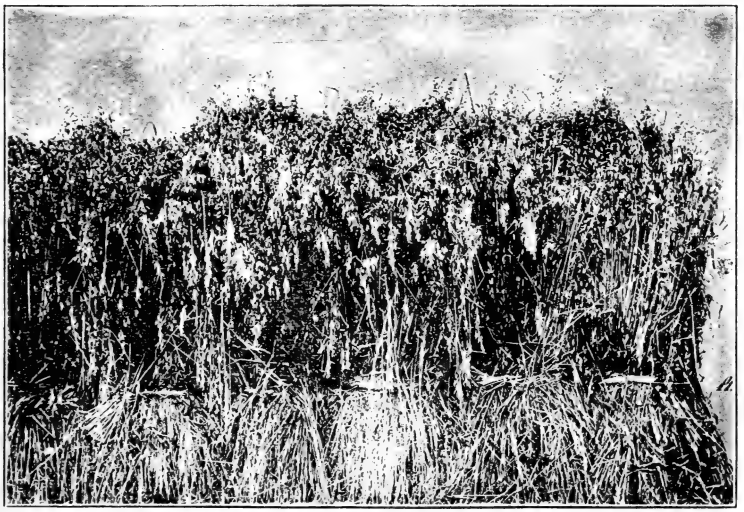
Fertilizer. Like other grains, oats need a liberal supply of phosphoric acid and potash and sufficient nitrogen to secure a medium growth of straw. Apply per acre 400 to 600 pounds of fertilizer analyzing:

Nitrogen, ... 3 per cent.
Actual Potash, ... 5 "
Available phosphoric acid, 8 "

Suggestions. In the north, oats are always sown in the spring, but in the south, frequently in the fall. Some varieties make valuable winter pasture, and the yield of grain is not injured if stock is taken off as soon as the



OATS, UNFERTILIZED. EXPERIMENT BY PROF. WAGNER (GERMANY).



OATS. COMPLETE FERTILIZER. EXPERIMENT BY PROF. WAGNER (GERMANY).

plants begin to shoot. Oats, in common with most other small grains, suffer from smut (ustilage). This smut, like all other fungi, grows from spores which become attached to the seed oats before they are sown. Nearly all of these spores may be killed by dipping the seed oats in hot water 15 minutes. The water should be heated to 132½ degrees F., and not vary more than two degrees from that temperature. Full directions for this treatment have been published in Bulletins of several Experiment Stations.

OLIVE.

Soil. The Olive thrives best on sandy or gravelly soils and can be grown only in a warm climate.

Fertilizing. Like other fruit trees, the olive needs large amounts of phosphoric acid and potash, with relatively little nitrogen. If crimson clover, vetches or cow-peas are grown in the orchard, little or no other nitrogen fertilizer need be used. Use from 2 to 4 pounds per tree of a fertilizer containing

Actual Potash, ... 8 per cent.
Available phosphoric acid, 8 "

Suggestions. Olives are grown in California and to some extent along the coast of the Gulf of Mexico. The trees do not bear before they attain a considerable age, but old orchards, which have received good care are very profitable. The California Station has published a number of complete reports on its cultivation, and, in its report for

1890, states that the quality of the oil is generally in proportion to the amount of potash in the soil.

ONIONS.

Soil. Onions do best on a light, loamy soil which has been kept free from weeds by careful cultivation. They do better when grown year after year on the same land properly fertilized. The soil needs to contain considerable humus, and be retentive of moisture; mucks are sometimes selected for onion farms.

Fertilizing. Thoroughly rotted stable manure is a suitable fertilizer, but fresh stable manure should not be used because it contains seeds of grasses and weeds which will increase the labor in keeping the onions clean. Commercial fertilizers contain no seeds and are to be preferred. Nitrogen should be applied freely. Use, per acre, at least 1,500 pounds of a fertilizer containing

Nitrogen, ...	4 per cent.
Actual Potash, ...	7 "
Available phosphoric acid,	6 "

Suggestions. If the onions are grown on a muck land, the amount of nitrogen which retards ripening, may be decreased to 2%, but the full percentage of phosphoric acid and potash should be given. Sulphate of potash often produces better results than muriate. Lime is also needed for onions. The usual practice has been to grow early onions from sets grown the previous year, but it is now

ONIONS.

(12) SHOWS YIELD FROM UNFERTILIZED PLOT.

(9) " " " APPLICATION OF BONE BLACK AND MURIATE OF POTASH.

MASSACHUSETTS EXPERIMENT STATION.

ONIONS.

(11) SHOWS YIELD FROM DRESSING OF 320 LBS. LIME PER ACRE.

(10) " " " APPLICATION OF NITRATE OF SODA, LONE BLACK AND MURIATE OF POTASH

MASSACHUSETTS EXPERIMENT STATION.

becoming a common practice in the middle and southern states to sow the seed in hot-beds or cold frames, six or eight weeks before they can be put in the field, and transplant the young seedlings. The expense of growing seedlings in this way is less than the cost of growing sets, the plants make a more rapid growth and the crop is of better quality. Heavy late crops are sometimes grown by sowing the seed broadcast on very rich, newly plowed sod and covering with light harrow, but the success of such crops depends almost wholly on the uncertain, unreliable weather during the two or three weeks after sowing.

ORANGES AND LEMONS.

Soil. A deep, mellow and well drained soil is necessary for the orange and lemon. The black hammock lands of Florida, the alluvial lands of the lower Mississippi, and the loose, gravelly lands of California produce heavy crops of fine fruit.

Fertilizing. The fruit of the orange contains unusually large amounts of lime, phosphoric acid and potash, and therefore these elements should be supplied liberally. The California soils contain more lime and potash, but phosphoric acid is greatly needed. Use from 5 to 10 pounds per tree of a mixture containing

Nitrogen, ... 4 per cent.
Actual Potash, ... 9 "
Available phosphoric acid, 8 "

The amounts recommended above may seem excessive,

but as a crop from an orange grove in full bearing is at least 20,000 pounds per acre, which contains 16 pounds of phosphoric acid, 45.9 of lime and more than 100 pounds of potash, it may readily be seen that it is not too great.

Suggestions. Orange trees need thorough but shallow cultivation when young, and because of the leaves remaining on the trees during the winter, the ground beneath them should be kept covered as thoroughly as possible. Crimson clover is the best crop for that purpose, and, when plowed under in the spring, there will usually be enough plants left around and under the trees to reseed the grove for the following season.

PARSNIPS.

The parsnip needs similar soil and treatment as recommended for the carrot, and nearly the same kind of fertilizer, though the nitrogen and potash should be increased about one-fourth while the amount of phosphate may with advantage be doubled.

PEACH AND ALMOND.

Soil. The peach and almond thrive best on well drained, somewhat sandy and gravelly upland; in fact, some of the most successful orchards are on soils too light and sandy for most other crops.

Fertilizer. Although the peach will grow on a thin soil, it needs high fertilizing to produce full crops of the large, well-flavored, high-colored fruit. When the trees

PEACHES, UNFERTILIZED. EXPERIMENT FARM, SOUTHERN PINES, N. C.

PEACHES WITH COMPLETE FERTILIZER, POTASH, PHOSPHORIC ACID AND NITROGEN. EXPERIMENT FARM, SOUTHERN PINES, N. C.

are first planted, growth should be stimulated by using about one pound per tree of a fertilizer containing

Nitrogen, ...	3 per cent.
Actual Potash, ...	9 "
Available phosphoric acid,	9 "

With advancing age, the amount of fertilizer used should be increased about one pound per tree, each year, until the trees are in full bearing. If clover, peas or other legumes are grown in the orchard, a part of the nitrogen may be omitted from the fertilizer.

Suggestions. The peach orchard should be kept cultivated and no other crop raised between the trees after the first two or three years. Irish or sweet potatoes, or melons are good crops for a young orchard, but when the trees begin to bear, it is better to seed the ground with crimson clover, vetch or lespedeza in the south, and with peas or red clover in the north.

The "yellows" is the most troublesome disease affecting the trees. This disease is more prevalent in the north than in the south, and, while its effects may be partly counterbalanced by heavy applications of potash, the only safe treatment is to dig and burn every affected tree. That most troublesome insect, the "Peach borer" which attacks the trees just above the surface of the ground can do little harm if the soil be mounded up a foot high around the base of each tree.

PEANUTS.

Soil. The peanut does best on a light, sandy soil, rich in lime. It is useless to plant peanuts on muck land or on heavy clay.

Fertilizing. If the soil be not rich in lime, it must be made so by the use of land plaster (gypsum) or, if more convenient, by air-slaked lime. The valuable part of the crop is the nuts, hence phosphoric acid and potash should be used liberally, 600 to 700 pounds of a fertilizer containing 8% potash and 8% phosphoric acid is about right.

Bulletin No. 31 of the Arkansas Station says: "The plant has, in a high degree, the capacity to produce its nitrogen from the air through the tuberculous growth on its roots, and therefore does not require much, if any nitrogenous manure. But like all legumes, mineral manures are especially beneficial, and potash and phosphoric acid should be applied to all poor soils."

Suggestions. Peanuts are grown largely in all of the southern states. Planting should be done at the same time beans are planted, in rows $3\frac{1}{2}$ to 4 feet apart, 18 to 24 inches apart in the rows. If the seeds are hulled before planting, they will germinate more quickly, but it must be done so carefully as not to break the skin of the seeds or they will decay. Many growers prefer to plant without hulling. The two most common varieties are the white and the red. The Spanish peanut is grown extensively in the Gulf States as feed for hogs and for hay.

PEANUTS, UNFERTILIZED. EXPERIMENT FARM, SOUTHERN PINES, N. C, YIELD 410 LBS. NUTS PER ACRE.

PEANUTS WITH COMPLETE FERTILIZER, POTASH, PHOSPHORIC ACID AND NITROGEN. EXPERIMENT FARM, SOUTHERN PINES, N. C. YIELD 1540 LBS. NUTS PER ACRE.

PEARS.

Pears require the same soil and fertilizer as the apple, but will grow further south, succeeding well in the extreme southern part of the country.

Suggestions. "Fire Blight" is a most destructive disease on pear trees, and no reliable remedy or preventive has yet been found. If the blight makes its appearance every diseased limb and twig should be burned after being cut away, well below the diseased parts. Most pears fruit more freely if their flowers are fertilized by pollen from some other varieties, so it is better to plant occasional trees of different kinds, even though the bulk of the trees are of a single variety.

PEAS.

In the north the ordinary garden pea is the "Pisum sativum" and is often called the "English" pea. In the south the cow-pea "Dolichos sinensis" which has already been discussed under that name, is often spoken of as "peas"

Soil. A good sandy loam, or light clay loam is the best soil for peas, and it should not contain too much humus, which makes an excess of vines and a scarcity of pods.

Fertilizer. No nitrogen is needed beyond a small amount to give the plants a vigorous start Use from 600 to 800 pounds per acre of a fertilizer containing :

Actual potash, ... 8 per cent.
Available phosphoric acid, 8 "

This is a heavier application than is needed for the peas alone, unless they are wanted as early as possible, in which case their growth should be hastened by liberal fertilizing, especially with phosphoric acid. Any of the fertilizer not used by the peas will remain in the soil without loss, and become so thoroughly dissolved that it will be immediately available for the succeeding crop, which will need but little more, and which should be planted as soon as the peas are gathered.

Suggestions. The peas grow well in cool weather, endure moderate frosts without injury, and should be sown as early in the spring as the ground can be worked. In the south they are often sown in December, to be ready for market in March. When grown in warm weather, the vines are usually much weakened, if not killed, by mildew.

PIEPLANT.

(See Rhubarb.)

PINEAPPLES.

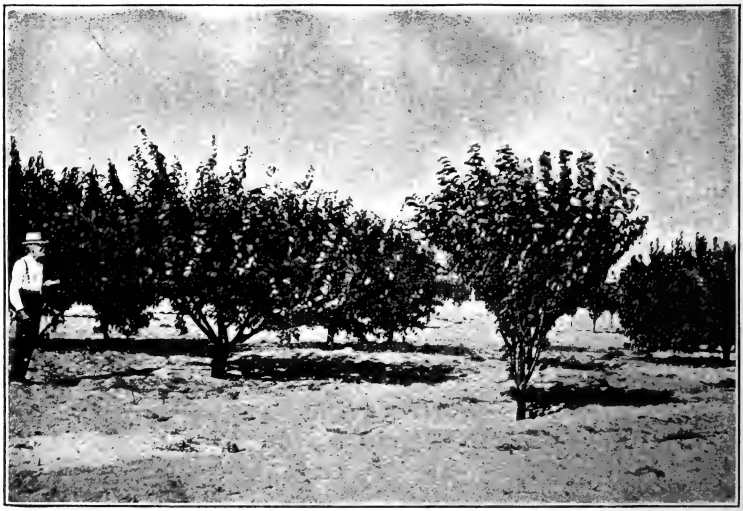
Soil. A light, sandy loam is the best for pineapples, which can be grown only in localities wholly free from frost.

Fertilizer. Before planting a field of pineapples, it is well to raise on it a good crop of cow-peas, which should be fertilized very heavily. During the early growth of the pineapple it needs a considerable amount of nitrogen. As the plants become older, considerable amounts of phos-

PEARS, (KIEFFER) UNFERTILIZED. EXPERIMENT FARM, SOUTHERN PINES, N. C.

PEARS (KIEFFER) WITH COMPLETE FERTILIZER, POTASH, PHOSPHORIC ACID AND NITROGEN. EXPERIMENTAL FARM, SOUTHERN PINES, N. C.

PLUMS, UNFERTILIZED. EXPERIMENT FARM, SOUTHERN PINES, N. C.



PLUMS WITH COMPLETE FERTILIZER, POTASH, PHOSPHORIC ACID AND NITROGEN. EXPERIMENT FARM, SOUTHERN PINES, N. C.

phoric acid and potash are needed. A bearing pineapple field should receive yearly, per acre, from 1,200 to 1,600 pounds more of a fertilizer containing:

Available phosphoric acid, 9 per cent.
Nitrogen, ... 4 "
Actual potash, ... 9 "

In making the application, the fertilizer should not be allowed to come in contact with the leaves.

Suggestions. The only parts of the United States in which pineapples can be grown successfully are southern Florida, where their cultivation is proving exceedingly profitable.

PLUMS.

Soil. Plums do best on a rather compact clay, though they thrive on a somewhat sandy soil having a clay subsoil.

Fertilizer. Like all hardwood trees, plums require large supplies of potash, and are greatly benefitted by an annual application of from 500 to 700 pounds of a fertilizer containing:

Actual potash, ... 8 per cent.
Available phosphoric acid, 9 "
Nitrogen, ... 2 "

Suggestions. There are in cultivation many varieties of plums which have come from several distinct species and hybrids. In the northeastern states the European sorts, like Green gage, Washington and Lombard, are generally preferred; in the middle and northwestern states

some of the American sorts, like Wild Goose, Chicasaw and Minor succeed better, while in the southern states, the Japanese varieties, Burbank, Abundance, Red June and others are more popular. All need the same general treatment. In the central and northern states, the "black-knot" is troublesome and is best treated by the prompt removal of all infected twigs. Brown rot of the fruit is more difficult to treat; but may be largely prevented by gathering and burning all diseased fruit. The curculio is the most troublesome insect, but many of the beetles may be killed by spraying the trees with one pound of Paris green in 100 gallons of water. Spray just before the flowers open, and again ten days later.

POTATOES.

(Irish.)

Soil. Irish potatoes grow best on a light, mellow sandy loam fairly moist, but well drained. If grown on dry and heavy soil, the yield is light, while a wet soil produces potatoes of watery, poor flavor.

Fertilizer. Fresh stable manure is almost sure to make the potatoes scabby, irregular in shape and coarse in texture. A crop of 200 bushels of potatoes removes from the soil in tubers, etc., 46 pounds of nitrogen, 74 pounds of potash and 21 pounds of phosphoric acid, which clearly shows the need of mineral fertilizers. Use, per acre, from 1,000 to 1,500 pounds of a fertilizer containing:

IRISH POTATOES, VERY POOR LAND, UNFERTILIZED. J. M. MC MURTREY, RISON, ARK. YIELD 7½ BUSHELS PER ACRE.

IRISH POTATOES, VERY POOR LAND, FROM PLOT RECEIVING COMPLETE FERTILIZER CONTAINING 3% NITROGEN, 8% PHOSPHORIC ACID AND 12% POTASH. J. M. MC MURTREY, RISON, ARK. YIELD 97½ BUSHELS PER ACRE.

Nitrogen, ...	3 per cent.
Actual potash, ...	9 "
Available phosphoric acid,	6 "

Much larger quantities are successfully used. Like all starch producing plants, it needs a liberal supply of potash; and of the potash salts, sulphate is regarded as better than either the muriate or kainit.

Bulletin No. 12 of the New Hampshire station says: "So far as this series of plots is concerned, we have evidence that nitrogen is of the least importance, potash of the most, and phosphoric acid intermediate, and it is clearly the case that phosphoric acid and potash combined give a good crop, well up towards the complete mixtures." The report of the Massachusetts Station for 1895 says: "The yield of potatoes in every instance is larger in case sulphate of potash has furnished the potash of the fertilizer used than where muriate of potash has served for that purpose." Bulletin No. 21 of the Kentucky Station says: "From the results obtained it would appear that both potash and nitrogen are needed on our soil for potatoes; that potash alone greatly increases the yield; that nitrogen does to some extent, but that best results are obtained by a combination of the two. Trials for six years have shown that potash greatly increases the yield of potatoes when applied to our soil."

Suggestions. Hundreds of experiments have been made in planting large and small whole potatoes; and potatoes cut in pieces of various size. The results of these

experiments have been very contradictory and seem to have been influenced as much by the soil and season as by the kind of seed used. In ordinary practice the best results generally come from planting good sized, well matured and healthy tubers, cut to two or three eyes.

Potato scab can be prevented by soaking the seed, either whole or cut, for two hours, in a solution of corrosive sublimate, (2 oz. to 18 gallons of water) or in a solution of formalin 1 to 250. Potato rot and blight can usually be prevented by spraying with the Bordeaux mixture, and the ravages of the Colorado (potato) beetle can easily be prevented by dusting the vines with Paris green or London purple.

POTATOES.

(Sweet.)

Soil. A light, sandy loam is best for sweet potatoes, and it is useless to plant them on any wet or heavy soil.

Fertilizer. The soil should be rich, but not contain an excess of nitrogen, or the plant will run too much to vines and the potatoes will be coarse and watery. When sweet potatoes have been grown on the same land for years, the soil is said to become "potato sick." For ordinary soils, use, per acre, from 600 to 800 pounds of a fertilizer containing:

Nitrogen, ... 2 per cent.
Actual Potash, ... 7 "
Available phosphoric acid, 6 "

SWEET POTATOES, UNFERTILIZED. EXPERIMENT FARM, SOUTHERN PINES, N. C.

SWEET POTATOES WITH COMPLETE FERTILIZER, POTASH, PHOSPHORIC ACID AND NITROGEN. EXPERIMENT FARM, SOUTHERN PINES, N, C.

SWEET POTATOES FROM PLOT TREATED WITH LIME; YIELD PER ACRE 220 BASKETS. J. W. KILLEN, FELTON, DEL.

SWEET POTATOES FROM PLOT RECEIVING COMPLETE FERTILIZER, CONTAINING 3% NITROGEN, 8% PHOSPHORIC ACID AND 12% POTASH. YIELD 600 BASKETS PER ACRE. J. W. KILLEN, FELTON, DEL.

Bulletin No. 54 of the New Jersey Station says: "Wherever potash was used the improvement in the value of the crop was from 8 per cent. to 107 per cent. In all cases where potash was excluded the decreases in the value of the second potato crop are serious being from 36 to 63 per cent."

Suggestions. In the middle and northern states, sweet potatoes must be planted very early, using sprouts from potatoes planted in hot-beds. In the South small plantings are made early in the spring either by planting pieces of potatoes or sprouts grown in beds. After these have grown a short time the ends of the vines are clipped off for successive plantings as late as July, the main crop being grown on land from which Irish potatoes, melons or some other early crop has been harvested. The potatoes are kept through the winter like Irish potatoes, but must be kept at a temperature of about 60 degrees F. In the north care must be taken to keep them warm, while in the south the endeavor is to keep them cool. In any case, they must be kept dry.

PUMPKINS.

(See Melons).

QUINCES.

Soil. Quinces do best on a moist clay, abounding in humus, especially if the ground about the roots is somewhat shaded. Where only a few are grown it is a good

plan to secure shade by planting them on the north side of a fence or building. When planted on lighter dry soil, they sometimes make a fair growth, but rarely bear well.

Fertilizing. It needs the same fertilizer as the apple and is greatly benefited by an occasional mulching with fresh stable manure.

Suggestions. Quinces are commonly treated with neglect, but there is no fruit which will give better return for good care. They are easily grown from cuttings set in the open ground in the fall. The more common varieties are the "Champion" in the south and the "Orange" in the north. The trees should be well cultivated until they come into bearing, when the ground should be seeded with clover or some other legume.

RADISHES.

Soil. Radishes, which are grown mainly for use in early spring, should be planted on the lightest and warmest soil which can be found. Their growth is slow and their quality poor when planted on wet or heavy soils.

Fertilizing. The more quickly a radish is grown, the better it will be, so nitrogen should be used freely, with an abundant supply of potash to produce its much desired large starchy root. Seed is not wanted, so little phosphoric acid is needed. Use, per acre, from 700 to 900 pounds of a fertilizer containing:

Nitrogen, ...	5 per cent.
Actual Potash, ...	9 "
Available phosphoric acid,	6 "

When only small areas are planted, use about 5 pounds of the fertilizer on each square rod.

Suggestions. Radishes are ready for use about six weeks after they are planted, and are usually grown as a catch crop to occupy the ground until it is needed for other purposes. After beets are planted, radish seed is often scattered broadcast between the rows and covered with a rake. The turnip rooted sorts mature a few days earlier, and are better flavored than the long rooted kinds, but yield much less. For the home garden both kinds should be planted so as to prolong the season.

RAMIE.

Soil. A deep, rich alluvial soil which never suffers from drouth is best for ramie. It is one of the few plants which will thrive on alkali lands, provided they do not contain carbonate of soda.

Fertilizer. Ramie needs very heavy fertilizing. It is a perennial, and ten tons of stalks per acre is a fair yield. Such a crop takes from the soil every year, 370 pounds of nitrogen, 156 pounds of phosphoric acid, and 252 pounds of potash. The bark alone removes 206 pounds of nitrogen, 11 pounds phosphoric acid, and 28 pounds of potash. If the stalks and leaves are stripped and returned to the field as manure, the fertilizer used per acre should be from 600 to 800 pounds of a mixture containing:

Nitrogen, ... 4 per cent.
Actual potash, ... 9 "
Available phosphoric acid, 6 "

If this refuse be not returned to the field, the fertilizer application should be doubled.

Suggestions. Ramie is usually propagated by dividing the roots. It makes a luxuriant growth in the south, and in California, but has not come into general cultivation for want of a machine to separate the fiber from the stalk. The fiber is imported from India and China, where the separation is done by hand. As soon as machinery is devised for doing this work economically, it is believed that ramie will become an important crop in the warmer parts of the United States.

RAPE.

Soil. A strong loam or clay is generally preferred, but any soil which will make a good crop of corn or potatoes will also make a good crop of rape.

Fertilizer. Rape is a heavy feeder and needs heavy manuring to make its best yield. It is grown for its stems and leaves, so the fertilizer must be rich in nitrogen and potash. It is near of kin to the turnip, and like it responds to liberal applications of phosphoric acid also. Use, per acre, from 600 to 800 pounds of a fertilizer containing:

Nitrogen, . . : . .	4 per cent.
Actual potash, ...	8 "
Available phosphoric acid,	8 "

Suggestions. Rape has much the appearance of a Swedish turnip, but grows from 2 to 3 feet high, and its leaves make excellent forage. It is specially valuable as a

soiling crop and gives good grazing for hogs, sheep and cattle other than milch cows, as it gives a peculiar flavor to the milk. It succeeds much better in the north than in the south.

RASPBERRIES.

Soil. A deep, rich clay loam is best for raspberries On light soils they do well for a time, but are short lived.

Fertilizer. Use per acre from 600 to 800 pounds of a fertilizer containing:

Nitrogen, ...	3 per cent.
Actual potash, . . .	9 "
Available phosphoric acid,	7 "

Suggestions. The general treatment of raspberries should be the same as that recommended for blackberries. The two types most commonly grown in this country are the blacks and reds; the former as well as many of the red varieties, are natives of the northern states, while other red sorts are of European origin. The black varieties multiply by rooting the tips of the canes, while the red ones multiply by sprouts from the roots. Both succeed better in the north than in the south, and neither is profitable in the extreme south, though the blacks will bear a warmer climate than the reds.

RHUBARB.

(Pieplant.)

Soil. Rhubarb is grown solely for its fleshy and juicy

leaf-stalks, which should quickly reach their full size, and for which result a deep, very fertile soil is essential. A mellow clay which is somewhat moist is best, as the plants suffer quickly from drouth.

Fertilizer. Good rhubarb can be grown only on very rich soil and there is no danger that the soil will be made too rich. A heavy application of stable manure is good, but greater satisfaction will follow the use of the fertilizer recommended for asparagus.

Suggestions. Rhubarb cannot endure a warm climate, and is of no value in the southern part of the United States. In the cooler climate of the north the plants continue to grow stronger for many years if liberally fertilized, and the crop is often very profitable.

RICE.

Soil. Water rice or swamp rice needs low land, diked and ditched for flooding and draining. Upland rice grows best on black, peaty soils which never suffer from drouth.

Fertilizer. Planters of water rice find that it pays well to use, per acre, from 400 to 500 pounds of a fertilizer containing :

Nitrogen, ...	3 per cent.
Actual potash, ...	6 "
Available phosphoric acid,	6 "

On peaty uplands only about half this nitrogen is needed, but the other elements should be doubled.

Suggestions. Water rice, which constitutes the bulk

RYE UNFERTILIZED. F. E DAWLEY, FAYETTEVILLE, N. Y.
YIELD 1,720 LBS. GRAIN PER ACRE.

RYE WITH COMPLETE FERTILIZER, POTASH, PHOSPHORIC ACID AND NITROGEN. F. E. DAWLEY, FAYETTEVILLE, N. Y.
YIELD 3,420 LBS. GRAIN PER ACRE.

of the rice of commerce, is grown near the coast, from North Carolina to Louisiana. Upland rice is grown in the same region, but further from the coast. It is grown much like wheat, excepting that the drills are 15 to 18 inches apart to admit of cultivation, which greatly increases the yield.

RUTA BAGAS.

(See Turnips)

RYE.

Soil. When grown for grain, rye does well on soils light in texture and containing but little nitrogen. A soil rich in nitrogen will produce a rank growth of straw with light yield of grain. It succeeds better on high and dry, soil than on low, heavy lands. If grown for soiling or grazing, it should be on the richest loam available, so as to secure the heaviest possible growth.

Fertilizer. When grown for grain, stable manure should not be used, and even clover sod usually contains too much nitrogen. Soil otherwise in good condition is usually poor in potash, and on such the best yields will be secured by using, per acre, from 600 to 800 pounds of a fertilizer containing:

Actual potash, ... 6 per cent.
Available phosphoric acid, 6 "

When grown for soiling or grazing, stable manure should be used freely, or the fertilizer should contain 3 per cent nitrogen.

Suggestions. Rye is a valuable crop for soiling and winter grazing in the south, and one of the best for early spring grazing in the north.

SALSIFY.

Salsify requires the same soil and fertilizer recommended for carrots, but the subsoil must be loose, as the roots reach a depth of 12 to 15 inches.

Suggestions. Salsify is rapidly coming into general use. Its cultivation is as easy and simple as that of beets and carrots, and the roots can remain in the ground through the winter without injury. In the north it is usually dug and put in the cellar on the approach of winter, and in the south it can remain in the soil and be dug whenever it is wanted through the winter.

SOILING CROPS.

The term "soiling," has been applied to the practice of keeping cattle confined and feeding them on green-cut fodder. A much larger number of animals can be kept on the same area of land in this way than by pasturing. Few realize the immense quantity of feed that can be cut from an acre of fertile soil by keeping up a constant succession of crops.

A report of the Pennsylvania Station says: "In round numbers we can produce from three to five times as much digestible food per acre by means of the soiling crops, (rye and corn, or clover and corn) as is produced by pas-

turage such as is represented by our small plat." The plat in question was believed fairly to represent the average pasture. In a similar comparison made at the Wisconsin Station in four months, cows on upland bluegrass pasture produced 1,779 pounds of milk per acre of land used while when fed on green clover, oats and cut corn-fodder, the product was 4,782 pounds of milk per acre. From this Professor Henry concludes that "it is fair to state, that by soiling in summer a certain area of land will yield double the amount of milk and butter that it will when pastured." The Iowa, Massachusetts and other Stations have secured similar results.

To make soiling economical, heavy yields must be secured, and for heavy yields, heavy fertilization is essential, using such fertilizers as are recommended for different forage crops. Forage is the one thing wanted, so stable manure should be used in large amounts. The best crops and succession for soiling will vary with the locality and soil where they are grown. The Connecticut Experiment Station suggest the following series for that state, viz: Rye fodder, wheat fodder, clover, grass, oats and peas, Hungarian clover, soy-beans, cow-peas, grass, barley and peas, which crops give a succession of cuttings from May to October. Further south these crops should be replaced by others: Oats and vetch, crimson clover, red clover, sorghum, corn and cow-peas supplying the succession. Near the Gulf coast rice, teosinte and other crops may be used, while in the western and some of the southern states,

alfalfa alone will furnish green food during more than half the year. In many parts of the United States the Japanese barnyard millet is now regarded as one of the most valuable soiling crops. Soiling requires less land and more labor than pasturing, and its economy must be decided by the relative cost of the two in any particular locality.

SORGHUM.

Soil. Sorghum makes growth on a heavy black loam and when grown for forage should be planted on such. When grown for syrup, it should be on a lighter and sandier loam, where the growth will not be so rank or the yield so heavy, but the juice will be sweeter, and the syrup a lighter color and better flavor on such land.

Fertilizer. For forage, bulk is the thing wanted, and the fertilizer should be rich in nitrogen and stable manure is good. Use per acre, from 600 to 800 of fertilizer containing:

Nitrogen, ...	4 per cent.
Actual potash, ...	8 "
Available phosphoric acid,	6 "

For syrup not more than half as much nitrogen and no stable manure should be used.

Suggestions. Early Amber and Early Orange are among the best early varieties, while Colman's Link Hybrid are among the best late ones. Sorghum is one of the best plants for soiling and for hog grazing, but when it

begins to make a second growth it is unsafe pasturage for cattle.

SOY BEAN.

Soil. The soy bean does best on a rich, moist, sandy loam, though it will do well on almost any soil excepting a hard, dry clay or one too wet.

Fertilizer. No nitrogen is needed, but as the plant produces a heavy crop of seed, it needs an abundance of phosphoric acid and potash. Use fertilizer recommended for rye. In the report of the Massachusetts Station for 1896, it is stated that "The test with soy beans showed that potash had the greatest effect upon the increase and quality of the crop."

Suggestions. The soy bean is erect and bushy in its growth, sometimes producing stems too coarse and woody to be eaten, but, by producing a large amount of leaves and an immense yield of seed, on good soils, it yields more forage and seed than the cow pea, but on poor soils the pea is a better crop. The seeds are sometimes sold as "coffee beans" and are used as a substitute for coffee.

SPINACH.

Soil. Spinach prefers a light, warm, well-drained soil, containing an abundance of humus.

Fertilizer. Market gardeners in the south sow it in August or September on land intended the next spring for a crop of early snap beans, using, per acre, from 800 to 1,000 pounds of a fertilizer containing :

Nitrogen, ... 4 per cent.
Actual potash, ... 8 "
Available phosphoric acid, 8 "

The spinach is cut during the winter, and there will be sufficient fertilizer left in the soil to carry the crop of beans which follows.

Suggestions. Spinach is perfectly hardy and will stand the winter in nearly all parts of the United States. The smooth seeded sorts are now the most commonly grown, the most popular being the "Norfolk Savoy" though the "Viroflay" is usually more productive.

SPURRY.

Soil. Spurry makes its best growth on very sandy soils, and will do well where it is so light and barren as to support hardly any other vegetation.

Fertilizer. Grown on such sandy soil, containing little plant food, spurry should be well fertilized to secure a vigorous growth. Use, per acre, from 600 to 800 pounds of a fertilizer containing :

Nitrogen, ... 4 per cent.
Actual potash, ... 9 "
Available phosphoric acid. 8 "

Suggestions. It grows much better in the north than in the south, and is especially valuable as a first crop on a sandy, pine-barren lands. On such soils it makes a better growth than any other plant, and, if plowed under green, forms humus for the following crops. It is eaten well by

STRAWBERRIES TREATED WITH PHOSPHORIC ACID AND NITROGEN. EXPERIMENT BY PROF. LIERKE (GERMANY).

STRAWBERRIES TREATED WITH PHOSPHORIC ACID, NITROGEN AND POTASH. EXPERIMENT BY PROF. LIERKE (GERMANY).

cattle. The Pennsylvania Station obtained a yield of 3,403 pounds of dry hay per acre, while the Oregon Station reports 20 tons of green forage per acre. The Louisiana and Mississippi Stations report a weak growth of only a few inches in height.

SQUASHES.

(See Melons.)

STRAWBERRIES.

Soil. Strawberries do best on a rich, light loam free from drouth. The growth on a heavy, dry clay is weak, and on a soil containing too much vegetable matter excessive in leaves and deficient in berries.

Fertilizer. Strawberries need an abundant supply of a complete fertilizer. Stable manure is objectionable especially on account of the seeds of grasses and weeds which it contains. Commercial fertilizers are more satisfactory. After the plants are set, apply per acre from 800 to 1,000 pounds of a fertilizer containing:

Nitrogen, ...	4 per cent.
Actual potash, ...	9 "
Available phosphoric acid,	9 "

Suggestions. The two common methods of growing strawberries are in hills and in matted rows. In hills the plants are set about 18 inches apart in the rows, with the rows about three feet apart. This method requires very high cultivation and constant care in cutting off the runners, but it

gives the largest and finest berries, and usually the heaviest yield. When in matted rows the plants are set about a foot apart in rows 4 feet apart, and allowed to cover a space 2 to 3 feet in width along the rows. This method requires much less labor than cultivation in hills, and is the method more commonly followed where the fruit is grown in large quantities for market. Whichever method of planting is followed it pays well to give the plants a heavy mulching in the fall to protect them from the winter cold, and to cover the ground, so that the berries will not be covered with sand by heavy rains during the ripening time. Hay, soy-beans, straw, chaffed corn, stover, forest leaves or cotton seed hulls make excellent mulching.

The most troublesome insect is the "Strawberry Crown Borer" which often kills a large part of the plants the second year. As the insect cannot fly, it can be avoided by planting on fresh ground every year, and plowing up the old plants after they have made their second crop. Leaf blight, which shows itself by bright red or purple spots on the leaves, is the most troublesome disease, but can be held in check by removing the affected leaves early in the spring and spraying the young leaves with Bordeaux mixture.

SUGAR CANE.

Soil. A deep, rich loam or alluvial soil is best for sugar cane, but by using sufficient fertilizer, it can be grown on almost any southern soil with good drainage.

Fertilizer. The yield of cane, 25 to 40 tons per acre,

emphasizes the need of liberal fertilizing. The best preparatory crop is cow-peas, plowed under in the fall. A good fertilizer would be from 600 to 800 pounds of a mixture containing:

Nitrogen, ... 3 per cent.
Actual potash, ... 9 "
Available phosphoric acid, 8 "

Suggestions. Sugar cane, or "Louisiana Cane" as it is often called, can be profitably grown only in the extreme southern states and fully 90% of that grown in the whole country is grown in Louisiana. It does not produce seed in this country, but is propagated by pieces of the old cane, laid lengthwise and covered in the bottom of a deep furrow.

SUNFLOWER.

Soil. The sunflower will grow on almost any soil, but does best on a deep, strong loam with plenty of moisture.

Fertilizer. It is an exhaustive crop and needs to be well fertilized, especially with phosphoric acid, to secure a heavy yield of seed. Use, per acre, from 400 to 600 pounds of a fertilizer containing:

Nitrogen, ... 3 per cent.
Actual potash, ... 7 "
Available phosphoric acid, 8 "

Suggestions. Sunflower seeds are among the most fattening of grains, and are of special value for sheep and poultry, being in many localities the cheapest poultry feed

which can be grown. The yield equals that of corn, while the grain is much more fattening.

TEOSINTE.

Soil. A rich loam, heavy rather than sandy, is best for this crop. It bears drouth well, but makes its best yield on moist, rather than dry ground.

Fertilizing. Teosinte is grown solely for forage, hence nitrogen and potash should be given freely, while a large supply of phosphoric acid is not needed. Use, per acre from 300 to 600 pounds of a fertilizer containing:

Nitrogen, ...	4 per cent.
Actual potash, ...	8 "
Available phosphoric acid,	6 "

Stable manure, to which kainit has been added, may take the place of the above fertilizer; use ten tons per acre.

Suggestions. Teosinte is a tropical plant and succeeds best in the extreme south, though it is reported as growing well as far north as Pennsylvania and Kansas. It grows much like corn, though with longer, more numerous leaves, and rarely produces seed in this country. It should be planted twice as far apart as corn, because of its enormous "stooling" a single seed often producing 50 to 75 stalks. In favorable locations it is a valuable soiling plant, and may be cut two or three times during a season. If left to grow until fall, it yields from 25 to 50 tons of green forage per acre.

TOBACCO.

Soil. Tobacco is influenced more in quality than any other crop by the soil on which it is grown, and the fertilizer used. To produce a leaf of high quality, for cigar and smoking purposes, the soil should be light, and rich in vegetable matter. A low, rich and heavy soil will produce a very heavy crop, coarse and inferior. The fine gold leaf tobacco of North Carolina is grown on a light, gravelly soil and the Florida tobaccos are grown on light sandy soils. A red clay often produces a fine, rich, mahogany-colored tobacco, while black, alluvial soils generally produce abundant, heavy, coarse, strong leaves.

Fertilizer. The heaviest crops, usually not of the highest quality, are grown after clover. The second crop on such ground, if properly fertilized, is of better quality. Potash is of the highest importance, but to secure a leaf which will burn well, all forms of potash, such as kainit or muriate, containing chlorine, must be avoided. Sulphate of potash is generally preferred. Stable manure should be applied to the preceding crop rather than directly to the tobacco. For ordinary soils use, per acre, from 1,000 to 1,500 pounds of a fertilizer containing:

Nitrogen, ... 4 per cent.
Actual potash, ... 9 "
Available phosphoric acid, 5 "

1600 pounds of leaves, and 1,300 pounds of stems, an average crop, remove from the soil 89 pounds of nitrogen, 102 pounds of potash and 23 pounds of phosphoric acid.

The seventeenth report of the Connecticut Stations says: "Of the various potash salts, the double sulphate of potash and magnesia, (plot K) produced the largest total crop, 1,745 pounds, and the largest quantity of wrappers, 940 pounds.

Suggestions. There are many varieties of tobacco, and the selection should be made according to the soil on which they are to be grown, and the purpose for which to be used. The Alabama Station recommends: "For dark, heavy, rich shipping, the James River White Stew, James River Blue Pryor and Medley Pryor; for sweet fillers, Sweet Orinoco and Flanagan; for stemming into strips for European market, Hester, Tuckahoe and Big Orinoco; for mahogany wrappers, Flanagan, Primus and Long-Leafed Gooch; for cutters, Hyco, Yellow Orinoco, Granville Yellow and Yellow Pryor; for yellow wrappers and fillers, Sterling, Granville, Whitestem, Yellow Orinoco, Havana and Yellow Pryor." White Burley is a favorite variety for limestone soils. The quality of the leaf of any of these varieties can be greatly modified in the curing process. It is not difficult to secure a good yield, but not so easy to cure it properly; this requires special knowledge and experience.

TOMATOES.

Soil. Tomatoes grow in any good garden soil, or one which will yield good corn. For the earliest fruit the soil must be light and warm, but for a late crop a heavier soil is better.

TOBACCO, UNFERTILIZED. EXPERIMENT FARM, SOUTHERN PINES, N. C.

TOBACCO WITH COMPLETE FERTILIZER, POTASH, PHOSPHORIC ACID AND NITROGEN, EXPERIMENT FARM, SOUTHERN PINES, N. C.

VIEW OF TOBACCO EXPERIMENT FIELD, TREATED WITH POTASH, PHOSPHORIC ACID AND NITROGEN.
FLORIDA EXPERIMENT STATION.

Fertilizing. The crop should be well fed with a complete fertilizer, and there is little danger that the soil will be made too rich. Use, per acre, from 800 to 1,200 pounds of a fertilizer containing :

Nitrogen, ...	4 per cent.
Actual potash, ...	6 "
Available phosphoric acid,	7 "

Suggestions. Tomato plants should be started in boxes of rich soil in a green house or sunny window of a warm room about ten weeks before they can be planted in the open air. When the seedlings have made the second pair of leaves, transplant to about two inches apart in other boxes. As soon as they begin to crowd one another, transplant 4 inches apart in a cold frame, in which expose them to the air during the day, and protect by sash or cloth-covered frames at night. Transplant to the field or garden when there is no danger of frost. Except in the north, seed can be sown in the open ground for late plants, which may be handled like cabbage plants. Where an early ripening is wanted the plants are tied to stakes, and pruned to single stems bearing from three to six clusters of fruit; but for canning or a late crop, a heavier yield is secured by allowing the plants to fall on the ground, or to rest on pieces of brush or blocks of wood.

TREES AND SHRUBS IN NURSERY.

Soil. A soil of medium texture, well supplied with humus and deeply worked, is best for general nursery pur-

poses. A fertile, clay loam which was several years cultivated in grain, followed by a few years in sod, is in fine condition for growing trees.

Fertilizer. A nursery on good soil requires very little nitrogenous manures, which, supplied in excess, produce rank and sappy wood that does not ripen well. Only sufficient nitrogen should be used to keep the trees thrifty. All hardwood trees are rich in potash, and must be well supplied with it, to make the firm and well-ripened growth essential to their health and longevity. Phosphoric acid is as necessary as nitrogen or potash. Use, per acre, from 500 to 700 pounds of a fertilizer containing :

Nitrogen, ...	3 per cent.
Actual potash, ...	8 "
Available phosphoric acid,	7 "

Suggestions. Deep plowing and subsoiling before planting are necessary to insure a satisfactory growth of trees. Rotation of tree and shrub crops is necessary, just as in growing grain. Shade and fruit trees should be followed by ornamental trees, and these, in turn, by evergreens. After such a rotation, occupying from six to twelve years, it is better to use the land a few years for ordinary farm crops.

TURNIPS.

Soil. Turnips thrive best on a mellow loam, but will do well on any good garden soil not too heavy. Large crops are often grown even on freshly plowed sod.

Fertilizer. They must be grown rapidly to be of good quality, and hence require a liberal supply of nitrogenous fertilizer. Either cow or sheep manure is better than horse manure. When these are not to be had at less expense, use, per acre, from 400 to 600 pounds of a fertilizer containing :

Nitrogen, ...	2	per cent.
Actual potash, ...	5	"
Available phosphoric acid,	7	"

Suggestions. The flat-rooted, purple-top varieties make the quickest growth, and are preferred for quick maturing in the spring, also for fall planting where the crop is to be gathered before cold weather. Where they are to remain in the ground through the winter, as is common in the South, the globe varieties are more hardy and not injured by frost, which make the flat varieties corky and tasteless.

VETCHES.

Soil. The vetch does best on a rather heavy, moist loam, but will do well on moist clays, or any other soils not too light and sandy.

Fertilizer. Use the same fertilizers as recommended for cow-peas.

Suggestions. The hairy vetch (vicia villosa) a winter growing annual, seems to be at its best in the lower Mississippi Valley where crimson clover rarely succeeds. It should be sown in September or October. If to be used for grazing, winter tuft oats should be sown on the same

ground. By December the double crop gives fair grazing, and continues to improve until April, when stock should be taken off so that seed may mature. It is harvested in May or early June, after which the ground should be plowed for millet, cow-peas or some other summer crop, which will come off by October. Sufficient seed is usually left on the ground to reseed, and give another crop the following winter. In the north, winter vetch has proven hardy in localities where the crimson clover is almost always spring killed, and it must be regarded as a valuable forage crop where grown together with winter rye or wheat. This vetch and crimson clover are the most valuable winter growing legumes known, where they flourish. Both are fine for forage and can be grown when the land cannot be used for other crops, while either one is as valuable as the cow-pea for green manuring.

VELVET BEAN.

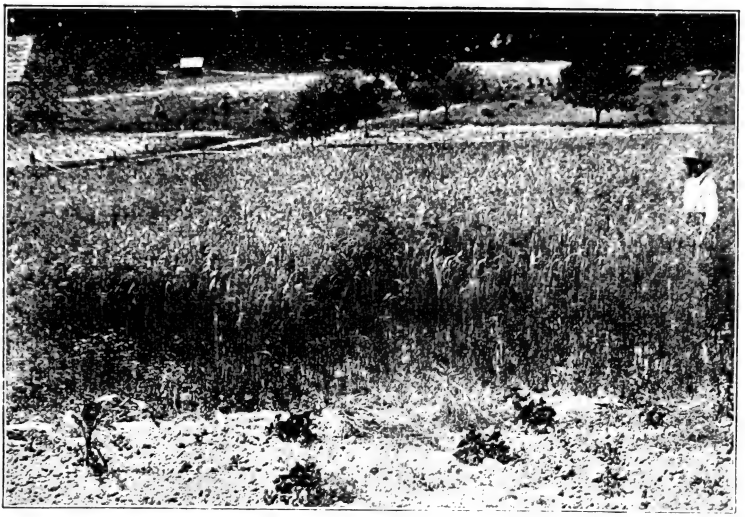
Soil. A rich, sandy loam is best; even a soil very light and sandy is better than one wet and heavy.

Fertilizer. Nitrogen is not needed, but phosphoric acid and potash should be given freely, as the plant is a rank grower and produces a heavy crop of seed. Use, per acre, from 300 to 600 pounds of a fertilizer containing:

Available phosphoric acid, 5 per cent.

Actual potash, ... 7 "

Suggestions. The velvet bean, a plant of recent introduction, is suited only to the extreme southern part of the



WHEAT ON POOR SOIL, UNFERTILIZED. T. B. LINDSAY, DOUGLAS, N. C.
YIELD 8½ BUSHELS PER ACRE.

WHEAT ON POOR SOIL WITH COMPLETE FERTILIZER, POTASH, PHOSPHORIC ACID AND NITROGEN. T. B. LINDSAY, DOUGLAS, N. C.
YIELD 20 BUSHELS PER ACRE.

country, where there are at least eight months without frost. In Florida and along the Gulf Coast, the vines grow 20 to 40 feet in length, and yield more forage than can be secured from cow-peas, but they become so tangled in their growth that they are hard to cure. The chief value of the crop is for late grazing and green manuring.

WHEAT.

Soil. The best soil for winter wheat is a rather compact clay loam, well drained. Spring wheat prefers a lighter soil, and even one which is quite sandy may produce a good yield if properly fertilized.

Fertilizer. In wheat growing, proper rotation of crops, is as important as heavy fertilizing. In the North, the best crop to precede wheat is red clover; in the south, either red clover, melilotus or cow-peas. These crops should be grazed off and the ground plowed, not too deep, in August or September. On such ground little or no fertilizer is necessary. Use, per acre, from 300 to 600 pounds of a fertilizer containing:

Nitrogen, ...	2 per cent.
Actual potash, ...	6 "
Available phosphoric acid,	8 "

Bulletin No. 62 of the Maryland Station says that the fertilizer which has been found best for wheat at that station contains 2% nitrogen 9% available phosphoric acid, and 7½% potash.

Suggestions. In the southern wheat growing regions the winter varieties succeed best, in the northern, spring varieties are more widely grown. In the southern states, spring wheat is of little value, because of its likelihood of being killed by rust. Winter wheat should be sown about two months before the usual time of heavy frosts: spring wheat should be sown as early as the soil can be worked. Hundreds of tests on red and white, smooth and bearded varieties, show no constant differences in their yields or milling value.

DISTANCES FOR PLANTING TREES.

(IN PLANTING TREES THE GREATER DISTANCE SHOULD BE GIVEN ON THE RICHER SOILS.)

Apples	20	to	30	feet	each way
Pears (Standard)	20	"	25	"	" "
Pears (Dwarf)	12	"	15	"	" "
Quinces	15			"	" "
Peaches	18	"	24	"	" "
Plums	15	"	20	"	" "
Cherries	15	"	20	"	" "
Figs	12	"	15	"	" "
Japan Persimmons	15	"	20	"	" "
Mulberries	20	"	25	"	" "
Oranges (Sweet)	20	"	25	"	" "
Oranges (Japanese)	12	"	15	"	" "
Blackberries	6	by	4	"	
Raspberries	6	"	3	"	
Currants	5	"	3	"	
Gooseberries	5	"	3	"	
Strawberries (Hills)	36 x 18 inches				
Strawberries (matted rows)	48 x 12 "				
Grapes	8 x 8 to 10 x 12 feet				

USUAL DISTANCES FOR PLANTING VEGETABLES.

(Bailey.)

Asparagus, rows 3 to 4 feet apart, 1 to 2 feet apart in rows.

Beans, bush, 2 to 3 feet apart, 1 foot apart in rows.

Beans, pole, 3 to 4 feet each way.

Beets, early, in drills 12 to 18 inches apart.

Beets, late, in drills 2 to 3 feet apart.

Cabbage, early, 16 x 28 inches to 18 x 30 inches.

Cabbage, late, 2 x 3 feet, to $2\frac{1}{2}$ x $3\frac{1}{2}$ feet.

Carrots, in drills 1 to 2 feet apart.

Cauliflower, 2 x 2 feet to 2 x 3 feet.

Celery, rows 3 to 4 feet apart, 6 to 9 inches in row.

Corn, sweet, rows 3 to $3\frac{1}{2}$ feet apart, 9 inches to 2 feet in row.

Cucumber, 4 to 5 feet each way.

Egg-plant, 3 x 3 feet.

Lettuce, 1 x $1\frac{1}{2}$ feet or 2 feet.

Melon, Musk, 5 to 6 feet each way.

Melon, Water, 7 to 8 feet each way.

Onions, in drills from 14 to 20 inches apart.

Parsnip, in drills 18 inches to 3 feet apart.

Peas, in drills early kinds, usually in double rows from 6 to 9 inches apart; late, in single rows 2 to 3 feet apart.

Pepper, 15 to 18 inches x 2 to 2½ feet.
Potato, 10 to 18 inches x 2½ to 3 feet.
Pumpkin, 8 to 10 feet each way.
Radish, in drills 10 to 18 inches apart.
Rhubarb, 2 to 4 feet x 4 feet.
Salsify, in drills 1½ to 2 feet apart.
Spinach, in drills 12 to 18 inches apart.
Squash, 3 to 4 feet x 4 feet.
Sweet Potato, 2 feet x 3 to 4 feet.
Tomato, 4 feet x 4 to 5 feet.
Turnip, in drills 1½ to 2½ feet apart.