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THE
GARDEN YARD
A HANDBOOK OF
INTENSIVE FARMING



BOLTON HALL
Introduction by N. O. NELSON

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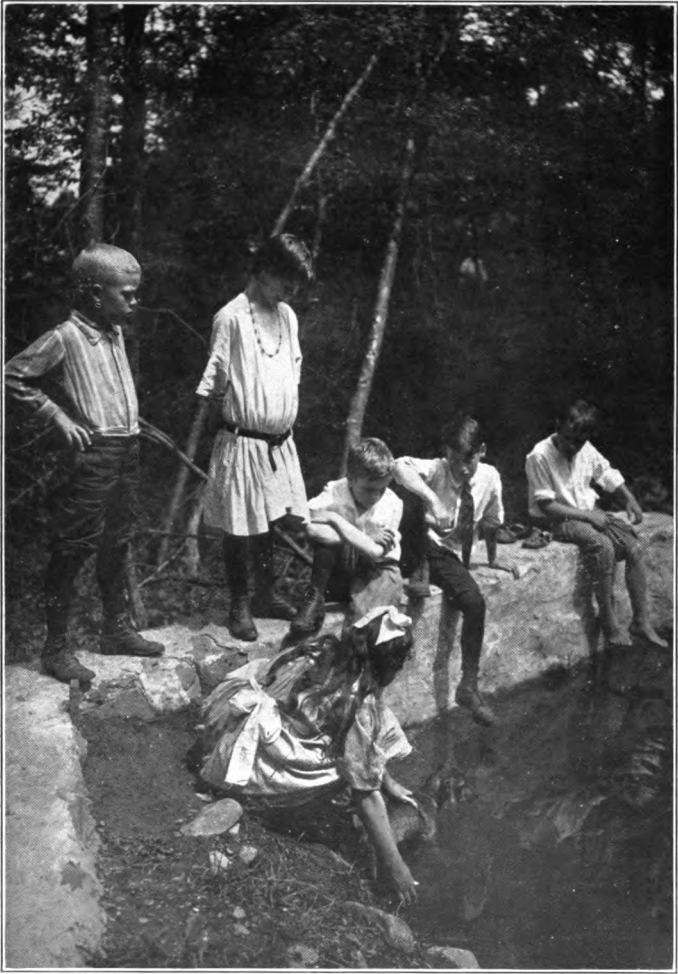
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THE GARDEN YARD





THE FINEST SUBURBAN FARM PRODUCE.

THE GARDEN YARD

A HANDBOOK OF
INTENSIVE FARMING

BY
BOLTON HALL

Author of "THREE ACRES AND LIBERTY," "A LITTLE LAND AND A
LIVING," "THE GAME OF LIFE," "THINGS AS THEY ARE"



With an Introduction by
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AND WHERE TO FIND IT.

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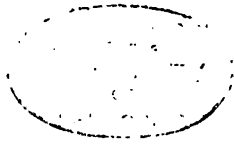
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PREFACE.

AN intensive farm is only an enlarged garden patch.

This book is not intended as a scientific book on agriculture; there are many such books which are out of the depths of everyone except professors and professionals. In a nice experiment station, nice experiments and scientific calculations are excellent; but I want to give the plain man or woman who has a back yard or back lot, out of which he might make part of a living or more than a living, a book that will show how to do it.

I want to help the man or woman who has to do the cultivation at odd times and who finds it hard to get the time for the work, even though this work enables him to do far more work of other kinds. I have had all sorts of experience with gardening, in spite of telegrams and people who want "just five minutes for some important business." So if you have the same trouble getting the time, do not let that discourage you. We can get health, happiness and some profit in spite of the interruptions.

It won't be enough simply to read this book; that won't make you a gardener; but if you study it while you are working on the land and

use your judgment and common sense, in one season you will be able to teach most of those whom you now have to hire as expert Gardeners at Three Dollars a Day.

If anybody sneers at your gardening as being "book farming," let him sneer; a fool never understands what a wise man is doing: if he did, he would do it himself. You have here the plain, simple, practical facts without scientific terms—just the ordinary garden talk. There are plenty of things you will not find in this book. You won't find analyses of fertilizers, nor how to grow "pomatoes," or anything else that won't sell when you have grown it. Nor will you find fairy stories of poultry profits that make the goose's golden eggs look like thirty cents. There is a use for all that sort of thing—it arouses interest and stimulates the imagination. But you will probably be content to be a good, practical, every-day gardener who can make things grow and knows what to do with them after they have grown.

Some critics, who will not read this book, will sagely remark that such books as Mr. Hall's are dangerous, because they induce inexperienced persons to sell out and lose their money trying to get Liberty on Three Acres or a Living from a Little Land. To repeat for such people

my cautions and advice to learn navigation before buying your ship, is to blow against the North wind.

If you have skipped the foregoing, just skip again, back to it. You will see that I have promised to use no scientific terms. This book will be read by more plain people than by scientists, and so I have aimed to talk just as I would if I were trying to teach you how to raise lettuce—or rather trying to teach you to learn for yourself how to raise lettuce. For we cannot teach anyone anything, we can only give him the opportunity of learning. So if the experimental agriculturist thinks that a good deal has been left out that might have been put in, I hope he will remember that I have had to pick from a measureless field, and by trying to crowd in too much I might easily confuse the less experienced and make it hard for him to learn.

And yet no one need think that by reading a book or any number of books he can be made a gardener. That is done by work of head and hands on the soil; and the best preparation for a really scientific use of your own land, is, to hire yourself out for a while to a market gardener and get the practical, every-day experience.

You might as well expect to learn writing without using a pen as gardening without using a bit of land. You will make some mistakes and lose some crops, but I can show you how to profit by mistakes and to lose very little by losses.

If you don't understand the directions, that is my fault: I should be able to make it clear to everyone. So just write me (a pencil and a postal card will do) and I will tell you what you want to know, if I know it myself or can find out.

BOLTON HALL.

56 PINE ST., NEW YORK CITY.



INTRODUCTION.

A FARM is the only proper home. Working for yourself is the only true independence. Labor on the land in the open gives health and long life. Raise a living and sell the surplus. Work all the time, but don't overwork. Make faces at the cynic who says the farmer and his wife and children work fifteen hours a day and then starve. It isn't so. Work alone is not farming; you must manage. Farming needs intelligence and care, nothing more so. Everywhere you see good farm-homes and poor ones; the difference is in the farmer. What the good farmers do, all can do.

In this book, the author tells how to lay out the land, how to prepare and plant and harvest, and how to make life joyous. He has boiled down the experience of himself and his friends and the information contained in bulletins and books and catalogs. A cobbler or clerk or typo, can take this book and with his tennis-made muscle and his trade accuracy can make a bare living the first year, a good living the second, and start a bank account the third. I know it because I helped do it in my youth and I have seen it done all my life.

One of the obstacles in the way of town families going to the country is separation from friends and going among strangers. Another is the conscious ignorance of the work and a sense of helplessness. These are real and valid difficulties. They are equivalent to the difficulties besetting a German or Norwegian farmer coming alone into an American community in a new state. The hundreds of thousands of European farmers who came to the states every year from the forties to the end of the eighties overcame this difficulty by organizing colonies of friends and neighbors and settling in one spot. They thus had society and they had the benefit of their best leaders. Then their old friends kept coming in smaller squads. This is the way for town people to do. Find six or ten or a dozen and go together. Even if all are not relatives or friends they may be of the same class or trade.

To any such colony I will furnish the money to pay for all the land they need and let them begin paying the cost price of it at the end of five years and finish in ten, with 4 per cent. interest. They may pick the tract and bargain for the price. Upon their showing that the agreed number are ready to go and are able to make the improvements and provide the

working equipment, I will advance the money to pay for the land. They can divide it up to suit themselves.

I have furnished farms already plowed, fenced and housed, and horse and cow free of charge. But these empty-handed folk, who have saved nothing out of their former occupation, lack the qualities to manage for themselves and to succeed at farming. They are too helpless and dependent. Their best plan is to hire out in the country until they learn farm work and life, then rent a piece of land, and then buy.

How much land shall each one have, how much can he properly cultivate? That depends on what he raises, and this governs his location and the price of the land. With present methods, he will need 20 acres if he keeps a dairy of ten cows; or, 10 acres if he raises vegetables, small fruit, poultry and milk; or, four acres is enough for truck and a horse and cow, while one acre is enough if he raises only celery, asparagus or tomatoes. The price of land is influenced by social conditions, speculation, proximity to and quality of market and agricultural adaptability, all the way from \$5.00 an acre to \$250.00. There is plenty of it not above the value of the public and private improvements. It is useless to buy a farm of

160 acres for one family. They cannot work it, it is a dead expense, they would be lonesome, would starve and quit. But a colony, settling as neighbors on well-chosen land for which they pay only when they have had time to earn it, will have every opportunity to succeed.

Only in rare cases would I advise town dwellers to go singly to the country; they are disqualified by their social and industrial habits. A colony of friends or Co-operative Associations overcome the difficulties and do in fact assure success to any one possessed of industry and frugality.

By intensive cultivation is meant, not any particular kind of product, but farming the land thoroughly, getting the best yield and the best quality out of every acre, the best seeds and the best breeds and the best way of disposing of the crop when you get it. The farm or garden may be in the vegetable or small fruit or corn and hay or dairying section. In either case, you can cultivate it intensively, which is thoroughly.

The book will tell you in A, B, C style how to farm. I am asked to tell what to do with the crop after you have raised it, how to buy what you don't raise, and how to make social substitutes for the city crowds and sights.

Associate! Co-operate!

You may not know it, but the world is turning from private trade to co-operation at a fast rate. In some countries most of the farmers do all their business by co-operation.

Co-operation is simple and sure and safe, when enough people want it and are shown how.

I have practiced co-operation in my business for twenty-three years. I have been intimate with it the world over for twenty-five years. I have seen it grow and grow until it numbers its millions of workers in some countries, and is doubling every five years in many countries and states. Though I am a manufacturer, my chief occupation is to preach and teach co-operation to farmers—at my own expense.

Co-operative creameries have changed Minnesota from a declining wheat state to a rich dairy state. Co-operation has saved the California orange grower from bankruptcy and made him prosperous; it has raised Denmark's exports of butter, eggs and bacon from eighteen to eighty millions a year, and it has almost cut off our supply of policemen and politicians from Ireland, because over a thousand co-operative associations have grown up there in twenty years.

After you have undertaken what this book

tells you all about, you want to count on forming co-operative associations with your neighbors to do all the business that you have. You raise your own crop; but pack it, ship it and sell it through your association. You use bought goods, but buy them all through the association. That gives you a saving in expenses, a saving in price, and a better quality. What is still more, it makes better neighbors of you, and rids you entirely of the demoralizing tricks of the trade, and prevents you figuring how to get the best trade out of the other fellow. You are yourself "the other fellow." In the co-operative way, your interest lies in producing the best stuff, which will gradually improve your motives. Co-operation fits any sort of business, if there is enough of it.

One hundred and fifty cows are needed to start a cheese factory, 250 for a milk shipping association, 500 for a butter creamery; fewer than these do not pay.

For co-operation in raising vegetables and small fruits, no fixed quantity of product is required; two or more persons working together is better than each for himself.

Talk it up as neighbors and then hold a meeting. Let all who want to join, sign an agreement to deliver all their truck to the association

and pay a membership fee of \$5.00 or over. Each member should have an equal voice regardless of his acreage. Organize, either as a corporation or a limited partnership. Elect the best qualified men to be officers, and then give them unqualified support. Select a manager and see to the marketing arrangements. If the quantity raised is large enough, it is best to have your own receiving and selling agent in the principal market. Every member must make a legal contract with the association to submit to its rules about condition, packing and delivering, to apply to his entire crop. Good quality, reliable packing and regular supply are essential to good prices.

The manager or inspector must have full authority. Each member's delivery is graded, weighed, measured or counted and accurately recorded. Once a month the account from each grade is made up, and the proceeds, after paying expenses, are paid over.

The manager should be an experienced trucker, competent to instruct and advise about the work of planting, growing and gathering. The growers meet each other at the station, and compare notes. They all learn what is known by the most expert among them. They can arrange to have one man gather up the crops

from several places and make one load to the packing-house, taking turn about in this service. Small or poor growers may be admitted with a nominal payment, even as low as 25 cents, the remainder to be paid by a 5 per cent. deduction from his proceeds.

The association and management can also fill the assembled orders of members for fertilizer, seed, implements and packing material, at wholesale prices. In time you will make your own boxes, erect a cannery for the surplus and even buy your own groceries co-operatively.

You can form a credit society with unlimited liability, to receive on deposit the members' surplus and borrow from the city. That money is lent, for productive uses only, to members of known ability and honesty, who give two similar members as security.

When you get safely started in one kind of co-operative association, you will easily go to the next, as the Danes and the Irish have done.

ST. LOUIS, MO.

N. O. NELSON.

CHAPTER I.

THE GARDEN YARD

NO man knows, nor can know, the capacity of a yard of earth, for it is unlimited, just as the speed of the engine is unlimited. Just as with the engine, the only question is whether it would pay to make it do any more—it may cost too much. Where land is cheap, labor is high; there intelligent cultivation will pay, but intensive cultivation will not. That is the place where the field crops should be raised.

But the garden crops should be raised right round the towns and cities and it is foolish to get to a distance from them. Stay right where you are and get the piece of land that is best for your purpose; buy it, if you can without paying too much for it; if not, rent it for as long a term as you can; or get permission to use the bit of land, the vacant lots—there are plenty even in the most crowded cities—and raise your truck and your income on those lots. Without separating yourself from your acquaintances or exiling your wife and children, learn to get your living out of the earth.

Suppose that a man owns his house, even if it be but a bit of a bungalow, and suppose he

has a little bit of land on which he can raise the most of what the family eats; he may have to work hard, especially if his family cannot help in the work, but at least he is independent; at least panics, lock-outs, change of circumstances or even loss of health will not reduce him to starvation.

If you have a farm, Intensive Cultivation should interest you all the more. Every farm is full of opportunities to make good money; but you must not make the usual mistake of half working a big piece of land; that means that you will always be overworked, always have a lot of things that you know ought to be done, but cannot find time to do; always have common grade crops that bring common prices. Everyone that is overworked is underpaid, for he cannot do his best work.

Use the big fields for pasture, or for raising fine horses, or for pigs or Angora goats or even for sheep; you had better let the fields run wild rather than half cultivate them.

Keep accounts and watch your chance to sell all the land that does not pay well. It may be that you are missing a fortune in the old neglected orchard, or in the chestnut or hickory grove. The black walnuts or butternuts, that are usually left for the neigh-



bors' boys, may be the most profitable part of the farm.

The wood-lot may have possibilities for barrel hoops, which may be sold to the improvement of the timber. It may need only thinning to bring you a steady income while it increases in value.

Fine apples grafted on the old trees that now bear only cider apples, if properly sprayed and thinned so as to give first-class fruit, may sell for more than all the corn you can raise.*

The "pesky briers" that the farmer struggles with year by year, may be the raspberries and blackberries that will sell readily for good prices, when they are cultivated, to the summer residents or boarding-houses. Your exposure and soil may be just the place for the fine strawberries with which, when nicely separated from the second and third grades, no market is ever overstocked.

But if you are always behind with the work and always short of cash or worried to pull through, you have no time to think of these things and no means to hire labor nor to develop them.

That pond may be needed, if it were cleared out, for a profitable ice supply, furnishing payable work in the winter. The stream may be a

* There is only one good way to do this: cut back all the old wood and work out a new top on which to graft the fine apple scions.

valuable water-power or at least may bring a high-priced crop of watercress; or it may be the very water needed, when properly distributed, to make yours the most fertile land in the county. The bit of swamp land, that raises nothing but mosquitoes, may need only a few dollars' worth of cranberry sets to be the best paying acre in the country side.

There may be a veritable gold mine in a neglected quarry, or brick-clay pit, or kaolin clay deposit, or in a sand bank, or a vein of marl.

Possibly you could rent the farm house or let camping sites for the summer to people who would pay city prices for much of your stuff; so that you could afford to keep help enough to leave only the easy work of superintendence for you. Brains save more work than machines.

If you are raising the same crops that your neighbors do, harvesting at the same time, and getting the same prices that everyone else does, you may be sure that you are neglecting your chances.

The money is in finding things to raise that will sell, and that do not have to compete with all the others.

Says the *Farm Journal*: "Farmers need more

time to plan their work and look after the business and economic end of their calling. The employer who makes a full hand in barn and field from 5 A. M. till 8 P. M., has no other time to devote to the real business of the farm than the hours in which Nature imperatively calls upon him to rest, and a man with aching muscles and tired limbs is not in condition to think clearly or plan intelligently. It is poor economy for a farmer to take the place of a dollar-a-day man in the field, when in so doing he has left no leisure in which to work out the details of his operations."

Think—think—it is true that we ourselves must work with the men if we are to get the best work out of them; there is a big difference between saying "Go, do that," and "Come and let us do this." But it is not enough to work; any jackass can do that.

You know the old fable: "A farmer got his wheels stuck fast in a miry road. The man knelt down in the mud crying to Hercules to come and help him. Said Hercules, "Get up and put your shoulder to the wheel, I help only those who help themselves!"

(There is a new part to that fable)—Now the mire was very deep and even Hercules' help was not enough; so he called on Pallas, the

Goddess of Wisdom. Said she, "Put this lever under the wheel." Then the wagon was easily lifted out.

Since then, some one else suggested using wide tires, so that the wheels would not sink at all, and another invented a split-log road-drag to keep the roads hard. But we are still waiting for the farmers to learn to use them.

Maybe the roses in the bit of garden would bring you bigger money, if they were made to bloom at the right time, than the potatoes that take twice as much outlay and ten times as much work.

Pick out as much land as you can attend to without walking your legs off, and raise on it the best crops that bring the best prices and let the rest take care of itself.

The market is more important than the crop. Consult the editors of your agricultural papers about where to sell. Require bank reference from any commission merchant that you do not know, and write to the bank for its report on him before you ship to him. Make his acquaintance, if possible, and talk to him about what he can sell the best; naturally, he will take more interest in the affairs of a man that he knows than in a stranger. Don't go to town or to the boat or railroad with half a load or

with a load of poor stuff. Arrange with your neighbors to take enough for them to make your trip pay.

If a trolley or a carrier can be brought into use to make regular shipments, see some merchant or hotel man and arrange to supply him constantly. Then lay out your plantings so as to have a constant supply of what he needs.

If you are choosing a farm or have a chance to sell yours, inquire and look to see if you can find one near a good market where you will earn your own commissions. The way to find out what you want is to talk about it to everyone you meet. A good local map will help you, but of course the real estate agents know more about what is for sale and the prices and values than you could learn in a year's travel. No men, except editors and hotel clerks, are so ready to give information as the real estate agents. Remember, however, than even when they are honest (most of them are, like the rest of us, as honest as circumstances allow), the successful real estate agent must see the rosy side of the peach and may not point out the worm-hole on the other side. You will have to look for that yourself.

When you have found what you want, point out that you are buying to improve, so that the

security will be better every day, and fight for easy terms and for a long mortgage. You can get the privilege to pay off any time that you cannot use the capital to better advantage.

Let some good lawyer examine the records and see that the papers are all straight, and guarantee the title. If there is a local title insurance company its policy is worth all it costs, and will help you greatly should you want to sell or to raise another mortgage.

Buy your land—don't rent it; it does not pay to put your work into another man's land.

Every improvement in the condition of the earth—agricultural, mechanical, ethical, educational, political or even religious must go eventually and mainly to the benefit of the owners of the earth; therefore get hold of a bit of the earth, so that everyone who does good will do that good for you.

Get a small bit of land near the market rather than a big bit away from it, because the more people there are near you the better you can live and the more money you can make. Besides it is much pleasanter and better for the wife and children, as well as for yourself, to be near schools, libraries, proper company, stores, than to be away out among stumps. A growing town will make you rich when it grows out

your way, because you are in the way and when the land is wanted you must be paid to get out. Meanwhile, you can get manure and help much easier and cheaper than if you were at a distance.

Don't put your labor or your money into expensive buildings: they only invite the tax assessor; but get proper buildings—they may be only shacks, but they should be well planned shacks, for you must have room enough to shelter your tools, wagons and farm machines, to house your stock, to store your crops, to sprout your seeds, to save your manure and to do indoor work during bad weather.

CHAPTER II.

THE SOIL.

IF this book is to be of real service, we must be clear about the terms and expressions, so that, though you may know nothing about gardening when you begin to read it, you may know enough to earn a living from the soil when you finish it—and practice a little.

Many talk glibly enough about the soil, though few could tell exactly what it means. But market-gardeners must understand it, if they are to live by it. So it will be well to begin with the soil itself. Soil is that thin layer of earth that covers our globe like a blanket, and in which all that plants, beasts and men live upon, grows. If it were washed off, starvation would follow. The scientific explanation of the origin of this blanket, is, that it was formed by the action of heat, cold, water, frost, ice, low forms of vegetable life and tiny animals; sometimes working singly and sometimes all together. It is now established that the most of the face of the earth was once rock which was rubbed, crushed and ground by these forces until this surface layer was made. Then higher forms of life became possible. Not centuries only, but aeons of time, were

necessary to accomplish this. Layer upon layer of finely crushed particles were exposed to the action of the air which completed the work the grinding of Nature's forces had begun.

To follow out the story of the development of the soil is a most fascinating study, and if you have time from your other interests, you will be glad that you took it up; for though you may be a good farmer without this knowledge, you will be a better one with it, because you will be more intelligent and sympathetic. The soil-blanket holds within its warm folds all that is necessary for life, and the wonder of it all increases the more we learn about the millions of years and numberless forces employed to bring it to this state of perfection. If Nature has not wearied in her great work, there is poor excuse for the gardener to shirk or neglect the labor necessary to get the best possible results from any given piece of soil.

Nobody yet knows what are the best possible results from any given piece of soil; for since new discoveries are being made every year, we can show only what has so far been done with the best knowledge and skill at our disposal. One man in Pennsylvania is selling his soil; not his crop, at \$1.50 per bushel to inoculate other ground.

The fine, fertile layer of earth that is called soil does not go very deep. It covers another layer which is harder, coarser, colder than itself, and this second layer is known as the subsoil, or that soil which is under the surface layer. In all temperate climates the difference is strongly marked, but in rainless, sun-dried regions there is often no difference to be noted. The intelligent farmer or gardener has the opportunity to decide just how much of that subsoil he will convert into surface soil, and the means of doing this will be disclosed later under the head of "Tillage." The more of it he brings into use the greater his own profit, so that it pays to know how. In the early days of farming no effort was made to bring the subsoil into use, and consequently the returns from agriculture were small. Now we know better than that, and we also know how to get more out of the soil, whether surface or subsoil.

No soil, no garden; so the new gardener must get acquainted with the ground he intends to cultivate. It is not to be denied that soil which is in good tilth will be a great help to the beginner, but that is only to be had in well-cultivated gardens, which usually bring a good price when found in the market. Besides, with proper care and attention, any well sit-

uated soil can be made to yield good returns, and the gardener who is not disposed to give proper care and attention will find nothing in this book, or in any other, that will teach him how to succeed. The German idea is that a good soil is merely a place to put fertilizers (and German ideas on gardening are not to be despised). This is simply another way of repeating that, with brains and work any soil can be made to yield good returns. It is not safe, however, to trust to the "Light of Nature" as to what "proper care and attention" is, so here are the details.

If you are already settled and are planning to use your back yard for a garden, you will have to take the soil as it is, and by your own effort make it what it should be. There is no cause for despair no matter what it may be. A back yard that was trodden almost as compact as asphalt, and whose clods when dug had to be broken up with an axe, was made to yield a large variety of flowers the first season it was planted. So go ahead and do what you can with what you have. But, if you are hunting for a garden plot, bear in mind the importance of soil texture. You may thereby save yourself both time and labor.

The first thing is to examine the soil to de-

termine whether it is sandy or clayey, dry or moist, light or heavy, well drained or wet; whether it is warm and live, or cold and dead. You will then learn what sort of cultivation is best for your particular plot of ground.

Because in your neighbor's garden a certain treatment has been successful, is not saying that it will give the same results in yours, unless all the conditions are the same. For instance, his light, sandy loam needs little cultivation, and your soil may be hard and clayey. In that case you would have to make up the difference by careful work.

There are "gardeners" who think it is sufficient barely to break up the ground, add a little manure or other fertilizer, and scatter seeds. That they get any sort of results only shows how willing Nature is to give a return on the slightest labor. But Nature is wise as well as willing, and therefore gives lavishly to him only, who, by intelligent labor, deserves the best returns.

Therefore, learn the needs of your soil and supply them, and you will have no cause to complain of the niggardliness of Mother Nature to those of her children who feed at her bosom.

Plants often die for lack of moisture in the soil, and this condition cannot be satisfactorily

remedied by the watering-can. The trouble lies back of such surface treatment and can only be cured by getting at the cause. The soil should be so prepared by tillage that it will catch and hold enough water to supply the plants with the moisture they need even through hot, dry spells. Plants draw their nourishment through their roots to their stems and leaves, and you need only examine the fine roots and rootlets of any plant to realize for yourself that such nourishment could not be taken in in a solid form. Plants are constantly drawing this moisture from the soil and as constantly giving it off into the air through their leaves. If you will watch any plant during a drought, you will see the leaves begin to shrivel before the stems or branches show signs of suffering. This is Nature's effort to sustain the life of the plant as long as possible. The shriveling of the leaves prevents the escape of the little moisture the plant can draw, and retains it longer within the plant's system.

Deep plowing, the breaking up of the subsoil, the addition of decaying vegetable matter or humus, fertilizing with stable manure, and the raising of crops that can be frequently tilled, all help to add moisture to the soil. If you do these and the dry spell does strike

you hard, so that it seems necessary to bring water, the soil will suck it and hold it, instead of letting it pass off quickly through the action of sun and air. Frequent stirring of the surface soil, to the depth of one inch, will make a little dry layer or top-coat through which the moisture does not readily escape. This is what is called a "mulch." A mulch may also be an added coat of leaf-mould or stable-litter or any little dry covering which will prevent the moisture from escaping.

For early crops a light, sandy loam is best. A sandy loam is a loose, sandy soil made productive by good tillage, by mixing in humus and plant food or fertilizer. But when you haven't the best, it is for you to counterfeit it as nearly as possible. The advantages of sandy loam are that it is early, easy to work, responds quickly to fertilizers and is readily kept in good tilth.

"Tilth" is really the planting condition of the soil, and good tilth means the best possible conditions for planting seeds; where the plow and the harrow have done their work; where the sun has warmed and the rain moistened; where the fertilizer has sweetened and quickened; where stones and weeds are unknown, so that the new life finds the best conditions for

sprouting and developing. You will understand why such soil is not often in the market. It is Nature's materials plus man's intelligent labor; and he who has it, is usually found working it to his own profit.

Some soils are easily put into condition: others require much time and labor, but all always repay. It is well, however, to avoid a hard, cold, clayey soil if possible; it takes so long to warm up, that the seeds make little progress. Of course, steady persistent effort will greatly improve even this soil, and if that is the sort you have, you must do your best with it, but the average gardener cannot afford to wait.

Compared with agriculture, which has been known in some form ever since there have been any records, tillage is very new. Like many another important thing, it was discovered quite accidentally by an English farmer, named Jethro Tull. He found that by stirring up the soil about his plants, he got better returns; and gave his discovery to the world. But he could not explain why it was so; he merely knew the fact itself. Science has since discovered that it is due to the action of the air in helping to break up the many compounds found in the earth containing plant food. It was a simple thing, yet it has really revolution-

ized gardening. Before tillage was known the returns from the sort of cultivation in use were very scanty, and this book had never been written had Tull's discovery never been made. So you may be able to do the world a great favor if you cultivate intelligently, not fearing to experiment or to make known the results of your experiments. It may be reserved for you, in your little garden patch, to discover some new truth that will prove a blessing to the whole world, for no science today offers so wide a field for discovery as the science of Agriculture, nor so sure a return for labor expended.

There is a story that illustrates the value of tillage. A man lay dying and as his four sons gathered about his bed he whispered feebly, "My sons, there is a great treasure hidden in the garden." Scarcely had they laid the body of their father away, when the sons went to the garden and began digging it up. They dug every inch carefully, and found nothing for their pains. Then the eldest son, being of a practical turn of mind, suggested to his brothers that they plant the garden and thus secure some return for their labor. This they did, and when harvest-time came the returns were so wonderfully increased that they said, "Now we know what our father meant. Let us seek

like treasure in all our fields." And in every garden and field lies hidden the same treasure that can be revealed only by the expenditure of intelligent labor.

Tillage is an art in itself, and very important to success. There are two kinds—the tillage of preparation and the tillage of maintenance. They are widely different in their purpose and effect. The average farmer thinks that both may be carried on at the same time, and this belief may be in part the cause of his failures.

The tillage of preparation includes not merely the breaking up of the soil by the plow, but pulverizing it for as great a depth as the roots of the plants will reach. How deep that may be, depends upon the character of the soil and of the crops. For example, a hard soil with a subsoil near the surface, must be plowed deep; so that the root crops, which run deep, may find sustenance. On the other hand, sandy soil, or one which leaches away, can stand only shallow plowing, as we must hold the subsoil firm to prevent leaching. So that, even in the tillage of preparation it comes back to the same point, to learn the needs of your particular soil and supply them.

The tillage of maintenance should be given as often as once a week or ten days, and is merely

that surface loosening which enables the soil to drink in the rain and withstand the heat of the sun. The loosened surface will not cake about the plants, and it makes a layer of mulch for the protection of the under soil.

By the addition of humus, or vegetable matter, a clayey soil may be put in condition so that it will respond to further tillage as satisfactorily as the lighter, sandy loam. This is the way to "counterfeit the best soil."

Humus is added by plowing into the land vegetable matter which is in condition to rot quickly and become thoroughly mixed with the soil. Rye, clover, cornstalks, vines or other garden waste, and manure, are commonly used. Manure that contains a large proportion of stable litter and sweepings, and street sweepings, are especially rich in humus, and are much sought after by experienced gardeners. By adding them, the texture of the soil is lightened and improved, made loose and mellow so as to hold moisture, and is at the same time prevented from caking. Moreover, humus contains plant food and heat that make seed sprouting easy.

The amateur gardener seldom recognizes the importance of the physical texture of the soil, but the best results demand the best conditions.

Unless you want to grow pears and plums—which thrive in clayey soil—break up the clayey earth and improve its texture in every way. Your garden will repay you, and you won't go about denouncing those who have written books about the possibilities of small areas as wilful deceivers of the guileless and unwary. Get it firmly fixed in your mind to start with, that, if your garden does not yield adequate returns upon your labor, the fault is yours. You are working unintelligently, and deserve no more than you are getting. To know your soil is to be able to give it the treatment it needs to make it fruitful.

CHAPTER III.

SOIL FERTILITY.

SOIL fertility is the power in the soil itself to produce a good crop under proper conditions. Man can neither make nor destroy the land. All that man can do is to make it more or less efficient, according to how he uses it. Two men may take two pieces of soil of equal fertility and get vastly different results; by careful study and experiment we may learn how to take advantage of this fertility; but the real secret of it, Nature has wisely locked up in the soil itself, so that one generation of men cannot really rob the next. It has been said that old-time farmers, of New England particularly, robbed the soil of its fertility, so that their sons have been compelled to abandon the old farms and seek new land in the west, or new occupations in the cities of the country. The real truth is, not that the soil has been robbed of its fertility by the fathers, but that the sons have continued the unenlightened methods of the fathers even after their ineffectualness has been proved.

Since that land was abandoned it has not really been idle. Nature has been improving it all these years by placing leaves and trees back

upon it, thus providing humus; and also by the action of heat and cold. Some of this land, overgrown with briars and brush, has been cleared and found to be better and stronger than ever before. Much of the soil is sour, but that is easily remedied, and wherever a patch is burned over, the grass works in well. On some of these abandoned farms there is an excellent opportunity to combine intensive culture on the lowlands with orcharding on the hills, for the fertility is still there. If man could destroy this quality, that clings to all soil, he would have spoiled it centuries ago, and the race would have starved. But we are a long time learning how best to use it.

Robert S. Seeds, of Birmingham, Pa., thinks he has solved the secret of unlocking that soil fertility, and he offers the astounding results of his operations on an abandoned farm, as proof of his claims. He not only raises enormous crops, but he sells his soil by the bushel, to his less enlightened neighbors to inoculate their farms. He tells the story of his experiments in a lecture called "How God made the Soil Fertile," which is published in pamphlet form and sells for 25 cents.

He says "The Lord made all the acres of the land fertile, from the Atlantic to the Pacific,

and gave it to man to live upon, to prosper and be happy. In doing so He never hauled a wagon-load of manure or a load of lime, nor bought a ton of fertilizer—and how did He do it? He did it with vegetable matter; and I thought if the Lord could do it, I could do it. This sounds a little conceity, but I mean it.”

As a result of this belief, Mr. Seeds took to experimenting, beginning with the crops that store nitrogen in their roots, such as crimson clover, and with purple-top strap-leaf turnip. But the results were not sufficiently great to please this man, who was after all there was in the soil. He needed some plant with longer roots, and finally hit upon the cowhorn turnip, which will grow roots from 9 inches to 2 feet long, thus making available the plant food locked up in the subsoil. Finally he combined cowhorn turnip and rape, and now his soil is the most fertile in his district, and is so profitable as an inoculator of other soils that he keeps fields free from harvest crops so as to have the soil for sale.

“Bob Seeds” further says that a field filled with the decayed vegetable matter and humus from one crop of crimson clover plowed down, will hold fifty tons more water to the acre than soil that is not. If you figure how much water

you must have to raise a crop of corn, oats, potatoes, hay, etc., you will see the value of land that has the power to hold water. There was a farmer in Pennsylvania who got his farm in such a water preserving condition that he said the spring rains were a nuisance. Watch the soil and you will see, that soil that is filled with decayed vegetable matter and humus is warmer in the winter-time, cooler in the summer-time, wetter in dry weather and dryer in wet weather.

A mulch which preserves the moisture in hot or cold weather also unlocks this fertility of the soil.

All of this is of immense importance, not only to the farmer on a large scale, but also to you, with the limited area of your garden yard; for in it lies the secret of heavier and earlier crops than your less instructed neighbors. Professor Whitney, Chief of the Bureau of Soils, Department of Agriculture, Wash., says that deep plowing and shallow cultivation are the best means of retaining moisture in the soil, and he adds, "Strange as it may seem, while we suffer if we do not get rains, we should actually be better off, as they are in the arid regions of the west, if we did not have any rain during the growing season and had a means of providing water when we wanted it. The trouble with

us is that we cannot maintain the dry mulch, because we have rain on the average every three days. If you knew what was coming, you could save your crop through any ordinary period of drought, provided you had the skill, the judgment and the chance which would lead you to begin your operations at just the right time."

According to Professor Whitney there are about 400 distinct types of soil so far encountered in the United States, with varying degrees of known fertility, and only eight or ten staple crops growing. This, of course, does not include the special crops like celery; it is the regular, staple field or garden crops that are unnecessarily limited. These are grown on all kinds of soil in all parts of the country without regard to the suitability of the soil to the crop.

The Government, through the Department of Agriculture, has given a great impetus to plant introduction, and you cannot of course expect to rival or approach it, with its enormous funds and staff of experts, but you can experiment with the new crops it introduces. Hitherto, in this country, where the soil was too dry for corn or wheat, or too moist for potatoes, it has been neglected altogether; but the present movement includes finding crops suitable for these lands. The Government has introduced

the durum wheat which yields crops in regions suffering from drought, and in 1905 the United States exported 6,000,000 bushels of it; Japanese Kiushu rice is doing well in Louisiana and Texas rice fields; the Japanese salad plant, the udo, is being tested from Maine to California and giving good results; Kafir corns from Abyssinia, India and East Africa are being grown in Kansas and other western sections; while the English broad bean, Hungarian paprika, and fruits from all parts of the world, are being tested in all sections of this country. Those 400 different types of soil should mean limitless diversifications of crops, and it is fair to assume that the real day of agriculture, in this country at least, is only just dawning.

The Government is now testing profitable crops for the farms of New England which have been abandoned to the mortgagees. Areas there are too small to grow corn* and wheat in successful competition with the great farms of the west, but there are other crops which will yield even better results and command the market. You, who are now coming into the

* NOTE.—But corn growing is on the increase in New England and at the great Omaha Corn Show a Connecticut farmer won three first prizes. The Flint varieties are especially adapted for the New England climate and soil and open up new possibilities for the New England farmer.

great calling of earning your living from the soil, could not have chosen a better moment for entrance. Keep in touch with the Department of Agriculture. It is your department, a sort of college or training school which you maintain, and anything you want to know the Department will gladly try to tell you. If you want to know what is best for you to plant on your patch, send a sample of your soil, tell where your farm is located, what are your means and experience, and the suggestions made will fit your particular case. If you send any of your requests, whether for advice or for bulletins, addressed simply to the Department of Agriculture, Washington, D. C., you will get a reply, and will find out who is the head of the special department your request was referred to. The Department is doing needed work, and by corresponding with them and getting advice, you can give proof of your interest.

CHAPTER IV.

LOCATION.

HOW to buy land and why; how to help the poor to keep themselves on the land and what plain people have actually done; the record yields and how they have been raised; how much capital can be used by one man, are considered in "A Little Land and a Living."

How much of a crop you may be able to get; how much or rather how little capital it takes; how much labor is needed; where cheap lands are to be found and how to clear wild land and how to build, are all treated fully in "Three Acres and Liberty," now published in fine shape at fifty cents. So this "hand book" need only show what other things are included in the term "location."

If you are thinking of the character of the soil when hunting for a garden plot, you will more than ever think also about the importance of location. Any soil, even the best sandy loam, needs some fertilizing and watering, and you cannot afford to use land where manure can not be had easily, or where there is not a good water supply. To pay high for fertilizer cuts the profit from your small area, and this is more especially true if your soil is clayey and needs

much preparation-tillage. In most cities you will find stable-keepers and others who will give you manure or street sweepings in the winter in return for hauling it away. That is a great advantage to you, but if you locate your garden where truckage amounts to two or three dollars a load, you have offset the advantage you derived from the free manure. Also, if your water supply is poor, you will find it difficult to carry your crops through the hot weather.

MARKET.

You can raise a good crop from good soil properly fertilized, but if you cannot market it to advantage, you can't sell it at a profit. A long railway haul not only injures the garden truck, but it also eats up the profits. Therefore, get your plot near a town or city where the expense of selling is reduced to a minimum and where the demand for garden products will at least equal the supply.

So the good-garden-plot tests are three: first, the character of the soil, second, the location as regards the market, and third, the demands of that market. He who must of necessity use the land where he is, will, if he uses his brains as well as his hands, find his reward satisfactory, even though it fall below the returns from a plot with all advantages.

CHAPTER V.

SEEDS.

THE expense and labor of preparing and tilling soil is too great to allow you to plant poor seed. The stock-breeder does not take his sickliest, poorest specimens for breeding purposes, but rather selects the best and most nearly perfect specimens; you should be careful to do the same with your plants. The farmer's work is just as important as the stock-breeder's. It should be the aim of each to improve the strain and produce the best possible result. Therefore, if you are growing corn, plant seed only from the stalk that produced the most and the best ears of corn. It is good to send fine ears to market and get the best price for them, but if you save only your scrubby ears for seed, next year you will not have fine, perfect ears of corn to send. So select of your very best for seed purposes, and if your best is not good enough, then buy from a better grower who has the best. Aim to produce an ideal ear of corn. It can be done, and you might as well do it. Only in this way will you find your corn crop paying you for your time and labor. If you carefully follow this every year, you will find your acre annually producing more and

more corn without any additional labor or expense. That is one trick in making farming pay. It is a trick that holds good with every garden crop as well as with corn. It won't do to wait until harvest time to find out if the seed you have planted is any good, if you have to buy your seed and want to make a profit from your garden the first season. This simple method of testing seeds may save you time and money. Get your seed early in the season, select about one hundred and put them between two moist pieces of flannel, which in turn are placed between two soup plates. Keep the flannel moist (not soaking wet with water standing in the dishes), and as soon as the seeds have sprouted, count the proportion of live ones. If only a few of them have sprouted, you will know that you cannot afford to give ground up to the use of such poor seed. The larger the proportion of your test seeds that sprout, or "germinate," as this process is called, the better for your profit, if you plant from this same stock or assortment.

Be sure you deal with a seed house that has a reputation at stake; and if possible go there yourself and see the man who really knows about seed: generally there is only about one man in a concern who does know his business.

If you answer attractive advertisements and buy at "big bargains" you may lose your money, or, what is worse, you may be kept waiting from day to day till your planting days are over, or worst of all, you may plant poor seed. The dates of planting given throughout this book are for the latitude of New York. In Northern New England planting should be about three weeks later. All the middle western states can be figured the same as New York: but all states south of Pennsylvania may be figured twelve days in advance for every one hundred miles southward.

This holds good for sowing out of doors or for transplanting out of doors. For starting seeds in your home, these times will do for the entire eastern states.

CHAPTER VI.

PLANT-BREEDING.

PLANT-BREEDING is producing plants adapted to particular conditions or requirements; but the mere production of something new or different, is not true plant-breeding. The plant breeder has a definite purpose or aim in mind, and this comes only from a clear idea of his business. The professional breeders produce the races or groups, but the intelligent individual farmer adapts them to his own conditions, and may make modifications of inestimable value to other farmers.

Good farmers have always been plant-breeders, even though they did not know it. They have always kept the best ear of corn and the best potato for seed. They have followed the stock-breeder's plan—only the best stock for sires and dams. So no common plants should be used for seed; only the finest is worth planting. Improvement is made by selection, as Darwin taught us many years ago, but we are slow to learn new lessons. We know that we do not look to the children of physically, mentally or morally deformed persons for our specimens of physical, mental and moral manhood; nor to the cur's litter for the best type of pup. Now

we are learning that the same holds good with plants, and that the farmer who keeps the small potatoes for seed will produce poorer potatoes than he ought to have.

The other day I found a farmer harvesting a measly lot of corn. "Where did you get that seed?" I asked. "Oh," he said, "I picked it up 'most anywhere." I could have told him that myself without asking.

Selection and breeding are not the work of experts alone, for any one who gains the simple knowledge that enables him to recognize the plant or crop that resists prevailing diseases and flourishes best under his conditions, needs only to preserve the seed of such plants for propagating. Cross-breeding, on the contrary, is expert work, but new strains may be secured by straight selection of individual plants, and this gives enormous results. If one persistently saves the seeds of those plants that best serve his purpose, he will soon have crops that are superior to any that he had before. The process is so simple that anybody can do it. We have talked for years of the "survival of the fittest," and this is but helping the best to beat the poorer ones.

What causes the variations that make selection possible nobody yet knows; but we do know

that changes in soil, climate, methods of growing and in other things have an effect. Some variations come from "crossing," and some from no cause that we can see: in those cases they are called "sports" of nature; learn to look out for them and when the new variety is better than anything you have before produced, save it for seed and see what comes of it. You may thereby be doing all mankind a service.

CHAPTER VII.

PLANT NEEDS.

PLANTS need water, air, food, light and warmth just as animals do, and it is wonderful to study the shifts and contrivances to which they resort to get these, and also to protect themselves against too much of any of them. If the plant were not able to change itself to suit the conditions, it would often die where now it fights successfully.

Nothing affects the plant like the water supply; the size of every part of the plant is increased by plenty of water. It not only helps the growth of flowers and fruits, but it even changes the character of the plant. In a moist air, cactus will put out leaf-like organs, gorse will grow leaves instead of thorns; while where the water supply is very scanty, the potato will put forth no leaves, but will become like a cactus.

Yet plants do not grow in soil that is too wet, because they need air, and too much water suffocates the roots. By proper irrigation—which means giving just the right supply of water—both the quantity and quality of the crop can be improved.

While plants need light, all varieties do not

need the same amount of it. You will find that those which need much light can turn towards it, and this of itself will show you where such plants should be sown. Plants have various ways to resist the supply of light when they are getting too much. They droop their heads or close their leaves, which prevents evaporation.

Different plants need different food and the same soil conditions will not suit all. Some require rich soil if they are to flourish, while some do better in poor soil. On the whole, plants, like people, are better for under-feeding than for over-feeding. In general, starving a plant makes it flower and fruit more quickly, but less abundantly; while over-feeding helps to make much stem and leaf instead of fruit, and also produces monstrosities. Too much nitrogen, especially, makes too much stem and leaf, though nitrogen is one of the most important plant foods. (Bailey says too much nitrogen can be corrected to a certain extent, by potassium put in the soil.*)

We are sure of only three plant foods—potash, phosphoric acid, and nitrogen. Then there are

* NOTE.—In regard to muck soils, it is not a case of excess of nitrogen but lack of potash which makes potash valuable for such. Samuel Fraser.

lime, stable manure, green manure, clover and cowpeas to doctor the soil with, when it is suffering from chemical ills. This gives some idea of the vast unexplored regions of agriculture which afford you and every other worker in the soil an opportunity to make some great discovery for the benefit of the world. No other calling offers such limitless opportunities.

Lime is especially valuable for plant food and also to make other kinds of plant food available. Crops often fail in soil where there is plenty of plant food, because it is not in the form that the plants can use. Lime hastens the decay of vegetable matter, sweetens sour soil, and greatly improves the texture of clay soils. Besides this it counteracts magnesium in the soil and destroys its bad effects. But lime may not be applied carelessly, because, although some plants cannot live without it, some require a very small quantity. (It is, therefore, wise to send a sample of the soil, to write what we want to grow, to the nearest Government experiment station, who will probably suggest what could be done with it, to make it productive.)

The right degree of warmth is another plant necessity. The best temperature for plants generally is 86° of the ordinary thermometer (30° Centigrade). This, however, depends upon

the plant. The "best temperature" varies with the species and variety. Usually, if the soil is hotter than that, growth stops, and if the greater heat is kept up, the plant dies. When the temperature is lowered, growth ceases before freezing point is reached. Some few plants may be frozen without injury if they are allowed to thaw slowly, but most of them are easily killed by the frost. Too great heat or too much cold acts the same as lack of water; the heat causes too great evaporation, the cold prevents the roots taking in the water.

Shingles stuck in the ground on the sunny side will serve to protect young plants from sun and rain, while cool soil may be had by using the shady places, or by sheltering the ground with flat sheds the roof boards of which have open spaces between them as wide as the boards. This is done in some southern tobacco fields.

It is the law of nature that living cells must have a constant supply of oxygen, that is why a tar wash sometimes kills plants by cutting off the air supply. In the same way, too wet soil or too hard a crust smothers the roots and the plants die. The surface soil should be kept loose and sufficiently dry, so that the air can circulate. If this be prevented, the soil becomes hard and sour and unfit to feed plants.

It is of the greatest importance to keep the soil open and loose by proper tillage, so as to make plants healthy and vigorous.

Though plants need air they should be protected from draughts and sudden blasts of air, whether hot or cold. For this reason, the intelligent gardener will consider the effect of wind upon his crops and where necessary will plant windbreaks. If you look about you, you cannot fail to see the ill effects of strong winds in the odd shapes of forest trees; and in badly arranged gardens you will find the same effects in the fruit trees and small fruit bushes and in the stunted crops. Plants shape themselves to their surroundings, and the way they shape themselves is determined by inherited qualities; so it may be said that the success of the plant depends upon its surroundings and upon the seed it came from.

CHAPTER VIII.

CROP ROTATION.

IN agriculture on a large scale the difficulty is how to arrange the farm business so as to make it pay. It is only of late that we are beginning to understand that agriculture is a business, and that to make it pay one must apply business principles. The best farmer is not necessarily the one who knows the most "Science," but the one who is able to fit his science, his facts and his business in together.

The market value of special crops is so high that the grower can afford to provide the extra manure and other expensive materials to keep the land in good condition. This is the chief reason for the use of great quantities of stable manure in market-gardening, far greater quantities than are needed for mere food of the crops. So if you find that you are advised to use more manure on your small plot than some farmer you know uses on his big field, do not feel that you are being imposed upon. He could not afford to use so much and you cannot afford to use less. The farmer on a large scale has to let part of his low priced land rest in clover once in a while. You cannot afford to let any of

your small area rest, so you must make up to the land by giving it plant food enough.

In these days machinery has made so many wonderful changes in the management of crops that the farmer who sticks to the old farming customs has no chance of making more than a living. When the country was new, it was the practice to farm one section until it was exhausted, and then to move to fresh soil. The farmer was saved the bother of cultivating, as virgin soil needed practically only to be planted to bring forth a good harvest. But conditions have changed and the virgin soil left today is not important in the farming possibilities. Therefore, we have had to look for other means of getting crops and making every inch of land do its share. We no longer allow land to lie fallow that it may rest and renew itself. We renew it by fertilizing and by rotation of crops. Crop rotation is very valuable because it is a saving of fertilizer and labor, and keeps the soil in good condition. This has been proved by experiments made without manure, depending entirely upon rotation for fertilizing, which gave excellent results.

There are probably a dozen or more good reasons for the value of crop rotation which have not yet been discovered and formulated, but the following are well known:

Some crops tend to correct the faults of others. It has been proved that the continuous growing of one crop injures the soil in some respect, and the crop falls off both in quantity and quality. Rotation tends to overcome this difficulty. Then, too, this rotation works out and evens up the inequalities of the soil, partly through the different treatment required by the different crops.

Different plants draw different portions of food from the soil and at different times. By rotation these heavy drafts on the plant food do not come at the same times, and the seasons get a chance to even up the inequalities.

Different plant food gets mixed into the soil, so that the roots can feed on it, by the decay of the parts left in the ground or which are plowed under. But the greatest benefit comes from the nitrogen compounds through growing plants, such as cowpeas, crimson clover, etc.; these "leguminous" plants have little knots or tubers on their roots with the mysterious power of gathering the free nitrogen out of the soil or air, and turning it back again to the soil in condition to be used by other plants. Now nitrogen is the hardest to keep and the most expensive of all the plant foods that the farmer has to buy, and to get this nitrogen is sometimes

the only reason he has for buying chemical fertilizers.

This shows the importance of leguminous crops to the farm. They supply this nitrogen at almost no cost, or at a profit.

Some plants have more power than others to use the contents of the subsoil, and may draw less on the upper soil, and further, by their decay may add richness to the earth. Most legumes have this power to take nourishment from the subsoil.

Well-planned rotation helps to maintain the supply of decayed stuff in the soil, on which the plants feed. It also improves the soil's texture. Moreover, it not only lessens the necessity for much chemical fertilizer, but it puts those fertilizers to better use. Where live stock is kept, crops should be raised to feed the stock to make manure.

Rotation is, also, a plan for cleaning the soil. Different weeds and insects grow after different crops and the succession or "rotation" as we call it, prevents any kind getting a secure hold.

It enables the farmer to meet the demands of the market, by continuous crops.

CHAPTER IX.

WEEDS.

IT is not enough to know what to grow, you must also know what not to grow for profit, in a garden patch; and first in this class come weeds. Study them until you know even their seeds. You cannot expect to get rid of weeds until you know the nature of them and the best way to attack them, so that they may be readily destroyed. If you run across any common ones that you cannot place, send sample to the Department of Agriculture. They will tell you all about them. Get from the Department Farmer's Bulletin 28 on "Weeds and How to Kill Them." All this will pay.

One of the most common of the weeds of the north is the pigweed. This is the growth of one year and can be destroyed by simply preventing it from running to seed. A year or two will clear out even the most obstinate growth of pigweed.

Mustard, plantain, chess, dodder, cockle, crab-grass and Jimsonweed are the most disagreeable of the common weeds. The best time to kill them is when they are small; therefore, you should keep the ground constantly stirred up that the young weeds may not have

a chance to get a firm hold of the soil. If they do get a start on you, don't let them ripen. Cut them down before they run to seed at all. Never let up in your war upon them. That advice holds good for all weeds, whether they be annuals, which die every year, biennials that last for two years, or perennials that can stand the winters. The biennials commonly found are wild carrot, thistle, moth mullein, wild parsnip and burdock. These are best destroyed by cutting the roots below the leaves with a grubbing hoe or spud. Be sure they are cut low enough, else they will branch out and make new seeds.

Some weeds live more than two years and are called perennials, such as many grasses, dock, Canada thistle, poison ivy, passion-flower, horse-nettle, etc. The best thing to do with them is to dig them out and take them away. Crude sulphuric acid applied to the soil kills them, or they may be starved by covering them with boards or with layers of straw. If they come up through the straw, lift it up a bit and let it fall again. There is yet another method, and if you have the time and land to spare, you will find it a good one. Smother them out by a dense growth of useful plants. Some use buck-wheat and others cowpeas. The cowpeas are

to be preferred as they enrich the soil by the nitrogen their roots gather. And that is another story that has its own time and place. Just now we are considering weeds, and you will find that they will keep you considering most of the time, for the only good thing so far known about them is, that they make even lazy farmers till their crops, if they have any. Left to themselves, weeds shade the crops, steal their nourishment, waste moisture, and probably poison the soil. Not even a mortgage can eat up a farmer's profits like weeds.

CHAPTER X.

INSECTS AND DISEASES.

THE wise gardener uses the spray to prevent disease and the attacks of insects, instead of waiting to fight them after they have arrived. But if they attack your garden you must fight them intelligently and without ceasing.

The destruction by insects, is, generally speaking, easily seen, but diseases of plants are not so plain, and have only been carefully studied even by experts during the past fifty years. At present, all we know is how to fight insects and diseases by different substances, put on or about the plants. As fresh discoveries are constantly being made, we will some day get rid of all these difficulties. It is always better to get the advice of an expert when insects or diseases become troublesome.

Anything in the soil or surroundings of your garden which interferes with the plants during the growing season, weakens the crop and lays it open to attacks. Plants are like children. If they are badly fed, poorly clothed, ill housed or neglected, they are far more likely to become diseased than if they are kept in a good state. So look after your drainage, the character of the

soil and the sort of cultivation you give it. All these help the crop to withstand disease. On the big western wheat fields, it has been found that drainage has a most marked effect upon blights, wilts and rust. Undrained wheat sections suffer greatly from rust.

Just how diseases are caught by one plant or section of a garden from another, is not fully known, but we know that insects often carry infection from one to another, as in fruit trees to which bees go for honey. The bee, coming from an infected tree to a perfectly healthy tree, may bring with it the germs of the disease or the eggs of the pest. Many scientific men now hold that plant diseases are transmitted by germs, which are carried not by insects only but also by the wind and the water in the soil.

The wrong use of fertilizers or barnyard manure may often induce disease, simply because the unbalanced food supply causes irregularity in growth, which weakens the plant's resisting power. What is called a "balanced ration," is of the utmost importance to plants. It is not enough that the soil contain an abundance of some of the elements of plant food, but that it contain all of them in nice proportion, so that the plant can draw all it needs, and not be overfed in some ways and underfed in others.

That is why we add humus, why we fertilize, why we cultivate, and why we take note of our plants while growing. Only in this way can we supply their wants.

Weeds spread diseases and we should be ashamed of them. Not only are they usually favorable to the growth of insects, scales and blights, but some kinds of weeds actually breed these parasites. Moreover, they rob the soil of nourishment during the dry, hot spells, thus bringing about various kinds of rots and mildews. And now it is supposed that they give out a kind of poison, or excrement, which renders the soil unfit for crops. All this shows the necessity of clean cultivation if we would help our crops to resist both insects and diseases.

CHAPTER XI.

RE-SOILING.

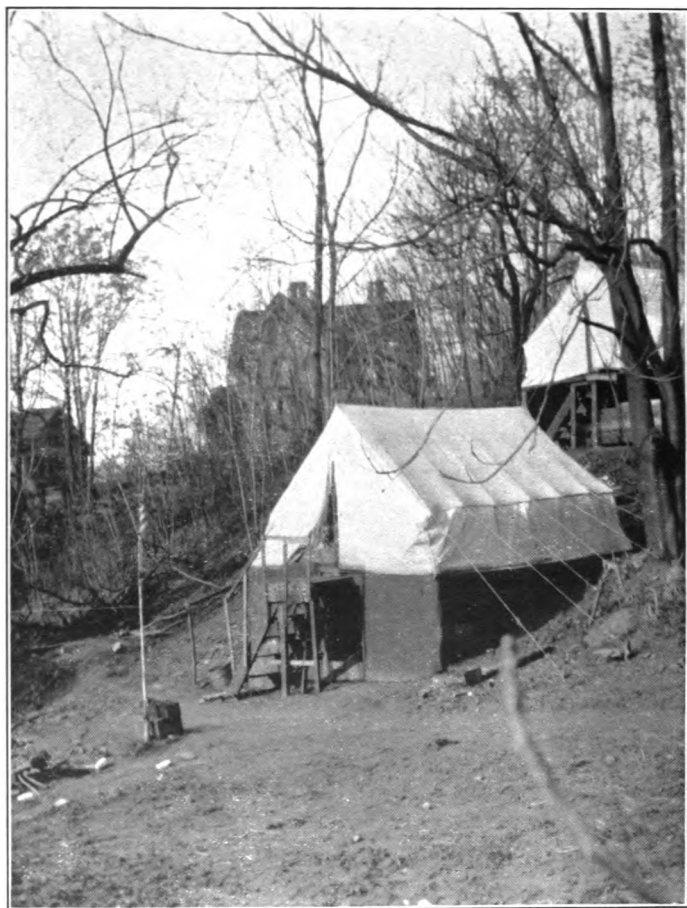
THERE is a good deal of talk these days about re-soiling, but the word is misleading. We cannot re-soil this earth or any part of it. The soil is there for keeps. It was here before us, and will remain after we are gone. All we can do is to put back into the soil some of the vegetable matter of which we have robbed it; and this is really what we have in mind when we speak of re-soiling. People have the habit of coining almost meaningless words, and then wondering why everybody does not know at once what they meant to say.

What we are after is, to put humus, which is really decayed vegetable matter, back into the soil. Then that natural fertility, of which we have been talking, will have a chance to get to work.

Now, decayed vegetable matter is part of what makes up stable and barnyard manure, street and stable sweepings; but, in practice, this does not afford enough humus: that is one reason why crops of clover, cowpeas, velvet-bean, buckwheat, etc., are often grown only to be plowed into the ground in the fall. These are the green manures which decay and

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WINTER RESIDENTS IN A SUMMER CAMP.

become a part of the soil before the next planting season. Soil fertilized in this way will be richer, moister, darker, than soil fertilized solely by stable manure or commercial fertilizer. Soils that contain enough plant food to supply crops for a thousand years to come, are often barren or yield but a niggardly crop. This may be because they lack humus, which is the key that unlocks the store of plant food in the soil, and makes it available for the seeds and tender rootlets. How much more humus may do, we do not yet know, but every year fresh discoveries are made, and if we are to be benefited by them, we must get ourselves ready for the new truths by using those already known.

On his famous farm in Birmingham, Pa., "Bob" Seeds plows his cowhorn turnips, tops and all, into the earth in the fall, and by spring they have decayed. He says wherever a turnip has rotted, you can see the difference in the color of the soil even some distance away, and the abundance of the next season's crop shows how quickly Nature responds when we work with her.

All vines and garden waste may be used for humus if plowed into the ground in the fall, unless they have been infested with insects or troubled by diseases. It is well established,

that insects and their eggs manage to live over the winter by the aid of vines and refuse left lying about, as well as by weeds that the careless farmer has failed to destroy. It is well to cut all weeds, not only those that bother you in your garden, but also those that grow along the road, as often their seeds are carried by the wind or the birds into your garden patch. Gather them into a heap and burn them, adding to your bonfire all the sickly, dead, diseased, or insect-ridden vines and plants, and completely destroy them. You may be sure that the bugs on those particular plants will not bother you next year. What you lose in possible humus by this practice, you can make up by growing green manure, or even by buying some of the prepared humus materials now on the market.

The *Long Island Agronomist*, in a recent issue, tells of one of these materials which comes from New Jersey, and consists of innumerable rootlets, leaf-fibres and vegetable matter of all descriptions. It is gathered from the peatbogs of New Jersey and is really the wash from mountains and hills carried down by streams in freshet times, until some level was reached where this deposit was made. When spread on the land or mixed with the earth, it is found to hold much moisture, for each particle swells

up as if it were a sponge, and the crops planted on soil treated with this preparation do remarkably well. It was so very expensive at first as to be almost prohibitive except for very valuable crops, but the price is now such that many a man can afford to use it, especially if he cannot afford the time or space to grow his own green manure.

Nothing looks nicer about a house than a green lawn, with smooth-cropped, velvety surface, but nothing is harder to maintain after a few years of cropping. This is because a well-kept lawn is carefully raked after each clipping, and is kept free from falling leaves or other vegetable waste matter. It must be admitted that the general effect is better, particularly when the lawn stretches from the front of the house to the roadside. But the lawn is, nevertheless, being starved, and though watered every day it cannot keep up its velvety surface indefinitely, unless supplied with the food it needs. This is Nature's own secret for replenishing the earth with good crops, and all you need do is to observe what is going on around you, to find daily proof of it.

To quote Mr. Seeds again: "Every two years, we ought to sow clean blue grass or lawn grass seed over the lawn. I prefer to mow often and leave the clippings on the lawn. It is the

blanket and vegetable matter that will do the lawn good. Every few years I cover the lawn with barnyard manure, in the fall; let it lie there all winter and that which we rake off in the spring we put on the garden. This is a little trouble, but I want to say that I made more money creating my lawn than I ever did in taking a fat ox from the stall, or a bushel of potatoes from my cellar.

“A man will stand on the public road in front of my place, and give me more for my property on account of my lawn; but money is not the only thing in the world. The lawn makes the boys and girls want to stay on the farm. It is on our lawn that we spend our spare moments on Sundays, entertaining our friends, in the summer; and there, beneath the shade of ‘the old apple-tree,’ the smoke curls more beautifully from my chimney than from any other I ever saw.”

So there is no reason why you should not have a good lawn, as well as a good garden, if you will supply what the grass roots want. And it is true that the lawn is a genuine asset. The man who is too busy to bother with making a lawn, or to sit on it with his family in spare moments, even though it takes a good deal of contriving to spare those moments, is the man

who, by and by, is going to complain that his boys and girls have left the old place, and that "farming is mighty expensive with all hired help." Unless you have made yourself and your family happy, you will not have achieved success, no matter how much wealth you may get. Give your crops and your children what they need for their best development, and you will find nothing to complain of either in parenthood or in farming.

CHAPTER XII.

HOW TO WORK.

IF you are only just beginning to experiment with gardening, and feel that a fresh supply of fruits and vegetables from May until Christmas would satisfy you for the first year or so, you will find a plot 100 x 200 feet quite large enough to feed your family and a little more besides. If your plot has not been used for a long time, you will have to do your plowing, if you can, the fall before you plant it. This will give the frost a chance to sweeten the soil, and it is very likely to need a good deal of sweetening. Most yard soils have become acid, and in an acid soil little will grow. It comes from the earth having been so long packed down that the air has had no chance to circulate, and fresh air sweetens your soil just as it does your house.

It is not good to put stable manure on an acid soil. What it wants is a little slaked lime or plaster, to help the sweetening process. Some scientists claim that we can find out whether or not soil is acid by the use of blue litmus paper, which you can get at any druggist's. Open the soil to a depth of six inches and put in the litmus paper, drawing the earth close up to it.

Examine it in 20 minutes, and if there is any acid present, the paper will have turned red. This test is still being experimented on.*

If your land is in proper condition to manure, use about twenty-five heaping wagon-loads to the acre before plowing in the early spring, and then use a disc or cutaway harrow until you have made the soil as fine as dust. Then you have good planting conditions.

How much of the discontent with farming and gardening may have arisen from the old method of planting in beds, it is hard to say. But that cause for dissatisfaction no longer exists. We now plant in long rows far enough apart to allow the use of the wheel-hoe in cultivating the large and small plants alike, without having to readjust the blades. The wheel-hoe is one of the most useful of farm tools, and has done away with most of the back-breaking work of hand-weeding.

We cannot use the wheel-hoe on beds; that is why we now plant in rows. If your plot allows rows one hundred feet long, you will find one row of any vegetable enough for family use. Let them run crosswise of the slope of the ground

*NOTE.—Another way is to mix a little soil with rain water, stir it well, and put the litmus paper in it. Pure rain water is the only water that can be successfully used in this test.

if your patch is not level, else the rain may make channels of your seed rows. If possible, choose a southern exposure for your garden; because this gets all the sun, it will be earlier than less favored exposures. Lay out a plan of your land and work with a definite purpose. The "rule of thumb" is no more satisfactory in gardening than in carpentering.

If the slope of your land allows it, run your rows north and south, so that each row may get the sun from the east in the morning, and from the west in the afternoon. Put asparagus, rhubarb, sweet herbs and other permanent vegetables in a row at one side, so they may not interfere with the plowing of the rest of the garden.

Plant vegetables of the same height together, so far as the tillage required will allow. Put the tall ones at the back, so as not to shade the others. If you have a hedge, a building or a strip of woods as a windbreak on the side where the wind blows worst in winter, you will get vegetables a fortnight earlier in the spring, and probably a month later in the fall. The more protected the garden, the warmer the soil, and warm soil means quick and abundant returns. That is one reason why we use so much manure. It warms and quickens the soil.

Plant vegetables that ripen at the same time as near together as their size, habits and tillage requirements will permit.

Practice rotation; for instance, lima beans should not immediately follow string beans or peas. As far as possible, keep the plants subject to the same insects and diseases together. It is easier to treat them, and besides, it leaves the other portions of the plot uninfested, if they get so bad that you have to change the position of the plants.

If you are growing fruits, you could plant a row of apple trees about fifteen feet apart on the northern border, plums and pears on the west, and cherries and peaches on the east side. Then if you could put a grape-trellis next the apples, and a row of gooseberry, currant, raspberry and blackberry bushes in front of the grapevines, you will have a windbreak as a protection against the north winds, which will prove profitable in itself as well as in its service to the vegetables.

Transplant freely; nearly all vegetables are the better for it, especially lettuce and other salad plants. Sow seed thickly in the first place. You can easily thin out or transplant, but you cannot increase the number of plants if you have sown thinly. Even a small propor-

tion of weak seed that would not sprout would seriously affect your crop. Besides, where you sow thickly, you can afford to weed out all but the best and stockiest, and you are thus doing something to improve the strain.

Keep your soil busy all the time. Dr. Watts said, "Satan finds some mischief still, for idle hands to do," and that might be paraphrased to read that "Nature has great store of weeds in idle lands to grow." "Weeds are the farmer's best friend, they force him to cultivate." But that friendship is only true where it has that effect. The farmer who lets the weeds grow either in the garden rows or in the walks and hedges, is going to find them his worst enemy. They poison and suffocate his crop, and are also regular incubators of insects and diseases. The best way to fight them is to starve them out with paying crops. Therefore, as soon as one crop begins to ripen, plant another, and then another, and so on. To grow but one crop is risky, unless you are specializing and have prepared the best possible conditions for that one crop. For a special market this is very profitable. But usually companion-cropping is best. That gives two crops in the ground at the same time, one maturing before the other needs the space. Thus late celery may be planted between the

rows of early celery; lettuce with early cabbage; radishes with beets or carrots; corn with squash, pumpkins or beans, and horse-radish with early onions or cauliflower.

Irrigation for arid soils and drainage for wet or clayey soils, are the two opposite methods which bring astounding results. Any sort of drainage is better than no drainage, but the best form so far discovered is the tile drain laid about two and a half to four feet below the surface. This carries away the surplus water and prevents the roots of the crops being suffocated. On the other hand, irrigation supplies to the dry lands the moisture they need. The tremendous irrigation works carried on by the Government in the sandy, hitherto barren, reaches of the west, are bringing results even more tremendous than the works.

Hard, wet soil will not grow crops and here is where the advantage of draining comes in. Drainage deepens the subsoil and removes the water; it deepens the surface also and makes more of the plant food in the soil available. Wet soil is sticky and hard for the seeds to push their way through; but drainage will improve its texture and make it crumble and fall apart easily, or as the experts say, it will make it "friable." At the same time it will prevent it

washing or "leaching" away. But even this does not tell all of the advantages of drainage. It warms the soil and by making the ground more porous allows the roots to go deeper in search of their food and moisture. This in turn enables plants to withstand drought and hot weather better and makes returns more sure. It also permits working the ground earlier in the spring and after rains, because, the more porous the soil, the quicker it absorbs and stores moisture that comes in rain.

There are germs in the soil which change the nitrogen into nitrates, the form in which nitrogen becomes the real plant food, and drainage favors the development of these germs. You see how important good drainage is.

Get the tools you need. You cannot afford to be without implements if you are cultivating intensively. That does not mean that you must get all the advertised garden tools, or even all that your neighbor has. Although a tool may be the best of its kind, that is not reason enough for buying it. You must have a use for it on your plot. Get whatever you have a use for, and get only the best. It pays in the long run.

A list of tools and costs is given in "Three Acres," and in "A Little Land," so it is necessary

only to note here that the spading fork is a far better tool than the spade; some gardeners never use a spade. The spading-fork is easier to use and breaks the soil much better.

The seeder, attached to the wheel-hoe, is also a saver of labor and of seed: it makes the rows quite straight, so that they are easy to keep free from weeds; it drops the seeds at even distances and if your soil is as fine as it should be, it covers them all just deep enough—provided you have learned to fix the gauges right to start on.

Combination tools, those that do several different things, sometimes work well, but they usually get out of repair quickly, and are apt to puzzle the beginner. Get the best and simplest form of the tool you want, and keep it always in condition for use. Tools that are not cleaned after use are spreaders of disease. Cleanliness prevents and cures. See to it that your cultivating tools, your harvesting baskets and bags, and your storage bins are thoroughly cleaned, and you will soon discourage the bugs. They will regard you as cold and unsympathetic, and your garden as a place to be avoided.

Don't be afraid to use manure, both stable and green, and when you must, use commercial fertilizer. But this is expensive and is only

profitable under particular crops. You won't need it, if you keep the soil supplied with humus.

Don't waste kitchen slops or any other waste water. It all has fertilizing qualities that will help your garden. Even in the winter it is a good plan to pour your slops on the ground, choosing a different spot each day so that no one place may get too wet and leave surface pools. Mankind in the lump is stupid, so stupid that we drain our fertilizing matter into our harbors and then dig it out again at the cost of four dollars the yard.

But you need not be so stupid as that. Even some of our cities are now learning the value of sewage, notably San Antonio, Texas. This city, with its 85,000 inhabitants, has solved the problem of what to do with its sewage, although the city fathers leased the rights to a private corporation, instead of providing for the city's own disposal of it. This company carries the sewage six miles out of town, and has built five miles of canal, through which the surplus sewage not used in irrigating, flows upon a filter-bed where all solids are removed, and the water runs into a big basin which covers about 1000 acres. This basin being very shallow, the sun's rays reach the bottom of it, and purify the water, so that, though it enters one end of

this basin as sewage, it flows out of the other as pure water. Chemical analyses and tests have proved this many times over, and we might take a hint from this at home to "raise our darkened windows and open wide our doors, to let the blessed sunshine in." It is the best destroyer of disease and impurity yet discovered.

The company's acres along the line of the canal profited so much from this irrigation, that farmers soon began to purchase the irrigating sewage water for use on their forage crop fields, and for root crops particularly. The solids are spread on the surface of the lands upon which the clear, purified water is to be used, and the results have been most satisfactory. San Antonio really makes a profit out of that which is costing other cities millions every year, and in doing this has shown us another way to work, in bringing into use all lands that are available in any way for intensive cultivation.

Plenty of manure and thorough cultivation are almost a complete protection against drought. If you have plowed deep, manured thoroughly, added humus and maintained tillage, you can laugh at the drought that would once have spelled ruin for the farmer in any part of the country. You have been told this before in this very book, but that is no reason why it

should not be repeated. It is of such great importance, that the average farmer would make no mistake if he had it made into a motto printed in large and striking type, and hung it where he could see it a dozen times a day. It is part of the "How to Work," and a mighty big part, as you will learn, whether you practice it or neglect it.

Use your brains; that's what they are for. After you get your farm started, you can get cheap and unintelligent labor, to keep it going, if you wish; but you can only reap a profit from intelligent labor, and you must furnish the intelligence yourself. Plan your work, and make the most of your soil, your climate and your market. Things that everybody grows bring low prices, but things that you alone grow, or that you grow better than your neighbors, bring good returns all the year round.

We have to learn, you know, and if we won't learn by doing right and profiting by it, then we shall have to learn by doing wrong and suffering for it—"the way of transgressors is hard."

If you have very little time or very little land, you will probably get the best return for your time and money by growing radishes early in the season with lettuce, followed by bush-beans or tomatoes and then sweet corn.

Put some nasturtiums in any odd space and climbing nasturtiums and morning-glories on your fence, and you will have a very creditable looking garden—big returns for little expenditures.

If you haven't got any land, don't let that discourage you: grow some things in a window box and learn how, so that you have learned something when you do get some land.

You can grow mushrooms in half a barrel in the cellar. The thing to do is to get started growing something.



Part II.

CHAPTER XIII.

ROOT CROPS.

ROOT crops are usually grown in drills and are not ordinarily transplanted. They are hardy and require little skill in the gardener, but they need a cool season and deep soil so as to grow long, firm and well shaped. The quicker they grow the better the quality, so that in the north it is necessary to warm the soil with stable manure and have it in good condition. Good tilth helps quick growth and therefore improves the quality; so that it rests with the gardener to make his root crops among the first and the best in the market. The price of a root crop depends almost entirely upon its looks, so have as few side roots as possible, and cut off those that may develop in spite of care. Forked or branched roots should not be mixed in when we market, for even a few such specimens lessen the price of all.

Early crops, such as radishes, beets, carrots and turnips, are sold in bunches of 6 to 12. All in the bunch should be of the same size and shape

and tied neatly around the leaf-stalks with a cord. The leaves are left on these early vegetables, so they should be kept cool and moist, as wilted leaves also spoil the sale price. Beauty may be only "skin deep," but it commands the market.

Late root crops sell in bulk, and harvesting them is the hardest work connected with root crops. It is well to plow them out, cut off the tops, and allow the roots to lie in the sun only until the soil is dry enough to shake off. They are then ready for storing in pit or cellar, and are easy to keep.

RADISHES.

The radish is the earliest root crop, and the quickest growing. It is ready for market in three to six weeks after planting the seed; so it is a great financial help to one who is just starting a garden. It is a hardy crop requiring rather cool weather or shade. The radish responds well to hot-bed culture and the earliest spring varieties are usually grown that way. But even for planting in the open garden you need not wait long. Soaking the seeds will save several days. As soon as you can work the ground, even before all the frosts are over, radishes may be sown, provided there has been

good preparation-tillage. To secure crisp, edible radishes, the growth must be continuous. Any interruption in development, or an overgrowth, makes the root stringy, bitter and often hollow. See that those in each of your bunches are even-sized and bright and clean, so that they will look like the delicacy that they are. A prime bunch of radishes is as pretty as a bouquet.

The radish is a partial season crop, and is, therefore, suited for all sorts of double-cropping. It is often sown shallow in the same drills with the other vegetables of later growth, because it matures so early that it breaks the earth crust for the slower seeds. Radishes may also be sown between rows of cabbages, beans, peas, etc., or broadcast in beds by themselves. One ounce of seed will sow about 100 feet of drill or eight to ten pounds to the acre.

Sow the seeds one-half inch deep (better sow too shallow than too deep) in rows 6 to 12 inches apart, if you have only a little plot; or in long rows a little farther apart if you use a wheel-hoe. Drop two or three seeds to the inch; this can be done only with a seeder attached to the wheel-hoe frame: later, thin out the seedlings to about two inches apart. Only large seeds should be used, the small ones being too slow maturing. They may be sown at regular intervals of seven

to ten days all through the spring. It is usually difficult to grow good radishes in summer, unless you can select a cool spot and keep the soil cool, but some sorts of radishes do well in the hot weather. Although in America the radish is best known as an early spring crop, it may also be grown for winter use if planted in July or August, and stored like turnips or other root crops. The tops make good greens for boiling.

The radish is the easiest of crops to grow, and has only one serious enemy, the root maggot. This insect is one of the cabbage enemies also, and can be destroyed by injecting bi-sulphide of carbon in the soil, but that treatment is too expensive for the returns from radishes. The most effective way is to sow the radishes where the maggot has not been breeding, and thus starve the pest out.

The most popular varieties of radish are the French Breakfast, Olive-shaped, Scarlet Short-top, Chartier, Wood Early Frame, and White Box. Those that grow well in summer are White Naples, White Vienna, Strasburg and Stuttgart, while for use in winter Scarlet Chinese, Black Spanish and White Spanish are best.

BEETS.

Beets, like radishes, are a hardy crop requiring a loose, rich soil and continuous growth to reach their best and quickest development. They are easy to raise and respond readily to good tillage. The early or garden beet is usually a succession or companion crop, because it may be planted early and matures quickly. Although most kinds require two or three months for maturing, yet with some of the early varieties roots large enough for bunching may be had in six weeks to two months. The quickest sorts are the round or nearly round varieties, which may almost be called surface feeders. For this reason they require soil in excellent tilth and the richest, well-rotted barnyard manure. Indeed, the wise gardener will plow his land in the fall, and plow it deeply, too; then as soon as it can be worked in the spring run the cultivator and harrow over it, and plant the seed about $1\frac{1}{2}$ inches deep in rows from 12 to 18 inches apart. The land must be kept well tilled and free from weeds, especially during the early part of the season. The long field-crop beet is now very little grown, as the early varieties may be sown late in the season for fall and winter use, and the Southern grown beets cost less in the late winter than it does to grow and store

them. Even in feeding cattle, the beet has been largely superseded by the mangel, so that few are grown except the short round sorts for table use. The sugar beet is a field crop.

The seeds (which are really fruits, containing within a hard shell four or five seeds each) require a great deal of moisture to germinate. Some gardeners advocate throwing them into hot water and allowing them to soak for six or eight hours before planting. This makes them sprout more quickly. Beets come up in clumps and must be carefully thinned, until they stand 6 to 8 inches apart, although this is not done until the tops are sufficiently grown to sell for "greens." In this way there is no waste, since top and root alike are used as a pot-herb. The contrast of the green leaves with clean roots attracts customers.

If you plant beets early in the season, say as soon as the ground can be worked, they may be followed by celery, late potatoes, cabbage or cauliflower; or they may be grown at the same time between the rows of some main season crop like cabbage. If planted in hot-beds or cold-frames it will not pay to transplant them, as they mature very early under such conditions, and may be bunched and sold without that labor. In July or August, and in some

places even in September, the turnip-rooted variety may be sown for fall and early winter use, but special attention must be given to tilling them so that the soil may not be too dry. The best and firmest of the roots may be stored for winter use, and for better prices.

Early beets are sold in bunches of six, but late crops are sold in baskets or barrels. Five to eight pounds of seed are needed for each acre; one ounce will sow from 75 to 100 feet of drill. The average crop is from 300 to 400 bushels to the acre.

Beets have three serious diseases: root-rot, for which apply lime to the soil; leaf-spot, kept in check by spraying with Bordeaux mixture; scab, for which the only cure now used is not to plant where the land is infested.

Beets respond to special fertilizers, which may be used if the soil is already rich in plant food, and the market will afford enough profit to pay for the extra expense. At the New Jersey Experiment Station from 400 to 700 pounds of nitrate of soda well-worked into the soil before the plants were set out, increased the yield from 10 to 23 per cent.; and the earliness all the way from 17½ to 135 per cent. In the "Farmer's Cyclopedia of Agriculture," Messrs. Wilcox and Smith of the Department of Agri-

culture, say that "where earliness is of primary importance, nitrate of soda can be used with profit with this crop even on the richest of soils."

If you can't get your root crops early, get them late. When the mercury goes away down, the prices go away up.

CARROTS.

Besides being a hardy crop that may be planted in the early spring as soon as the ground can be worked, carrots have the advantage of having no serious insects or diseases. They require a clean, mellow soil, that will not "bake" over the seeds, and the best of surface tillage. Carrot seeds are so small and so slow in sprouting, that it is good practice to plant radishes or turnips or other quick seeds in the same row, to help break the crust for the tender seedlings. The young carrots have such a slight hold upon the soil, that they need petting, only the shallowest, surface tillage being possible, yet scarcely any of the garden crops need tillage more. But once let the carrots get established in the soil, and they are easy to grow and give good returns. They are sown thickly about one inch deep in rows from 12 to 18 inches apart. When they are well up, they should be

carefully thinned so as to stand two to three inches apart in the row. The early varieties will bear forcing and respond to hot-bed culture, but they are slower of growth than radishes or beets, requiring from two to two and a half months to be ready for market. They are tied in bunches of six with the tops left on, and are in great demand in the early season when small and bright and tender.

Carrots are of two main types, the early, small variety and the large sort grown in the field for winter use. The large kind is not much grown, because the smaller varieties may be planted late for winter use, and as feed for stock, carrots are no better than the larger root crops. If you grow the early variety for winter use, you will need to be sure that the soil is in good tilth, as dry or weedy soil would be fatal to carrots. Maybe you are tired of reading that all these crops need good tillage; but you will be much more tired if you neglect it. This crop may be sown as late as the middle of June in the Northern States, and the ground should be sown with some early crop, like radishes, to keep it in good condition until needed for the late carrots.

Carrot seed is sown thickly, about two pounds of seed being required for an acre, or one ounce

to about 300 feet of drilled row, if the seed is fresh. A good crop of carrots is from 200 to 300 bushels per acre.

The best varieties are the Early Forcing, which may be grown in hot-beds, cold-frames, open garden in the spring, and also in the fall for home use; the half-long Danvers for a good, reliable mid-season crop and the Long Scarlet for a good late crop.

These root crops are among the prettiest "fancy goods"—where they can be sold directly to well-to-do people they bring fancy prices.

TURNIPS.

The turnip is such an easy crop to grow that the gardener would have a snap with it if it were not for the snap that the root maggot has. It is a hardy, quick-growing crop, requiring a cool, short season and a moist soil. The turnip is so hardy that the herbage can bear considerable cold without real injury, so that when grown for winter use it is left standing in the field until the black frosts; but the roots will not stand such hard freezing as parsnips or salsify.

Turnips should be planted in moist, rich soil to insure quick sprouting, because their chief value as food is the result of rapid growth.

Like the radish, the turnip, if it grows slowly, is likely to be tough, woody and stringy. True turnip has soft, white flesh (sometimes the boys eat it raw) and the roots are flatly rounded, while the leaves are rough and hairy. The seed is sown as soon as the soil can be got ready in the spring for the early crop, and as late as the last week in July in the Northern States, or the middle of August in the Middle States, for a fall crop. They are ready for the table in six to ten weeks. Turnips are planted from 1 to 1½ inches deep in drills from 10 to 18 inches apart; one ounce of seed for every 200 to 300 feet, or one pound to the acre. Plants should be thinned until they stand three or four inches apart, and later, as the roots are pulled, a foot of space will allow of full development.

Turnips suffer so from root maggot, that where the land has become infested with this pest, it is better not to try to grow them until the insects are starved out, because the only effective treatment that we have found so far is to inject bi-sulphide of carbon into the soil, which costs too much for turnip crops.

PARSNIPS.

Unless your preparation-tillage has been thorough, there will be no good parsnips for you.

They require cool, very deep soil in excellent tilth to make good roots a foot long, straight, clean and tapering. A lumpy or shallow soil makes the roots branchy, and of little market value. Parsnips are usually sown in drills, far enough apart to let the wheel-hoe in; sow thickly and then thin out the rows, leaving plants about six to eight inches apart. We have to sow thickly because some seeds may be bad, for parsnip seed does not retain its life for more than two seasons. An ounce of fresh seed will do for 200 to 250 feet of drill, or about four pounds to six pounds to the acre.

The seeds sprout so slowly that it is well to plant some 'quick growing seed with them to break the soil, else it may have to be broken by hand. The parsnip is hardy and the seeds may be sown as soon as the ground can be put in condition, but it must be the main crop, for it takes the whole season to grow the long roots. The roots may be left in the ground until the next spring, as the hard winter freezes do not injure them. In that case you must store a large part of the crop in cool pits or cellars, because the best price is obtained in the late winter or very early spring when the ground is often frozen so hard that you can't pull the roots up. It would not pay to blast them out,

you know. There need be no waste where stock is kept, because the ragged roots make excellent feed. The Hollow Crown and the Student varieties are the standards. A good crop is 500 to 600 bushels to the acre, but under good conditions, this can be bettered. No serious pests or diseases consume the parsnips, so men and stock get all that grow.

SALSIFY.

The salsify plant tastes so like an oyster that it is called the oyster plant. It is grown for kitchen use only, not for stock. Like its cousin, the parsnip, it must be sown in deep, rich soil and given the whole season to mature. Salsify can be left in the ground all winter, unless it is needed for the late winter or early spring market. The seeds sprout quickly and may be sown as early as the soil is ready. Like beet seed, the salsify seed is really a fruit, long and hard like a stick, and it is somewhat difficult to use a seed drill in sowing them. An ounce of seed sows only about 70 feet of drill; an acre requires eight to ten pounds and a good yield is from 200 to 300 bushels per acre. There are no serious insects or diseases.

There are two important modifications of salsify known as Black Salsify and Spanish

Salsify. The regular type is a biennial, though cultivated as an annual, becoming wild and losing its fleshy root if left in the ground longer; but the Black, which is grown just the same as the main type, is perennial, and the roots continue to enlarge, yet to remain edible, though left in the ground more than one year. It has broader leaves than the regular salsify and a long black root, yellow flowers and light seeds.

Spanish salsify is not generally known in this country. Its root is much lighter in color and not so strong in flavor, but with careful cooking it develops other qualities of its own that are most agreeable. Moreover, it is easily cultivated and yields larger returns than the regular salsify and the average person would not know the difference. It is sown and cultivated just as salsify is, and when bleached the young leaves are eaten like cardoons, that is, as a pot-herb.

HORSE-RADISH.

Although horse-radish is a perennial, it gets woody the second year, so that the market gardeners grow it from fresh cuttings, called "Sets," every year. These cuttings are taken off the side roots, from three to seven inches long, and from the thickness of a lead-pencil

to that of a little finger. The cuttings are made when the roots are dug in the fall and may be stored all winter. Horse-radish grows very easily, but as it is a late season crop, and needs cool soil, there is nothing gained by planting it early. It requires very deep soil if the roots are to grow straight, long and tender. Only long, large, even shaped and uniform roots bring any price in the market. It may be planted with early cabbage or beets, and when they are harvested, the horse-radish takes the land. It will grow until freezing weather and is the better for being left in the ground as late as possible. Sets are planted either upright or slanting, three to five inches below the surface and from twelve to eighteen inches apart in rows. If they grow too fast they may be cut down two or three times, as horse-radish stands considerable ill-usage, if it is planted deep and in good soil. Before sending to market, wash the roots and trim them of all side shoots; tie them in bunches of six or eight; or they may be sold in bulk or by the barrel. The price ranges from ten to fifty dollars a ton, and in good rich soil four tons can be raised to the acre. The usual yield is only two tons. The extra two come from knowing how.

But horse-radish can easily become a bad

weed, for weeds are only plants misplaced. So plow the roots out as soon as you have dug your crop and have them removed. Although it is next to impossible to get them all out, they cannot do much harm if the ground is kept thoroughly busy with some other crop. There is a good deal of the Old Nick in Nature, and wherever she finds idle land she sets to work to grow weeds. She would just as readily help your crops; so it is for you to profit by her willingness.

CHAPTER XIV.

TUBER CROPS.

POTATOES.

A HEAVY yield of potatoes may be simply a matter of moisture and frequent tillage.

The potato likes Scotland* and Nova Scotia because it thrives best in deep, cool, moist soil, finely pulverized and containing much potash. Knowing the conditions under which any crop grows well, is equivalent to growing a big crop, to the careful farmer, so if you want some potatoes, you may as well get the most possible. The average farmer raises 75 bushels to the acre, but it pays to be above the average. You ought to be ashamed to grow less than 200 or 300 bushels even taking 75 as a starting point, for, when you consider that by the exercise of brains and labor, all the way from 600 to 1300 bushels per acre have been produced, you may well decide to prove what you can do. You have a chance to beat the record.

Potatoes should be planted deep and early. If they are planted too near the surface they will ripen before they are fully grown or maybe get sun-burned and unfit for eating. Choose

* Ireland is not really the land of the "praties"; the average yield of Great Britain is higher than of Ireland.

your best potatoes for seed, if you plant from your own crop; or buy only the best varieties, if you must buy. But it is well to remember that there is always danger in potato seed raised elsewhere than on your own patch where you can watch conditions. Don't use a potato for seed if it has a black thread running through it; a roughened or irregular circle on the skin, or a hollow center. Burn all such; else you will have diseased crops and give yourself no end of trouble and expense. Plant the seeds at least four inches deep and plow them in. The surface should be harrowed two or three times before the plants come up, and the crop should have light, surface tillings five to eight other times during the season.

Potatoes are planted in "drills" or continuous furrows, 27 to 42 inches apart, at intervals of 9 to 18 inches, and it requires from 8 to 18 bushels of potatoes to plant an acre. Most farmers plant too sparingly. There has been much book discussion as to the size of seed cuttings, but the most economical size is one weighing about three ounces or the size of a large hen's egg, with at least one good eye. The potato cutting is food; therefore the larger the cutting the more food, and the more food the better early growth, and the better the early growth

the better the yield. Bailey claims that a piece containing too many eyes means too many sprouts contending for that food and each weakening the other in the struggle for its own existence.

For early potatoes, the only ones that can pay in a small plot, remember five different things: (1) good site and an early soil; (2) land prepared either by special plowing the fall before, or by growing late-tilled crops, that the soil may be in good tilth; (3) free use of concentrated, quick-acting fertilizers; (4) early varieties of potatoes; (5) sprouting the sets, so that the short, thick, firm, colored shoots are secured. To secure these, light and a moderate degree of warmth, 40°-50°, is needed. Nothing pays better than sprouting.

No crop needs spraying more. Unless it is frequently sprayed, it is almost certain to be attacked by the potato bug, the flea-beetle and blight, and the yield cut down. Dry Paris green puffed on while the leaves are damp with dew, ends the troubles of the bug, and Bordeaux mixture can be sprayed for blight. No specific has yet been discovered for the flea-beetle, but it does far less damage where Bordeaux mixture is freely used. I have heard of letting the chickens loose on the flea-beetles.

SWEET POTATOES.

The common or Irish potato does badly in the South, except as an early crop, because the climate is too warm, but where the common potato suffers, the sweet potato thrives. It requires a warm, sunny climate, a long season, and warm, loose soil, with plenty of moisture during growing time, and less during ripening. It is very tender and cannot stand frost. It is grown extensively as far north as the sandy lands of New Jersey.

The soil must be rich, loose, and well drained and liberally fertilized with well-rotted manure. Wood ashes will help the growth of the tuber most satisfactorily.

Only one variety of sweet potato, the Spanish, is cut and planted like the common potato. All other varieties are grown from "slips," or, as they are sometimes called, "draws." A whole potato is laid on a hot-bed and covered with a couple of inches of loose soil or leaf-mould. Very soon it begins to sprout and when the shoots are from three to five inches high, they are broken off next the tuber, and planted. Their roots have already begun to form and these are the "slips." The same potato or tuber, will give another set of slips if allowed to remain in the ground. In the ex-

treme south no hot-bed is necessary to start the sprouting.

Another method of obtaining slips is from cuttings from the ends of the vines. Take cuttings from 10 to 12 inches long, from the earliest planted or the most vigorous vines. Having removed all the leaves except those at the very tip, plant the cutting lying down with only an inch or two of the tip showing. The rows should be about three feet apart and the slips in the row 18 inches apart. The average yield is from 200 to 400 bushels per acre.

Sweet potatoes suffer from several fungous diseases which are discussed in New Jersey Experiment Station bulletins on Sweet Potato Culture. Leaf blight may be checked by the use of Bordeaux mixture, but rotation is the cure for tuber crop diseases.

CHAPTER XV.

BULB CROPS.

ALL bulb crops are hardy, liking cool seasons and moist rich soil with a loose top. As a rule they are seed-bed crops, but are sown early in the open field. They grow from seeds or bulbs and may be raised as main or secondary crops and treated like onions. Their tops are often used for seasoning.

LEEK.

To the average American, there is but one important bulb crop, the onion, but the foreign-born use garlic, leek and others also. Of these the leek is the mildest flavored and the best worth knowing. It is grown from seed sown in the early spring, and requires the whole season to reach full development. It produces soft bulbs and thick leaves, both being used for seasoning. The leek is stored green, as celery is, being set in earth in a pit or cellar.

GARLIC.

The garlic is the strongest of all the bulb family in flavor. It is grown from "cloves," as the separate sections of the bulb are called, and is planted early. It does not fully mature until the end of the summer or early fall.

SHALLOT.

Shallot is much like garlic, only it is milder, and is grown in the same way. There is one interesting difference, however, between the two. The "cloves" of the garlic are all encased in one outer skin, those of the shallot grow separately.

CIBOULE AND CIVES.

The Ciboule or Welsh onion, and Cives, are grown for their leaves which are used for seasoning. The Ciboule is the most like the common onion and grows the same way and requires the same cultivaiton. Cives grow in dense tufts and are propagated by separating the tufts and planting a section. They are perennial, and make a good border for the garden walk, combining grace and toothsome-ness.

ONIONS.

It pays to grow onions intelligently. They take lots of care, but they repay the time and trouble.

You cannot get the best results from onions by beginning now, at the moment you start your garden, to sow your seed. Onions require that you should begin last year, so to speak. The ground should be well plowed in

the fall, after having been in use with good tillage all the previous season, and the surface soil must be in super-excellent condition. The onion is practically a surface feeder, and as the seed sprouts slowly, and the baby plants are delicate and slender-rooted, conditions must be absolutely right for a good growth. In fact, no other vegetable crop, grown on a large scale, requires such fine surface soil. Hard or baked soil is sure to give a poor crop. The surface must be kept loose and in good tilth, and low, level land is the best place for your onion patch.

When the ground has been plowed, go over it carefully and break up all the clods or lumps, and remove all stones and weeds. Do not use coarse, fresh stable manures, as that leaves the ground too coarse in texture, and moreover increases the probability of weeds, and weeds are death to onions. Only fine, old, well-rotted stable manure may be used, and this must not be plowed under, as it is the surface soil which must be rich. Commercial fertilizers, especially the sorts rich in potash, are of great value in growing onions, and, because of their potash, wood ashes make an excellent top dressing for the onion patch. Keep the soil finely pulverized and you will then have ideal con-

ditions for planting your crop. Next get good seed. Good onions often give poor seed, but cheap seed always means poor onions, so buy the best seed always.

Reclaimed marshes, freed from roots and peat, and thoroughly fertilized, are ideal places for growing onions. The rows or drills, which must be 14 inches apart, must also be perfectly straight, else the necessary cultivation cannot be given. The crop often needs two weedings by hand when the plants are very young, and frequent cultivation by the wheel-hoe. Now the wheel-hoe cannot do good work on rough or uneven ground, and its best work is none too good for onions, so you see where you are at.

The onion crop is divided into two classes, the early crop and the main season crop. Early crop onions are immature, green, and are tied in bunches for market; main season crops are dry and are a staple product.

Early onions may be grown from seed, but are usually grown from bulbs. There are three kinds of bulbs for planting: "top" onions, potato or "multiplier" onions and "sets"; the first two are distinct types, but "sets" are only partly grown onions. "Top" onions are really small bulbs which grow on the top of the plant instead of fruit; "multipliers" are onions

with several hearts or cores, each of which may be planted and will give rise to another bulb, which, in its turn, will develop two or three more cores. The process is continued indefinitely.

“Top” onions start quickly and soon give edible onions. If the bulb is planted out the following year it will send up a stalk and produce a new crop of tops.

To raise “sets,” seeds are sown thickly on dry, light ground, where they soon crowd each other, and by midsummer anyway, the tops die for lack of room, food and moisture. The bulbs, which should then be from one-half to three-quarters inch in diameter, are picked, cured and stored as ordinary onions are. When planted in the spring they start to grow again and soon produce eatable bulbs.

The new early onion culture is growing onions from seedlings raised in the hot-bed or forcing house, and transplanted as soon as the weather permits. By this method the large, quick-growing Southern varieties, Gibraltar and Prize-taker, come to perfection in the North. Our season is too short for this by the ordinary open planting. This “New Onion Culture,” which is not so new, after all, except in the middle East, is fully described by T. Greiner,

in his book published by the Orange Judd Company, N. Y.

In the main season crop, earliness is not so necessary, and less fertilizer will do, so long as it is the right kind. Seed is sown as early as possible, as the onion likes a cool season. In the garden, it is sown thickly because the onion often fails to sprout, but in the field, it is sown more carefully, waste of seed and the thinning in the big field being expensive.

On some land the onion runs to tops, particularly where there is too much moisture, or the ground is too new, or coarse manures have been used. If the tops are still rank and green in late August or early September, it is a good thing to break them by rolling a barrel over the rows, that the growth may go to the bulbs.

The trouble with onions does not end with growing them. They are a difficult crop to handle and store, unless the fall is warm. After they are pulled they must dry a day or two, either in the field or under cover—cover is more expensive but the bulbs have a better, brighter color. The bulbs must be free from dirt and the tops cut off about a half-inch above the bulb, neither more nor less, else the bulb will suffer in marketable value. It must be a clean cut without ragged ends, and the outer

skin or covering must not be broken. If the crop is uneven in size, as is quite apt to be the case, sort them over, because one misshapen or under-sized onion in a dozen, will materially lessen the price received for the crop. There are so many good vegetables on the market today, that the consumer is growing finicky, and wants only the best looking as well as the best tasting. Be careful to give him what he wants, and he will give you what you want—good prices—in return. The sorter may be a very simple contrivance, consisting of a rack or trough with a slat bottom through which small onions will drop. When raised to a convenient height on a slant it is easy to work the bigger onions over the end of the rack into boxes or baskets below.

Most farmers prefer to sell their onion crop in the fall, because it is difficult to house it. Mature onions will not stand freezing, unless they can be kept frozen all winter and allowed to thaw gradually in the spring. But this is a risky process and often results in heavy loss. They need a steady warm temperature, and many store houses are heated to ensure safety from frost.

It takes an ounce of onion seed for 150 feet of drill, or from 3½ to 5 pounds to the acre.

A good crop for an average farmer is from 300 to 400 bushels per acre, but an average crop for a good farmer is 600 to 800 bushels per acre; and some have grown as high as 1100 bushels to the acre. You can choose your own class.

The root maggot is the worst enemy the onion has, and there is no really successful method of fighting it. Infested land should be used for other crops that the root maggot will not feed upon, until he is starved out. Rust and smut which also affect onions, may be practically cut out, or at least held in check, by the use of Bordeaux mixture, but rotation is the best remedy for smut.

CHAPTER XVI.

COLE CROPS.

COLE crops are among the hardy plants of the garden and field, requiring plenty of moisture at the roots, a cool season and cool soil. Hence their name, Cole meaning cool: They are mostly seed-bed crops and need considerable space in which to spread. They are grown for their tops, rather than for their roots or fruits.

CABBAGE.

Cabbage culture needs a cool deep soil that will hold moisture, and continuous growth from start to finish. Its other essentials are: extra care in the selection of the seed; frequent and thorough surface tillage; avoiding the root maggot, club-root, and rot, by proper rotation of crops, and by destroying the cabbage worm as soon as it appears. "A cabbage head" may mean a stupid man, for "a cabbage head" can't take care of cabbages.

The demand for cabbage has increased more rapidly during the past ten years than for any other vegetable in the market. For sauer kraut alone the demand is enormous. Where a

few hundred barrels would supply all the demand twenty years ago, tens of thousands of barrels are now needed annually. Its use was at one time largely confined to the German in this country, but that is no longer true. So there is always a market for cabbage, and if you are willing to take the pains necessary to grow good cabbage, you will find it a paying crop. Cabbage is also largely grown for stock-feeding, and all the animals, from the horses to the fowls, are glad to get it.

There are, of course, the two sorts of crops now so usual in market-gardening, the early and the main season crops. The early crop is started under glass either in the hot-bed or forcing house, while the main season crop is sown in seed-beds or in the open.

The best soil preparation begins the fall before, with deep plowing and from 10 to 20 tons of manure to the acre. Then, if the land is at all acid or has not recently been limed, it is well to apply lime at the rate of 1000 pounds to the acre, and plow that in along with 50 pounds of nitrate of soda. This will supply the food for the cabbage, which is a gross feeder, and won't thrive without plenty of food. Farmers who raise it in large quantities, give it three applications of nitrate of soda after it is quite

well grown. They use about 50 pounds to the acre each time, about ten days apart.

If sown in hot-beds, care must be taken to harden the cabbage sprouts by gradual exposure to the air before transplanting, so as not to cause any serious delay in growth. In field-grown cabbage, likely to be used in part at least for stock feeding, the plants should stand from 24 to 30 inches apart, in rows not less than 30 inches apart. This gives room for the heads to increase in size and weight. Under these conditions an acre will produce from 7500 to 9000 plants. But on small areas, where the crop is intended for market, the plants may be crowded somewhat, to keep down the size and to secure an average weight of four to six pounds each. In this way an acre will bear 10,000 plants. Cabbage should be cultivated once in a week or ten days until the heads touch in the rows. If your cabbage is uniform in size, has few outside leaves, very little stump or core when cut open, closely packed leaves lapping in the centre, freedom from disease or insect injury, and is true to name and type, you should secure the uniform price of five cents a head in good markets.

Cabbage suffers from many diseases and insects, and the gardener needs to be on the

watch constantly if he is not to lose his crop after all his labor. The cabbage worm makes its appearance early, and should be destroyed at once; while for club-root, black rot, etc., rotation is our only usual remedy.*

Different varieties thrive better in different localities. You must experiment in a small way, or find out what your neighbors have done, keeping a record of the sort that does best under your conditions, and then plant only that. Near New York City the Bergen Drumhead does wonderfully well, but in some western parts of the country it has less success. The Newark Flat Dutch, on the other hand, for an early cabbage, does well both east and west. For a late season variety the Premium Flat Dutch is excellent.

To show the possibilities of profit in cabbage, Professor Bailey, in his "Vegetable Gardening," quotes from an expert cabbage grower in Green

* **NOTE.**—Some experts think that lime is the one great soil doctor, especially in a garden where crops are plowed under, lots of manure is used and there is not much chance for crop rotation. Heavy doses of lime will destroy many fungous diseases and also kill off a good many insects, especially the soft-skinned kind which gather as crops are grown in the same place year after year. It would scarcely be possible to grow good cabbage in the same spot for a series of years without heavily liming the soil. It prevents club-root.

Bay, Wis., as follows:—Assume that you have first-class land worth \$200 per acre:

| | |
|--|----------|
| Interest and taxes per year will cost, say.. | \$15.00 |
| Forty loads manure at \$1.00 per load..... | 40.00 |
| Plowing and fitting the ground..... | 3.00 |
| 10,000 plants at \$4.00 per thousand..... | 40.00 |
| Setting and watering | 5.00 |
| After-cultivation..... | 10.00 |
| Harvesting and marketing..... | 50.00 |
| | <hr/> |
| Total | \$163.00 |
| 8000 heads sold at \$3.50 per hundred.... | 280.00 |
| | <hr/> |
| Net profit..... | \$117.00 |

If you get only 8000 plants out of 10,000 set, it is a little below the average return, and as the market price is estimated at only $3\frac{1}{2}$ cents per head, there is no trace of exaggeration in these figures. The estimate was made ten years ago.

A crop of cabbages can be grown and harvested in 100 to 110 days, which makes possible two crops from the same piece of ground in the one season. There are two ways of planting the first crop. One is to use a good rich seed-bed and sow the seed in November, the favorite variety being the Jersey Wakefield. When the plants are three or four inches high, transplant them to cold-frames in a protected spot and let them winter there. In the spring they

will soon start growing and be ready for transplanting to the field early. The only drawback to this method is, that the plants being really old when spring comes, you are apt to lose a good many by their running to seed. For this reason, another method is rather to be preferred. Use the same variety of seed, but sow in hot-beds in February, and as soon as the plants are three or four inches high, transplant to cold-frames. If they are not too crowded, they will be ready for planting in rows in the field by April 1. But you must remember that the cabbage is a heavy feeder and that your soil must be rich and full of humus.

One noted cabbage-grower in New Jersey says he plants his cabbage with a potato planter, which makes the rows 3 feet apart, distributes the fertilizer, and makes the ridges for the plants all at one time. He levels down the ridges with a plank drag which covers two rows at a time. The fertilizer is of high grade, applied at the rate of 1000 pounds to the acre. If plants are set 20 inches apart, it will require 10,000 for an acre. He cultivates thoroughly until the cabbages begin to head; then while cultivating once more, he applies nitrate of soda at the rate of 150 pounds to the acre, putting it on the row close to the plants, but

not on the plants. This makes the cabbage head up quickly and uniformly, and makes the heads crisp and tender, besides increasing the yield enormously. This crop should all be marketed by July 4, and the yield should be from 8000 to 9000 heads per acre.

For the second crop, sow the seed in a good bed in the open, about the last of May and by July 15 at latest, the plants can be transplanted to the field. Between marketing the first crop and transplanting the second, the ground should be again thoroughly prepared by the addition of 1000 pounds of fertilizer to the acre and 150 pounds of nitrate of soda. Plant the same as in first crop. The variety most used is the large, early Dwarf Flat Dutch.

In growing late cabbage there is much more danger of maggots and other insects destroying your crop. The New York Experiment Station has tried a simple device which has given satisfaction so far as tested. This consists of screening the bed completely with cheesecloth which protected the plants from maggots. From 1800 square feet of screened bed 50,000 plants were transplanted to the field, while from an unscreened check plat intended to plant 40 acres, only enough plants for four acres were secured. The plants were "hardened"

by removing the screen one week before transplanting. There was no more wilting than with plants grown in the open. This is cheaper than any form of insecticides.

KALE.

Kale requires much less care than cabbage, and is usually sown where it stands. It is probably nearer the original type of cole plant than any other, and even in cultivation produces no heads, but very large, heavy foliage. It is a very hardy plant, and is grown especially for spring and fall crops, and is much used as greens at seasons when other greens are not to be had. In the Northern States the seeds are sown in the spring and the plants are ready for use in the fall. When the crop has been thinned, the plants that are to reach maturity should be from 10 to 20 inches apart, and the distance between rows may depend upon the sort of cultivation to be given. In large areas of kale, horse-cultivation is best, but in a small plot the usual 12 to 18 inches will allow of wheel-hoe work.

Kale is such a hardy plant that frost will not hurt it, and the crop is often allowed to stand in the field until very late in the season, or even all winter. The large outer leaves are improved

by frost. In the South and Middle South, kale seed is sown in the late summer and the young plants allowed to stand in the field unprotected all winter, but this cannot be done in the North. There the young plants need cold-frame protection. For this reason there is little winter-grown kale in the North, and the extensive supply that comes from Virginia from January until late spring makes it unprofitable to force it for early spring in the North.

There is a form of kale called collards, which is much grown in the South, especially where the climate is too hot for successful cabbage-growing. The seed is sown very early in the spring in protected seed-beds, so that the crop may get its growth before the hot weather sets in. It is much like cabbage, and sometimes young cabbage plants are raised for greens, and are called collards. Kale is subject to the same enemies as cabbage (which see), and requires the same sort of cultivation.

BRUSSELS SPROUTS.

Brussels sprouts are closer kin to kale than to cabbage, although not exactly like either. All cole crops have similar needs in soil, food and tillage, so what holds for one may be taken as true for all, except that kale and Brussels

Sprouts do not exact so much care as the others. In the Northern States, the seeds are generally sown quite late in the season that the crop may not come to perfection too early, as the plants are most prized in late autumn and early winter. A large part of the crop's growth is made in the cool weather of early fall. If the seed is sown in seed-beds in June, the plants will be ready to set out late in July or early in August. Where the winters are mild the crop is often left in the field until used, but in the North it is usually dug and placed in pits, like leek or celery.

The stalk of the Brussels sprouts may be from two to three feet high, although where the season is short, the dwarf or half-dwarf varieties give surer crops. All along this stalk, from the root to the crown of leaves at the top, grow tiny baby cabbages, each of which is called a "sprout," and averaging from an inch to two inches in diameter. When the sprouts are small and tender they are the most delicately flavored of any of the cabbage family. In many places, however, the demand is very limited.

Success in raising a good crop depends chiefly upon careful selection of seed. There is no crop which runs down so quickly, and in which

greater care is necessary in choosing only the best for seed. It is subject to the same diseases as other cole crops.

CAULIFLOWER.

The cauliflower is more particular than cabbage, both as to climate and cultivation. It won't head up in the heat and must have a cool, moist climate to reach perfection. It also needs a constant water-supply and therefore demands the best of tillage. It will grow only from the best of seed, and as it is easily sunburned, it is grown chiefly for early and late crops. For early crops the seeds are sown in hot-beds or forcing houses, and transplanted as soon as the weather is settled, so that the crop is off in late June or early July. The best varieties for this early cropping are the Snowball and Paris, variations of the Early Dwarf Erfurt. The fall crop is started in seed-beds in the summer and transplanted to the garden. For this crop some of the larger and later growing varieties may be planted.

Cauliflower is grown to best advantage along the northern sea-coast States, Long Island, the shores of the Great Lakes, and in the Puget Sound region, and wherever irrigation is practiced. Where the climate is at all inclined to

be sunny it is well to tie leaves over the young heads to blanch them, otherwise they will brown in the strong light and bring a lower market price. It is necessary, ~~too~~, to save all the moisture there is in the soil by the most careful tillage. Tillage should be shallow but frequent all through the growing period. "But-toning" or the throwing up of irregular growths which spoil the evenness of the head, comes from poor seed, or dry soil, or too great heat; and also from allowing the plants to be checked in their growth and then started again by renewed cultivation. The crop requires steady and persistent care, rather than occasional energetic care, and will repay you for all your effort.

The best cauliflower seed—and that is the only sort worth using—is expensive, often running as high as \$3 to \$5 an ounce, and you may be tempted to choose the cheaper sorts. But the best seed is of vital importance in growing cauliflower, the cheaper kind being given to "buttoning," which lessens the price you can get in the market. The best seed in the market has so far come from Denmark, but the Puget Sound growers are beginning to rival the Danes. There is a family of long-season, late-growing cauliflowers, called broccoli, but they are little known in this country. Things

that are little known are all right to eat and to show, but they are usually hard to sell.

KOHLRABI.

Although of the cabbage family, kohlrabi looks and tastes more like turnips and is cultivated like turnips. It is grown for the thickened stem or tuber which grows above the ground, and if eaten when young is very tender and more delicate in flavor for early spring use than turnips. It is also excellent for stock feed and is grown extensively for that. The best variety for garden use is the White Vienna, and the tubers should be eaten when from two to three inches in diameter. Like all cole crops they need continuous growth, otherwise they become bitter and stringy. Successive sowings of the crop may be made and when thinned the plants should stand from six to ten inches apart. They require from two and one-half to three months to mature and may be planted and tilled just as turnips are.

Cole crops all suffer from the same insects and diseases and it is well to get the latest advice upon how to deal with them. For root maggot, a most troublesome pest, read Cornell Bulletin 78 (published at Ithaca, New York), though the only really effective remedy is well-

planned rotation. In this bulletin, Slingerland recommends placing tarred paper cards close to the young plants to protect them against the maggot; rubbing the eggs of the maggot off the base of the young plants, and injecting bisulphide of carbon or carbolic acid emulsion into the soil about the plants. It is necessary to use a syringe made specially for this purpose.

The Cornell Bulletin 104, deals with cutworms, and New York Bulletins 83 (p. 657) and No. 144, tell about the cabbage worm or butterfly, the common yellow butterfly. Better look them up. They recommend persistent use of Paris green on the first crop, and a mixture made of five pounds pulverized resin; one pound concentrated lye; one pint fish oil or any cheap oil except tallow; five gallons water. The same treatment does for the cabbage looper.

For aphids, or lice, read the New York Bulletin 83 (p. 657) and Florida Bulletin 34 (p. 270). The injection of bisulphide of carbon in the ground, or the application of kerosene emulsion to both sides of leaves when young and small; tobacco; pyrethrum; Persian insect powder—any of these will prove more or less effective.

New York Bulletin 83 (p. 683) will tell you about methods of dealing with the Harlequin

Cabbage Bug. Hand-picking is effective, and with clean culture, should eradicate this pest.

Club-root is really cured only by a thoroughly planned system of rotation, although air-slaked stone lime, applied in the proportion of 75 bushels to the acre, does good work. Read New Jersey Bulletin 98.

CHAPTER XVII.

POT-HERB CROPS.

POT-HERB crops are "greens," grown for their leaves. Unless the growth be quick and continuous, the leaves will not be crisp and tender. Quick and continuous growth can be secured only by having the soil in good condition and giving the crop careful tillage. Furthermore, greens are mostly surface feeders, so that the surface soil must be in excellent tilth, and contain much plant food. They demand cool weather and are usually grown as succession- or companion-crops, because they do not require the whole season to mature.

SPINACH.

Spinach is a spring crop and a fall crop, because spring and fall give the cool, moist temperature it needs to come to perfection. Spinach belongs to the pigweed family and is a cousin to the beet. There are two varieties, the prickly seeded and the round seeded. The prickly seeded is the hardest, and is most commonly used for fall sowing.

Farmers in the North used to grow spinach extensively under glass, but of late years the large out-door crops grown around Norfolk,

Va., have spoiled the profit in that, and the Southern product takes its place. The spinach for early spring is sown in the field or garden in September and should be thoroughly established before winter, with a spread of leaves at least three or four inches.

As far north as New York State it is left out uncovered all winter and does not suffer unless the frost causes the ground to "heave." If straw or litter can be had without trouble or expense, the spinach can be covered lightly as that often prevents "heaving." If all goes well, the plants resume growth early in the spring, and may even continue growing during the winter if the season is mild. It is ready for market in April or May and should be off the ground in June to make room for the main crop. Southern spinach is marketed from late November until April or May.

Although spinach is a comparatively easy crop to grow, it needs certain conditions for perfection. The land must be rich and well drained, and liquid fertilizer must be applied after the crop gets started. Some put manure on the plot in the fall, and, as it leaches during the winter, it fertilizes the plants and starts them growing in the spring. Hen manure may be used. But the best way is to apply

nitrate of soda or sulphate of ammonia in a weak solution so that 50 to 75 pounds will be sufficient for an acre. This is generally used in a sprinkler and is applied two or three times at intervals of a week or ten days, using each time, 50 to 75 pounds of fertilizer.

Spinach is sometimes sown in the spring in the place where it is to grow. But in that case, the position chosen must be a warm one, and even then, although a better stand is often obtained, the crop does not mature quickly. It is still occasionally started under glass and transplanted to the garden, and sometimes it is grown in frames all the way through to maturity. Gardeners who want to hasten their crop frequently cover it with glass during February and March, and it responds well to this treatment.

A variety known as New Zealand spinach, which is hardly a true spinach, thrives in summer, but as greens are not greatly in demand in summer, it has not become very popular in this country.

An ounce of spinach seed will sow 150 feet of drill, or 10 to 12 pounds to the acre. It is so necessary to have excellent drainage for spinach, that the land is usually plowed into low ridges or beds six to nine feet wide. The

spinach is sown lengthwise of the beds 12 to 18 inches apart, according to the sort of tillage to be used.

CHARD.

One of the best of the pot-herbs, though not so generally known, is the chard or leaf-beet, which usually requires the whole season to mature, although it will give a succession of leaves from early summer until fall. The leaf-blades and midribs of the chard are very broad, and are usually white or slightly tinted, instead of green. Gardeners often blanch them further by tying the leaves together while growing. The seeds are sown in the spring as thickly as the ordinary beet is sown, and the plants are thinned until they stand six to twelve inches apart in the row.

MUSTARD.

Mustard is cultivated more extensively in the South than in the North, as it will grow where the climate is too hot for other greens. In the North it is usually grown only in home gardens for family use; the plants run to seed in midsummer, so seed must be sown very early in the spring. They are ready for use in May or June. Some of the new improved varieties

of curly-leaved mustard are among the best of pot-herbs. In the South, the Southern Giant Curled Mustard is much used, taking the place that lettuce and spinach fill in the northerly sections. The Chinese Broad Leaved is a vigorous variety which gives a large amount of foliage. It is easy to grow, and even in the North, if the soil is warm and sandy, seed may be sown in the fall and the plants will be ready for use early in the spring, even though the seeds do not start sprouting in the fall. The seed escapes easily and sows itself in unoccupied areas and spreads rapidly. So, if it is not carefully watched to prevent too general seeding, it can readily become a troublesome weed.

DANDELION.

Everybody knows the wild dandelion, and almost everybody likes it as a pot-herb, but only those who have eaten the improved garden varieties, know its real possibilities. Although the dandelion is perennial, it is treated as an annual for the best results in cultivation, and the seed is sown in early spring and the crop either harvested that fall or allowed to remain in the ground until the next spring. It will grow anywhere, and often persists in growing in its wild type where you don't want it; but if you

want plants with large, cut or frilled leaves, you will see that the soil is rich and deep, and that the plants have good tillage all the season through. The leaves of these varieties are not only good to eat, but they are extensively used for garnishing. If they have been properly cared for, the plants will often measure 12 to 20 inches across, with a crown or rosette of dense foliage.

Dandelion seeds are usually sown where the plants are to stand, although occasionally they are sown in seed-beds and transplanted. As soon as they have made a fair growth they are thinned to about one foot apart: the distance between the rows will depend upon the sort of cultivation the plants are to receive. Hand tools require less space than horse tools, and hand-hoeing less than wheel-hoeing, with more labor and less returns. If the plants are allowed to stand through the winter, they are ready for the market very early in the spring when the demand is briskest and the prices best. In harvesting, the plant is cut off just below the rosette and the roots must then be plowed out so that there is no danger of the herb becoming a weed. It is not worth while to try to sell the small plants, but they should be cut off, to prevent them going to seed and becoming a

nuisance. Some growers take the roots up and put them in forcing house or hot-bed for growing greens; or, they may be forced in the dark, which gives white or blanched leaves. This same effect may be obtained in the field by tying up the leaves, thus securing a blanched crown just as is done with endive. We owe much of the improvement of the dandelion to the French.

PURSLANE.

Purslane, or, as it is more generally called, "pusley," is another herb that the French growers have greatly improved. The common pusley weed is a weak, trailing plant, but the French, cultivated variety stands up stiff with large leaves and juicy stems. It grows easily in any good garden soil, matures quickly and is not hurt by warm weather. The seeds are sown early in the spring and there is little danger of the cultivated sort sowing itself and becoming a pest.

There are some other varieties of greens; but this book aims only to treat of those which are generally grown and for which there is a sure market each year.

CHAPTER XVIII.

SALAD CROPS.

SALAD crops are close kin to pot-herbs. But a salad is eaten uncooked, while pot-herbs are boiled. Some plants are used both ways, but they are then classed according to their most general use. Salad crops need a cool, moist soil and quick continuous growth. As has been frequently said before, (but not too frequently,) this can only be obtained by having the soil in good condition and plenty of plant food in a shape that the crop can eat. Salad crops need plenty of water, clean, thorough culture, and a good deal of prompt attention, but they mature so rapidly, that the demands are not really excessive. Having supplied their needs, you must, thereafter, depend upon the weather to help you perfect your crop. If you get dry, tough, wilted salad crops, you need not take the trouble to harvest them, for nobody wants that sort; and that is the only kind you can raise if you neglect them.

There is no pleasure like the ever-new exultation and joy of seeing the things we ourselves have planted come up; and these lovely colored shoots, springing from the brown earth, serve to renew our faith in the bounty of Nature

and the loving order of the world—as well as to fill our pockets.

LETTUCE.

The most popular salad crop is lettuce, a hardy, short-season, companion- or succession-crop requiring moist, rich, mellow soil, and plant food in quickly available form. It is easy of culture and is chiefly grown in the open, though the demand for it has increased to such an extent that it is started in hot-beds or forcing houses that it may be earlier on the market. You can get it in about five weeks. Coolness and continuous growth are necessary to prevent toughness and bitterness. It is little grown in the summer, though the Cos variety can stand the hot weather very well, if the soil is moist and cool. Lettuce does better if transplanted and for that reason it is usually sown in seed-beds; in transplanting, it is usual to cut off the top third of the leaves, unless the seedlings are very stocky; but the mid-season and later crops may be sown where the plants are to stand. Fall lettuce should be sown in late August or early September, and, as it is easier to control soil conditions and to get quick sprouting in a seed-bed than in the field at that dry time of year, it is better to use the seed-bed.

At any time lettuce does best in a soil that is loose and "warm," that is known to gardeners as "quick." Heavy, clayey soils are not adapted to lettuce, so see that your soil is pulverized and well fertilized before the seeds are sown. It has been found to pay well to treat the soil with nitrate of soda after the plants are set, because of the more rapid growth. The soda is applied dry, at the rate of two or three hundred pounds to the acre, and then raked or tilled in. Lettuce seed is sown thickly and the plants thinned, as they become edible, to about a foot apart. The thinnings make excellent "greens." The rows are usually 8 to 12 inches apart.

When grown as a succession-crop, lettuce may be followed by cabbage, early cauliflower, celery and other things. Or, it may be grown between the cabbages and cauliflower as a companion-crop, since it matures before either, and leaves the land to those plants when they need all the space. Seed may be sown successively until warm weather, and you may count upon 1000 plants for each ounce of seed. There are three well-known tribes: head lettuce, cut or curly-leaved, and Cos, and a fourth variety little known, called narrow-leaved lettuce. There are about 100 varieties. Field-grown lettuce has few enemies.

ENDIVE.

Endive is a summer and fall crop, thriving at a time when it is not easy to grow lettuce to perfection.* It is, therefore, a good addition to lettuce, and its culture is largely the same, though endive takes longer to mature than lettuce does. Endive matures under proper care about fifty days after the seeds are sown. If seeds are sown in June the plants will be fit for table use in August or September.

Endive requires about the same sort of soil as lettuce, the same tillage and the same general treatment. The plants should stand about a foot apart each way to make cultivation easier. It is sometimes sown in cold-frames, but just as often in the open field, and successive sowings will give successive crops, but that which gets its start during hot weather is not satisfactory. The inside leaves of the crown are usually blanched by tying them together near the tops for two or three weeks before the plants are ready for market. The blanched sort brings a better price. The disadvantages of blanching are that the plants fade and decay

* NOTE.—Fullerton says that the narrow-leaved, deeply serrated plant called endive in this country, in France is the chicory or succory known to all Americans as a roadside weed with beautiful blue flowers like a very open aster.

quickly unless used at once, and if rain or damp weather follows the tying-up, there is great danger of decay while in the ground. So the plants must be examined occasionally to see that they are doing well. When endive is used as a pot-herb, as it sometimes is, it is better to pick the new young plants before they have time to head or can be blanched. The coarse, outer leaves of the plant are apt to be bitter and tough, so that only the leaves of the crown are used for salads.

With all these crops you can see why nearness to market is so important—even though the land is higher priced.

CHICORY.

Chicory has various uses and is now quite largely grown in gardens. As a salad plant only the tender, blanched leaves of the crown are used. The outer, green leaves are often used for "greens," like dandelion. Chicory is not a surface feeder like most salad plants, but is grown as a root crop the same as carrots or parsnips. The soil must be deep, that the roots may come to perfection by fall; cuttings of leaves may be made during the season. The roots may be left in the ground over the winter. Chicory is really a perennial, but under culti-

vation it is better to grow a new lot of plants each year. When wanted for winter use, the strong roots are taken up in the fall, and buried in a sloping direction in a pit or cellar, with the crown of the plant showing an inch or so above the sand or earth. The growing-place must be kept dark, and in a few weeks the small, prized leaves begin to show. When chicory plants are covered, crowns and all, with about two feet of manure, they develop heads resembling lettuce heads. The young, tender roots of chicory are eaten as beets or carrots are, while the dried root is extensively used in place of coffee. This accounts for the increased area devoted to chicory in this country of recent years; it is less injurious to the nerves than coffee.

CRESS.

There is a delicate "bite" and piquant flavor to cress, that makes it a favorite for salads and for garnishings. Of the three kinds in general use, the water-cress is probably the best liked, but to bring it to perfection it is necessary to have a running brook of clean, cool water. To grow it in a drain is a good way to get typhoid fever. It is a perennial, and readily propagates itself when once it has got a start, while the grower can increase its spread by

scattering seeds along the brookside, or by planting bits of stems in the mud. When once established it will care for itself, and gives the grower no trouble. Although it does best along the sides of running streams, water-cress will grow anywhere if it can get moisture enough, even though not covered with water. Any moist, shady garden spot will do, if it is frequently watered, and gardeners often use abandoned hot-bed pits, where the hose can be turned on the plants daily.

Two women made a nice profit by sending fine water-cress, packed in oiled paper and cardboard boxes, to select customers by mail.

Common garden cress is a cool-weather, short-season annual, whose seeds may be sown early in the spring in a cool, rich soil, as its whole value as a salad plant depends upon its quick, vigorous growth. The plant runs quickly to seed in hot weather, or if left in the ground until late in the season. It is easily grown in pots or boxes in the house in winter; or, if wanted for fall use, the seeds may be sown in late summer and in early fall. Under ordinary conditions, the leaves are ready for use about six to eight weeks after seed is sown. There are a number of varieties of the garden cress; the sort with curled leaves being most in demand. It is not

so well known here as in Europe. The third variety, known as the upland or upright cress, is perfectly hardy and common to all parts of the United States. In cultivation it is usually treated as an annual or as a winter perennial. Seeds may be sown late in the season, when the young plants will be ready for use early in the spring; or, they may be sown in the earliest spring and will be ready for use about fifty-two days after sowing. If grown through the summer they are apt to be bitter and tough, unless grown in a shady place. The upland cress resembles water-cress in flavor.

CORN SALAD.

Corn salad is not so well known here as in Europe, where it is highly prized as a fall and winter salad and as a pot-herb. It is a cool-season crop, grown as lettuce is. It is hardy and may be sown as early in spring as the soil can be worked. It comes to maturity in six or eight weeks, producing a bunch of leaves something like spinach. It may also be sown in the fall and protected in winter the same as spinach, so as to have very early plants in the spring, or, if sown late in the summer, it will give edible leaves in the fall, and in a mild, open season, will flourish all through the winter.

In warm weather or dry places, it soon runs to seed. It is very easy to raise corn salad in any cool soil, and an ounce of seed will give from 2000 to 3000 plants, which should stand about six inches apart in the rows.

PARSLEY.

Parsley is the most popular of all the garnishing herbs, and requires no special care from the gardener, so long as it is planted in a cool, moist soil. The leaves are used for salads and for flavoring as well as for garnishing. Parsley seed is slow growing, and unless the garden soil is in excellent tilth and moist to the very surface, it is better to start the plants in a seed-bed. Although the plant is biennial, the foliage is usually gathered the first year and the plant destroyed, unless seed is wanted. In all these green things, it has been found better to adopt the annual treatment rather than let them develop into biennials or perennials, though that may be their natural habit: we can improve the nature of plants, animals and men.

SALAD CHERVIL.

Although salad chervil closely resembles parsley and may be used the same way, it is very little known in this country. It requires about

the same culture as parsley, and is easy to grow in cool, moist soil in spring or fall. It does not thrive well in our hot summers, but with very little protection from cold-frames or even from brush, it can be carried safely through the winter, if the weather is not very severe. The curly-leaved variety is the most popular, whether used as garnishing or seasoning. The salad chervil grows nearly two feet high when it reaches full maturity, but the young foliage is the most prized. It will give leaves for cutting in six or eight weeks after the seed is sown.

CELERY.

All garden or field crops are divided into two classes, those whose seeds are sown where the crop is to grow; and those whose seeds must be planted in special conditions, such as seed-beds, hot-beds or forcing houses. Celery is always a seed-bed crop, and occasionally a hot-bed or forcing-house crop, according to the time when the grower wishes it to mature. It requires a cool, rich, very moist soil, in excellent tilth, where surface tillage is maintained throughout the whole season. Although good celery may be grown on uplands by means of extra care and attention, it usually grows best in rich, moist, bottom lands. Reclaimed marshes, whose soil

has been pulverized and fertilized, are ideal celery plots, because there the moisture is sufficient even during the heat of summer. Celery cannot stand exposure to the direct heat of the sun, and on exposed places many growers find it necessary to shade the crop.

Celery seeds are very small and slow to sprout and are sown broadcast or in rows. If in rows the sowing is very shallow. The seedlings are tender and delicate, so that it is only in a well-prepared seed-bed that the plants can be satisfactorily raised. The site of the bed should be selected with great care, so as to protect it from hot or dry winds, and to make it convenient to water it every evening. Celery requires a great deal of moisture. The soil must be in such excellent tilth that it will hold moisture up to the very surface without the help of a mulch. Some growers do use a mulch in growing celery, but it makes the delicate seedlings so much more delicate that the loss from sunscald upon transplanting is likely to be heavy. If you do use a covering of any sort, be careful to begin to remove it as soon as the plants begin to grow, and take it all off before they are up enough to be transplanted. But if you make your seed-bed carefully, you will not need a covering for it.

Even when you have taken so much pains to start your celery crop, the work is by no means done. To secure good, strong, stocky plants, they should be transplanted once or twice in the seed-bed before the final transplanting to the garden. It is essential in North Carolina, says Prof. Massey, to transplant celery once before setting in field or garden. This entails so much labor, that many growers are now using the thinning process in place of these various transplantings, and even in the seed-bed the young plants are thinned to stand two to three inches apart and the tops are sheared if they grow tall too soon. The plants may be safely cut back a third or even a half of their growth. In small garden plots, shears or a sickle may be used, but, in the large fields, growers generally use a scythe.

There is usually a good deal of loss in celery seed, so it is well to sow it very thickly, and then you may reasonably expect from 20,000 to 30,000 plants to the acre. An ounce of seed will plant about 200 feet of row, and if good, should give from 5000 to 10,000 plants, although where losses are very heavy the yield is frequently only 2000 to the ounce of seed. One pound of seed should give plants enough to set out four or five acres.

Celery is grown both as an early-season and as a late crop, depending upon the location of the plot. On the higher lands, it is either an early or a succession-crop, following early cabbages, lettuce or other short-season crops. But on rich, bottom lands, it is a whole-season crop, as the land there is too wet to be worked early in the spring. Some growers raise two or three crops of celery in a season from one plot, the later or main crop being planted between the rows of the early crop. As celery may be set out as late as the middle or last of July, even in the Northern States, the main crop does not interfere with the early crop, which may be set out as soon as the ground is ready.

For two crops, the soil needs more attention than where only one is raised, because cultivation and fertilizer must add and preserve the moisture which is natural to the lower levels. Celery needs potash and nitrogen, and these foods are supplied by unleached wood ashes and well-rotted stable manure. Coarse, new manures must not be used, as they make the soil coarse and also cause weeds. Only old, fine, well-rotted manure will do for the celery bed.

When tillage is given the growing plant, care must be taken not to disturb the roots. The

soil may be stirred only at the extreme end of the tiny rootlets, and if fertilizer is applied it must be placed at the same point. Some growers make tiny trenches between the rows and cultivate and fertilize there. Celery is one of the crops that call for thoroughly intelligent care. In many localities where the weather is hot or dry, sub-irrigation, by means of tile-drains, has supplied the needed moisture for this thirsty crop.

There is an entirely new celery culture in the sterile sand of Florida by commercial fertilizer; but that is a subject by itself. The Florida Experiment Station will give particulars.

The plants should be four or five inches high when transplanted and the stems stocky and green. They are set from 10 to 12 inches apart in the rows and the distance between the rows depends mainly upon the method of blanching. To bring a good price in the market, celery must always be blanched, although many growers prefer it in its natural condition for their own use.

Celery is blanched in three ways: Blanching by boarding; by banking up with earth, or by blanching in storage pits. Boarding is generally applied only to summer celery, as it does not afford protection enough for plants left in the

field after early October. It is the simplest and most economical method of blanching, and where used, the rows may be two or three feet apart to admit of horse cultivation.

For blanching by boarding, planks 12 to 14 feet long, one foot wide and about an inch thick are preferred. These planks are set on edge on either side of the row close to the root crown of the plants, and tipped until they rest against the tops of the plants with their edges only two or three inches apart. Either wire hooks or cleats nailed across the tops are used to keep the boards in position. This boarding or blanching process is begun as soon as the plants are tall enough to show a few leaves above the board. As the stalks shoot up in search of light, the leaves fill the spaces between the boards and exclude light from the stalks. Great care must be exercised in warm weather that the plants do not rot at the heart because of too great moisture. Experience will teach you that it is well to get good lumber that may be used many seasons, rather than cheap boards which will warp or crack in one season.

Blanching by banking with earth, often gives a better quality of celery, but it is much more expensive and cannot be so safely used in summer, as it tends to rotting at the heart. It

usually requires two or three bankings or "handlings," as they are called, during the season. The first is given when the plant has spread so as to make a head about eighteen inches across. Then it is gathered in the hand and held, while earth is banked up around it about two-thirds of its height. In ten days or a fortnight this is done again, and in the very tall varieties once again. When this method is used the rows are from three and one-half to four feet apart. Of late years large growers use a "celery plow" for banking.

When celery is to be blanched in storage it is usually "handled" once while in the field, so as to start the process of blanching. Afterwards the plants are placed so close together in pits or sheds that the blanching goes on until the crop is ready for market.

There is another method of blanching celery which is particularly successful in small areas. It consists of growing the plants so close together that the light is excluded and the crop blanches as it grows. It is then grown as close as six or eight inches apart either way. This is called the "new celery culture," and is successful where the hose can be freely used to supply the necessary moisture.

Storing.

But the care necessary for growing celery does not end even with the blanching. It extends to storing, which is also important to the crop. There are several well-known methods, chief of which are storing in outside pits or cellars and storing in celery houses. Usually the outside pit or cellar is a temporary affair and a very satisfactory one is built like the regular vegetable pit: the way to make that is given in another chapter.

If celery is to remain crisp and juicy, it must make a very slow growth all the time it is in the store-house, and should be kept just above freezing point.

When you prepare your celery for market, be sure to clean it thoroughly. This may be done by washing, or it may require scrubbing, but be sure to have it clean. Remove the outside leaves and trim the roots down to a point, then pack in boxes or trays. And right here comes in another reason for studying your particular market, because the number of bunches of celery packed in a box or tray—and even whether you use a box or a tray—depends upon the market you supply. It varies with different markets.

In the “new celery culture” where the plants

are set so closely together that they blanch themselves, it takes 150,000 plants to an acre. This method of growing requires greatly increased quantities of fertilizers or results will be very unsatisfactory. The dwarf varieties of celery are most in demand, and the favorites for summer and fall are White Plume, Golden Self-Blanching and Kalamazoo; while for late winter and spring, Boston Market and Arlington are standard sorts.

The chief diseases are leaf blight and leaf spot and the fungi that attack the plants in storage. For leaf blight, dip young plants in weak solution of copper carbonate, and treat the young growing plants twice a week. It is well to read up on diseases; and for blight read the Department of Agriculture Report, 1886, pp. 117-120; Cornell Bulletin 132, pp. 203-205. To avoid leaf-spot, select seed carefully, treat it with Bordeaux mixture while in seed-bed, and continue its use if you fear an attack. Read New York Bulletin 51 and Cornell Bulletin 132. For dealing with the diseases that develop during storage, read Cornell Bulletin 132, and Bailey's "Vegetable Gardening," p. 229. If you wish to know all that celery specialists have discovered about this crop, read Greiner, Holister, Rawson, Vaughan, Stewart, Von Bochove

and Crider. These books may be found in some good public libraries or will be supplied by our house.

Understanding all this attention and care, you can easily see why there is big money in a successful celery crop, and why Florida's flat sand lands are making their owners rich raising celery—or raising rents and prices.

CELERIAC.

Celeriac is a form of celery, or at least is a very near relation to the real celery, and requires about the same soil preparation and the same conditions and tillage. Celeriac is frequently sown where it is to stand, but as the seed is as slow to sprout as celery, this is not really a wise plan. Sown in a seed-bed and transplanted, the crop gives far better results. In celeriac it is not the stalk but the enlarged, tuber-like root which is eaten, and the plant requires no blanching. It may be eaten raw in a salad, or cooked, as you like. Good roots should be from three to four inches in diameter and they may be kept through winter by packing in sand or moss as many other vegetables may be kept. Celeriac is sown in the same quantities as celery seed, the rows being only

far enough apart to allow of cultivation, and the plants from six to eight inches apart in the rows. Being of a dwarf nature the close planting does not cause the plant to over-shade itself.

CHAPTER XIX.

PULSE CROPS.

PEAS and beans are the pulse plants, and although they are cousins they are widely different in their requirements. In this respect peas and beans resemble children, who though in the same family, do not always thrive under the same conditions or do best with the same treatment. Both these crops are leguminous, and, therefore, capable of storing the nitrogen from the air in their roots, and thus enriching the soil where they grow, yet it is often necessary to apply nitrogen to secure a quick start for early crops. This is especially true where the soil has not before been used to grow leguminous crops. The more we study plants the more we learn about children and the more likely are we to recognize the close relation between all forms of life.

PEAS.

Peas are a partial season crop, and do not require very rich soil. They are so hardy that the seed may be sown where it is to stand, even before frosty weather is wholly gone. It is best to plant the seed from three to five inches deep, which allows the roots always to be in

cool, moist soil. A very rich soil tends to make the crop run to vines and leaves, so that a light soil is necessary, particularly where the crop is to be an early one. Peas should be early or late, because they like cool weather, and are apt to mildew if carried over into hot summer days. The fall crop may be planted early in August even in the Northern States. The plants should be from three to four inches apart in the rows. It takes a pint of seed, of the small varieties, for 100 to 125 feet of row, or one to two bushels to an acre. Where peas are grown in large quantities in a field, for canning, the seeds are sown broadcast and then it requires from two to three bushels to an acre. For early crops the dwarf varieties are preferred as they mature so quickly, and the tall, climbing varieties are planted for late crops. Planting and tillage for both kinds are the same. Peas should be planted in double rows only six or eight inches apart, so that the one row of supports, either brush or chicken-wire, preferably wire, may serve both rows in tall peas, while the dwarf plants support each other. Between each two pairs of rows the space should be wide enough to admit of tillage.

Very few farmers understand the value of peas to the soil or as stock feed. This is es-

pecially important for farmers of the Northern States, for peas will grow where corn will not, because of the cold; they do not need much soil preparation or after-tillage; they yield a good crop of forage that is excellent for fattening; they take any place in a good system of rotation of field crops, although it is most satisfactory to follow them with wheat; they may be sown at intervals of ten days, from very early in the season to very late, and when the crop has been harvested the ground is in better condition than before it was planted.

In Europe they grow peas with delicate pods, called edible-podded or sugar peas, which are eaten as string beans are, but these are almost unknown here. The two kinds of peas used here are the wrinkled-seed pea and the smooth-seed pea. The wrinkled variety is the best, but it is more likely to decay when planted very early. Both sorts of seed are found in dwarf and tall varieties of pea. The most popular of the very early peas are First-of-all, American Wonder, Philadelphia, McLean Little Gem, Daniel O'Rourke, and Blue Peter. Among the late peas the Marrowfat, Champion of England, Stratagem, Telegraph and Telephone are leading favorites.

Peas start so early that they do not suffer

much from weeds, unless the land is infested with the annual wild mustard. This will choke the peas, but it may be destroyed by a spray made of eight to twelve pounds of copper sulphate dissolved in 50 gallons of water, when the plants are only a few inches high. This solution will not materially injure the peas.

The insect enemies are the "pea weevil" or "pea bug"; the pea moth, and the pea louse. The pea weevil lays its eggs on the outside of the pod, and the grub, on hatching, eats its way into the pea and while hiding there changes into a beetle of a brownish-grey color, and about one-fifth of an inch long. It does not come out until after the seed has been sown in the spring. This beetle spoils the pea for seed and even to a large extent for stock feed. Where the weevil has attacked the peas, it is the custom to place the seed in air-tight vessels or rooms and fumigate with bisulphide of carbon for several days. The proportion is one pound of bisulphide for every hundred bushels of peas. Great care must be exercised in using bisulphide, as it is highly explosive and very poisonous. But only the careless or stupid need get hurt; so there's no danger for you. Get explicit directions from your nearest Experiment Station, and follow them closely.

The pea moth attacks late varieties of peas most severely, and as no remedy yet used has succeeded in destroying the pest, or even in materially reducing its ravages, the best thing is to sow early varieties of peas and so escape its worst effects. It is seldom seen in moth form, but is common enough as a "worm," or small, whitish, somewhat hairy caterpillar, about a half-inch long. It lives inside the green pods and eats ragged-edged holes in the peas, which it then fills with excrement or waste matter.

The pea louse is pale-green in color, and clings in great numbers to the tips of the shoots, and sometimes covers the whole plant. It attacks whole areas of peas sometimes, and becomes a serious pest. However, its hold is slight, so that it may be easily knocked off. In small garden patches they are brushed off in pans and burned, while in large fields of peas what is called a "brush-and-pan" device is used, followed by the cultivator, which buries the lice or aphids.

To find out more about the culture of peas, get Farmer's Bulletin No. 224, U. S. Department of Agriculture, Washington, D. C., and for the best methods of dealing with the crop's enemies read Delaware Experiment Station (Newark, Del.) Bulletin No. 49.

Pea cultivation was recorded two thousand years ago.

BEANS.

All the well-known varieties of garden beans are tender to frost, needing a warm season and a sunny exposure. The seed is not sown until the weather is thoroughly settled and the soil in excellent tilth; then it is sown where the plants are to stand. The favorites in this country are the dwarfs; the chief advantage of the dwarf types is the saving of expense in supports, and the greater ease of cultivation. The early crop is usually eaten as string beans, though the best "string" bean is the kind that has no "strings to it." This variety breaks off with a clean snap and is often known as "snap" bean. Beans that are well suited to be eaten as string beans have thick, fleshy pods and very little fibrous tissue. In order that string beans may be of the best quality, the crop must make a quick and uninterrupted growth. A succession of beans may be had all summer by planting at intervals, and late in the summer season a new crop may be planted for late fall use. String beans are always in demand; and now, because of the southern crops, the markets of large cities are seldom without them all the year around.

Beans, like peas, are nitrogen gatherers, but if the ground where they are to be planted has not been used for peas or beans within a year or two, it is well to apply a little nitrogen at first to start the growth. The land should really be prepared for beans the season before you plant them, because new, fresh or coarse stable manure applied when planted, will make the crop rank, without increasing the yield. This is especially true of Lima beans. Spread the manure the fall before, so that it will have done its work before the spring planting begins; if more fertilizer is necessary, use some of the quickly available commercial fertilizers, those rich in potash or phosphoric acid being the best. The soil should be harrowed at least twice before planting and thoroughly pulverized. This puts the soil in good tilth and prevents the growth of weeds. Through the whole season tillage should be frequent enough to prevent weeds getting a footing or a crust forming about the roots, but the plants should not be cultivated while wet with dew or rain, as that renders the crop liable to spore diseases.

LIMA BEANS.

Late Lima beans demand such a long season and such continuous growth, that it is not always

advisable to try to grow them in the Northern States, especially not the true Lima beans. The Sieva or Carolina bean is a Lima that may be successfully raised in the Northern States if due attention is paid to soil and exposure. It is not so high a climber as the large, true Lima, and therefore matures before the nights get too cool. It is a comparatively early crop, quite hardy for a Lima bean, truly annual, with thin, short, broad leaves, and a lot of papery pods much curved on the back, which burst open when the beans are ripe. These beans or seeds may be white, brown, or marked with red, but are always small and flat. Challenger is the favorite brand of Sieva bean. The true Lima is larger, whiter, and may be speckled with red, brown or black. The pods are fewer, thicker, and do not split when the seeds are ripe, and the vines are more easily injured by a touch of frost. Both the true Lima and the Sieva Lima may now be had in dwarf varieties.

String and Lima beans are not the only sorts in common use. The others are not picked until fully ripe, when the pods cannot be used. They are known as "shell" beans, and there are several kinds, all in high favor. These are mostly of the pole variety and mature late in the season. The preparation of the soil and the general

culture are the same as for dwarf beans, the Scarlet Runner and White Dutch Runner.

There are more than 100 varieties of beans and no one book could give in detail all that is of interest concerning them, but the gardener who wants to know more of his bean crop may read Bailey, Bulletin 87 Cornell Experiment Station; and Cornell Bulletin 115.

Bush beans are sown in drills, 18 to 20 inches apart to admit of easy and frequent tillage, which is necessary to preserve moisture and destroy weeds; the plants stand from five to ten inches apart in each row. One pint of seed will sow from 75 to 125 feet of drill, according to the variety of bean used, or at the rate of one bushel up to five pecks of seed to the acre, when sown in drills. Fall, or climbing beans, and all Lima beans, are sown in hills, four or five seeds to a hill, and the hills are three to four feet apart.

Pole and Lima beans need supports and when poles are scarce you may put strong stakes in the ground at distances of 10 to 12 feet, and then run two rows of wire from pole to pole, one row near the ground and one near the top of the stake. Then from the top to the bottom wire, run cords, up which the beans may climb. In small, home gardens, growers often sow Lima

beans in a semicircle of hills around one stake and then run cords from each hill to the top of the stake; but this method is not suitable for a large area.

But climbing beans, especially Lima and Scarlet Runner, can be ornamental as well as useful, and the wise gardener looks out for all such possibilities in his crops. If you have an old fence or unsightly building, plant your climbing beans against it, feed them well, and they will make a good growth of green vines, which will be a pleasure to look upon, at the same time that they give a good yield. This is true intensive farming, as you are getting all there is out of your ground, and at the same time making your place more beautiful at no added expense, save the use of additional intelligence.

There is still another point to remember in planting Lima beans, and simple as it may seem, it is really one of those tricks of the trade which make all the difference between profit and loss. Plant your Lima beans *eye down*. Other beans will stand for anything in the way of planting, but Limas are particular and insist upon having their peculiarities considered. You have seen people just like that, and you know that a little special attention brings its own reward. It is the same with Lima beans—or indeed with any

other crops—give them what they want and they will give you what you want in return. That is nothing more than a fair bargain, and the love of a bargain is ingrained in the American nature.

Commercial bean growing is a comparatively recent business, dating back only to 1839, although beans have been used for human food for many centuries. This branch of farming in New York State alone means the annual production of several millions of bushels of dried beans for commercial distribution.

The Northern States, Canada and California, are the chief bean-growing sections; in warmer sections the crop suffers severely from pests, so that it is not profitable to raise it. Southern bean growers use northern-grown seed to avoid the ravages of the weevil. Even in New York State some sections suffer more from this pest than others; beans grown in the northern counties being practically free from attacks. If you mean to grow beans by the acre, you will do well to read up more fully in Department of Agriculture Bulletins and in Bailey's "Cyclopedia of American Agriculture," Vol. II.

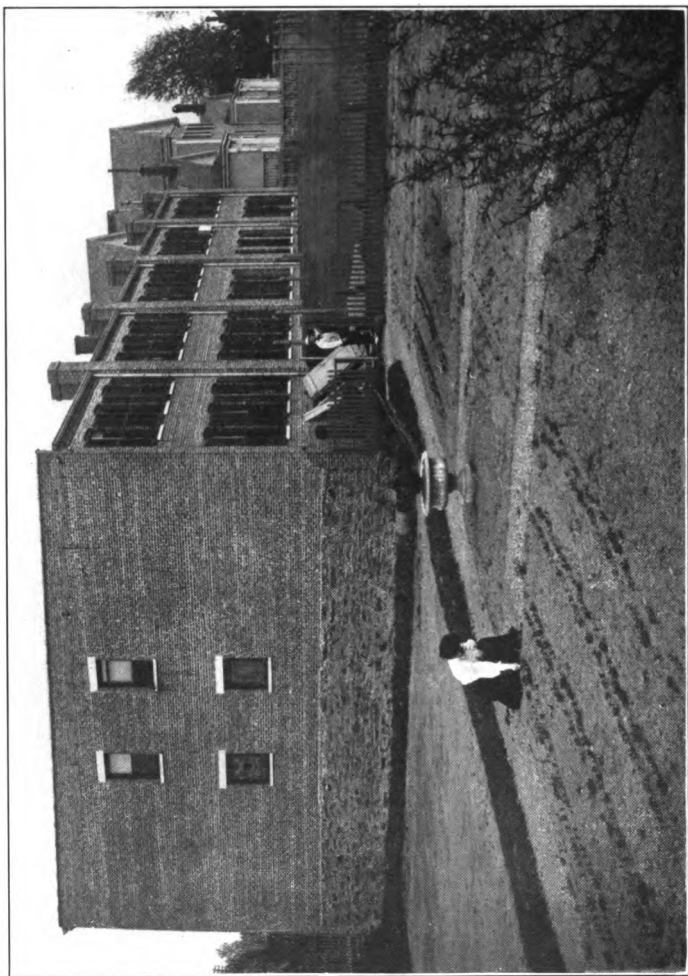
The chief disease from which beans suffer is anthracnose, which even the beginner may recognize when it has reached the stage where

sunken brown spots appear on the pods; and when these spots have a tiny pink centre, you have seen the spore at work. The best known means of fighting it, is to select clean healthy seed, carefully hand-picked; go over the field as soon as the plants come up and weed out the affected ones; spray thoroughly with Bordeaux mixture* to which has been added resin soap. The compound should be as follows: Bordeaux mixture:— $1\frac{1}{2}$ pounds vitriol, 1 pound lime, 12 to 15 gallons of water. Resin soap:— $\frac{1}{2}$ pound resin, $\frac{1}{4}$ pound crystallized salsoda, 1 pint water (boil until clear brown solution is secured, then add to Bordeaux mixture). Apply first when the third leaf of the seedlings is opening, and repeat at intervals of ten to twelve days or after rain has washed the mixture off.

*NOTE.—Unless the under surfaces of the leaves as well as the upper surfaces be kept coated with the spray, Bordeaux will be of little avail. For the commercial grower of dry beans, spraying is not advised.—Samuel Fraser.

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THE RENT PAYER.

CHAPTER XX.

SOLANACEOUS CROPS.

THIS is a big word, but it means only that these plants belong to the nightshade family.

This division takes in tomatoes, eggplant, peppers and husk tomatoes. These require all, or nearly all, the season to mature, and they keep on making growth, particularly in the North, until killed by frost. They are all seed-bed crops requiring a great deal of quick-acting fertilizer, especially when they are young, and to secure a heavy crop you must give them an early start.

They are really of the same family as the potato, yet they are not grouped with that crop, because the parts eaten are the fruits which grow on their stems and branches, rather than the thickened stem or "tuber." They are hot-season plants and are usually grown in hills.

TOMATOES.

In almost all parts of the United States the tomato is easily grown; yet it requires a long, warm season, and soil in excellent tilth for best results. The seed is sown in a seed- or hot-bed, and the plants are allowed to grow from four to

eight weeks before transplanting to the garden, although they may be transplanted once or twice in the seed-bed to secure free and stocky growth. For the small home garden the plants are usually handled in pots, but for commercial purposes they are planted in small flats not more than 12 inches square, holding about two inches of soil. The earlier they are started the better, because they are less likely to suffer from fruit-rot and frost if they fruit early.

In the North, you must have vigorous, stocky plants, well in advance of the season, and a warm quick soil, to get a good crop of tomatoes. Too much fresh stable manure will cause rank vine growth and delay fruiting, so that the soil should be fertilized a season in advance and the manure thoroughly rotted. At the time of planting it is well to apply a light dressing of nitrate of soda, as this gives better results than twice the application when given later at intervals up to August.

At the South, tomatoes are grown in frames covered with unbleached sheeting by night and during cold snaps, but in the day this covering is rolled up and the plants are hardened by the air. Although tender to frost, the tomato vine is a fairly hardy plant, and will stand earlier field planting than is sometimes given it,

if it does not get frost. We have proved by experiment that the yield is greatly increased by early transplanting. There is a profit in that.

Tomatoes give earlier and better results where the vines are trained, but that is only possible in small gardens. Where the plants are grown for canning, little attention is given them after transplanting to the field. Losses from rot are of course much larger there, but this cannot well be avoided.

In small gardens they are pruned to a single stem. Strong stakes are driven into the ground and cords are stretched between them horizontally at top and bottom. From these horizontal cords you may run perpendicular strings, to one of which each plant is tied. Plants pruned and tied up in this way, may be placed as close together as 18 inches, while if left to spread they require from three to four feet of space.

By pruning is meant the pinching out of each side branch as it appears, compelling the plant to put all its growth into one parent stem. Some growers even go so far as to cut off the tops of the plant as soon as three clusters of fruit are formed. I have cut off whole branches where the vines were too thick, without apparent injury. All this decreases the quantity of fruit that each plant will produce, but it greatly in-

creases the earliness of ripening, and the size and quality of the fruit. Besides, the plants may be grown so much closer that the loss in quantity is not so great as would at first appear.

Henry Jeroloman of New Jersey, known all over the country as the "Strawberry King," has a tomato-planting trick that is worth noting. Mr. Jeroloman, by the way, raises about \$5,000 worth from his eight acres annually, and he plants tomatoes at the foot of his grape-trellis posts and trains them to climb up the posts and along the trellis. And right here is where the real trick comes in: by training the tomatoes to climb up instead of sprawling all over the ground, he is able to plant his low-growing crops, like beets or turnips, close up to the vines and lose no space. That is one of the reasons why his eight acres bring in more than the average farm of 100 acres. Your profit will depend upon similar devices for "working" the soil.

The best rack for supporting unpruned vines, is a cheap, rough and simple affair, constructed by the grower himself as follows:—Run a row of stakes on either side of your tomato bed and nail a light board to each row about a foot from the ground, so that the distance between the two rows will be about three feet. Across this lay narrow slats, loosely. The plants lop on

the slats, the fruits ripen uniformly, and usually with a smaller percentage of rot than where they lie on the ground.

If your garden is situated where frosts are apt to come as early as August, you should plant your tomatoes against the south side of the house or out-building and cover them at night,—a point worth noting for all tender plants.

In "Vegetable Gardening," Green suggests an ingenious yet simple method of raising enough tomatoes for family use where the season is too short to raise them in the field or garden. Get three or four barrels about the size of a coal-oil barrel, bore several holes in the bottom of each, then sink about one-third their depth in the ground in the warmest corners of your land.

When this has been done, fill each barrel about half full of fresh horse manure well tramped down, and pour over it a bucketful of hot water to start fermentation. On top of this put eight inches of good soil, then a mixture of well-rotted manure and good black loam in equal quantities up to about twelve inches from the top of the barrel. Heap manure up around the outside of your barrel. Plant, say three stocky plants in each barrel, trimming them to two shoots each. Tie one shoot from each plant to stakes or some nearby support,

and let the other grow naturally over the side of the barrel. Give a gallon of water a day to each barrel and you will raise enough tomatoes in the season for a family of four or five persons.

The Iowa Experiment Station showed that untrained tomato vines gave the smallest yield and the largest percentage of decayed fruit; that staked vines gave a much larger percentage of sound fruit and the least percentage of decayed fruit of the whole experiment; that hilling up did not give any striking results in any direction; and that, while mulching enormously increased the yield, it also greatly increased the tendency to rot.

Because tomatoes suffer so from frost, it is wise to hasten fruiting by every means, but if frost strikes before the fruits are ripe, the large green ones may be picked and placed in drawers or other dry, close places to ripen. Generally they color well and develop a good quality. If the fruits have not reached full size, the whole plant may be pulled with the fruits on, and hung upside down in a barn or dry building, and they will continue to draw nourishment from the plant and sometimes ripen.

From one ounce of seed you may expect from 2000 to 2500 plants; if planted in hills three by four feet apart, an acre will require 3630 plants.

A large yield of tomatoes is from 12 to 16 tons per acre; the average is much below this. The favorite tomato in the American market is large, round and smooth, the Angular and other irregular-shaped varieties bringing a much lower price. Varieties run out so quickly that it is not advisable to give the names.

The friend that you make in the seed store will be able to keep you posted about such things—you can look in his eyes and tell if he is lying, which you can't do with a catalogue. Or you can ask the Agricultural Editor.

EGGPLANT.

You treat eggplants just as you do tomatoes, except that they need even greater care that the young plants are not checked in their growth, and a longer season. Eggplant is really a hot-climate crop, and so requires especial attention for early ripening in the Northern States. It grows best in the South, but does well as far north as New Jersey and Long Island. Further north it is seldom grown for more than home use.

Eggplant needs a long season, sunny exposure, a warm, loose, and rather dry but rich soil. It is started in the hot-bed and not transplanted until from six to ten inches high. It is such a finicky crop that if the plants are crowded or stunted

even in the hot-bed, the yield is seriously reduced. For this reason, growers often start it in two-inch or three-inch flower pots, or in old, small berry baskets, as it is less likely to suffer a check when transplanted to the garden. Eggplants do not need so much moisture as peas or cool-season crops, and whatever fertilizer is applied must be quickly available. Perfect tillage is necessary from first to last.

Eggplants are set in rows far enough apart to admit of horse-tillage, from $3\frac{1}{2}$ to 4 feet apart, and two to four feet apart in the rows, according to the variety of plant grown. The fruits are fit to eat when they have reached one-third their full size, and are desirable until they are fully ripe, when they lose their value as food.

Although the fruit may be left on the plant until fully grown, a larger crop is secured by picking before their full size is reached. For market, however, they must be well colored. The large varieties such as New York Improved and the Black Pekin bring the highest prices in the market, but it is difficult to grow them to perfection in the Northern States because of the short season. Some of the dwarfs, notably the Early Dwarf Purple, are more desirable. White eggplants are not popular, because they are usually an ugly yellow, while the striped and

coiling fruits are regarded more as curiosities than as staple market products.

The eggplant is subject to several obscure fungous diseases, particularly in the South, and the only known remedy is rotation and destruction of the diseased vines. For the potato bug, which sometimes attacks eggplants, it is best to use Paris green, about one-quarter pound to 20 to 25 gallons of water, and plenty of lime. For leaf spot, use Bordeaux mixture. Get New Jersey Report 1890, p. 355.

PEPPERS.

Peppers are started in frames and when transplanted are set from eight to twelve inches apart in the row. They are cultivated just as tomatoes are, and, as they do not suffer from pests or diseases, the crop is more sure.

Peppers will thrive in a cooler season than tomatoes, and will even endure slight frost, but in all other respects they require the same treatment as tomatoes. They have only recently acquired any importance as a crop, and even now, their use in cooking being only semi-occasional, they are not very staple. Italians use them extensively, and as Italian communities grow, the demand for peppers will increase. We use them mainly for making

pickles, for which purpose the small Cayenne, Chili and Cranberry varieties are grown. For stuffing, the favorite sorts are the large sweet peppers, Sweet Mountain and Ruby King. These peppers are not at all similar to the pepper-berries of commerce, which belong to other families.

HUSK TOMATO.

The husk tomato is an herb which produces a kind of papery skin containing a yellowish, glutinous berry. It is often spoken of as the strawberry tomato. It is very easy of cultivation on the tomato plan, although some varieties, notably the Cape Gooseberry, do not ripen well in the far North; the Dwarf Cape Gooseberry, however, does well as far north as Ontario. The soft, sweetish fruits may be eaten raw or cooked and are often used for preserves and pickles. There are several native species, some of which are called Ground Cherry.

CHAPTER XXI.

VINE OR CUCURBITOUS CROPS.

“**CUCURBITOUS**” is a fine large word, but you don't need to learn it. All vine crops are annuals and are tender to frost, although all do not need a hot-bed start. They are warm-season crops, and in the Northern States most of them need a quick start so that they can ripen before the summer is past. Well-prepared soil and a sunny exposure are desirable. They transplant with such difficulty that they are usually sown where they are to grow, but if not, it is best to start them on sods turned upside down, or in pots or boxes. They are always a main crop and are planted in hills. There is very little difference in the cultivation of any of them, and if you know how and where to grow one, you will generally do well with the rest.

Where you fail, you may usually lay it to the fact that your soil was not in condition to give the young plants a good hold and to get a quick start. If your soil is well prepared, well drained and properly fertilized, you will have little trouble, unless it may be from pests. The way to fight those is to sow seed freely, and be content to lose the greater part of your possible crop.

Some growers who make a specialty of melons

or cucumbers, plant squash and pumpkin seed very early in the field that the young plants may attract the striped beetle and give the farmers the opportunity to kill the pest before the real crops are taken from the frames. That is a method of deceiving the creatures, but the end justifies the means.

Unless you live where the climate is cold and the season short, you may plant squash, pumpkin and cucumber in the open fields where they are to grow. Otherwise start them in frames, as muskmelons are started. The land should be given the best of surface tillage, and every effort should be made to start the plants so well that the fruits will have set before mid-summer. All these vine plants need much moisture in the soil and if the preparation-tillage be neglected, no amount of after-tillage can make up for the first loss.

Watch the vines carefully so as to prevent one fruit setting much in advance of the others. It is better to pick the first one off if it is much ahead of the main crop. Otherwise there will be no uniformity of size or quality. If your plants run too much to vine, pinch off the shoots and let the vigor go to fruit-making.

These crops often succeed as early crop and main-season crop, by starting one about two weeks

after the other. Spade up the ground loosely for a space of a square foot or two, and mix light, loose earth or barnyard scrapings with it to make the hill. It is well to add a handful of fertilizer to the earth; but if it seems cold and hard, remove it altogether and replace it by light, warm soil. Of course in the warm, light soils of the South this is not necessary.

CUCUMBER AND GHERKIN.

There are almost no special directions for growing cucumbers if the general directions for all vine crops are carefully followed. Cucumbers are planted in hills, usually four by four feet apart, though for the large, late varieties they may be as far as four by six feet apart. An acre contains 2722 hills when the distance is four by four feet, and it requires two pounds of seed to plant an acre, or one ounce to 70 or 80 hills. That will allow four or five plants to a hill. Remember to plant freely if the striped beetle is at work near your patch.

As cucumbers are eaten when young, it helps the yield immensely if each fruit is picked as soon as it reaches the table state. You should go over the entire patch every two or three days at least, to see that no fruit is ripening at the expense of the growth of its little brothers on

the vine. If you want to keep some for seed, reserve a whole hill for that purpose.

For the early-season varieties which are planted in flats or seed-beds, the Early Russian, a small-fruited sort, is the favorite. For the later sorts the White Spine, in various strains, is the standard.

Gherkins are simply immature cucumbers, very small in size; they are used solely for pickles, usually sweet pickles. The fruits of the West Indian or Bur cucumber are also called gherkins. The treatment is the same as for cucumbers, but the fruits are pulled as soon as fully formed. It is quite profitable to pickle them yourself.

On the average, an acre will yield 100 bushels of cucumbers for pickling, but this yield can be greatly increased by proper care and attention. Under the best conditions, 400 to 500 bushels to the acre are possible.

MUSKMELON.

The muskmelon is native to southern Asia and was grown by the ancients. The melon grows best in light, sandy soil in warm, sunny spots, although it is raised for market in many parts of this country, and as far north as parts of Canada. New Jersey is an important melon-growing State.

Melons are planted in hills from four by five to four by six feet apart, according to whether early or main-season crop. The early crop may be planted a little closer than the main crop, and is in the field two or three weeks ahead. The quantity of seed is about the same as that used for cucumber planting and the same treatment is necessary. There are about 1185 hills to an acre, and two or three good fruits to each plant is a good yield. The most important varieties are the cantaloupes, which have hard, warty rinds, and are little grown in this country; the nutmeg or netted type, extensively grown here, and the winter melons, which ripen late in the season and are as yet little known here. The leading varieties to be found in the American market, are Rocky Ford, Osage, Montreal Market and Hackensack, but the melon is so variable that only types, not varieties, are constant. Diseases and insects are the same as in cucumber.

WATERMELON.

Watermelons are even more uncertain than muskmelons, because of their need of a long, warm season; therefore, they are but little grown in the northernmost States, except a few varieties which will ripen as far north as southern

Ontario, if both soil and exposure be warm enough. Watermelon needs such a long season, such a warm, well-drained soil, such attention to detail, to come to perfection, that it is not a very profitable crop for the average gardener. In the past, the south Atlantic and Gulf States have held first place as watermelon centres, and are likely to continue in that proud position even though the mid-continental States have taken up the industry.

Seeds are planted where the plants are to grow, but all danger of frosts should be past. The best soil preparation includes fall plowing that the winter frost may help powder the earth. The hills are made by mixing several shovelfuls of well-rotted manure with the soil and then covering the mixture with some inches of fine, soft earth. Plant the seeds in this and see that the soil does not bake or crust. This can only be avoided by careful surface tillage. The cultivation of watermelons must be done solely with hand-tools, as the vines are very tender and the least injury to them affects both quantity and quality of crop. The hills are usually ten feet apart each way, and there are only 435 hills to the acre. It takes four pounds of seed to sow an acre. When grown in the Northern States, plants may be started under glass,

but great care must be taken to avoid any injury or check to the growth, during transplanting.

Beginners often find it difficult to tell when a watermelon is ripe. There are three recognized methods, but to the practiced eye none of these tests are necessary. If a melon "thumps" right, that is, if it gives out a dull, flat, dead sound, it is ripe, but if it rings hollow or musical it is not yet ripe. The next test is the yellowish cast to the side that has lain on the ground, along with a hard, rough, warty skin in that place; and the third is the way the melon "gives" under pressure of the hand. The last test should never be applied to melons intended for the market, because it bruises them inside.

What is called vegetable citron in this country is nothing but a variety of watermelon with flesh too hard to be eaten. It is not the true commercial citron, which is the fruit of a tree like the orange or lemon.

Insects or diseases the same as in cucumber. If you must know more of watermelon culture, get Bulletin 38, Georgia Exp. Station.

PUMPKIN AND SQUASH.

Although so closely allied, pumpkins and squash do not usually cross, despite the com-

mon notion to the contrary. They are distinct types of the same family. The standard variety of pumpkin in this country is the Connecticut Field. The fruits are large, orange-colored and smooth furrowed. They are used to make pies for man and as food for stock, while to the small boy they are chiefly useful as "jack lanterns."

The pumpkin is often grown in corn-fields and in England they have a summer variety called vegetable marrow, which is in great demand, while our summer squashes, Crookneck, Scallop and Pattypan are also forms of the pumpkin. These are called bush squashes, and may be grown as close as three by four feet in the garden, while the regular pumpkin and squashes require to be planted eight to ten feet apart. It takes three pounds of seed to the acre for each, and a yield of two or three fruits to the vine is a large crop.

There are several leading types of winter or field squashes such as the Hubbard, Marblehead, Boston Marrow, Essex Hybrid, and Turban. To keep them through the winter they should be free from bruises or cracks, be fully ripe and have the stem on. A touch of frost injures them. They should be stored in a dry place with a temperature above 50° and placed on shelves or in shallow bins. Large growers have

specially constructed, stove-heated houses for storing them.

A third type includes the Winter Crooknecks, Dunkard, Tennessee Sweet Potato Pumpkin, and some others. The culture of both squash and pumpkin is the same as for cucumber.

The insects from which they most suffer are: the squash bug and the melon louse. To rid the fields of the bug, keep them free from rubbish. Trap the bugs with bits of squash leaves and every day in spring pick off the old bugs. Read New Jersey Bulletin 94; New York Bulletin 75, and Florida Bulletin 34.

For melon louse read Kentucky Bulletin 53 as well as those already mentioned. Get lice in their winter quarters and destroy at first appearance. Use bisulphide of carbon as the bulletin directs.

Powdery and Downy Mildew are the worst diseases. For powdery mildew, spray with ammoniacal copper carbonate, and read Massachusetts State Report, 1892, p. 225, and Cornell Bulletin 31. For downy mildew, use Bordeaux mixture every eight or ten days, until frost, and read Massachusetts State Report, 1890, p. 211, and New York Bulletin 119.

CHAPTER XXII.

UNCLASSIFIED ANNUALS.

IN this division of garden crops come sweet corn, okra and martynia, which have no relation to the other crops, and none to each other, except that they require about the same cultivation. They are all warm-weather crops and are grown for their immature fruits. They require "quick" soil, are not usually transplanted and demand little care, except good tillage.

SWEET CORN.

Although almost unknown in any other part of the world, in America sweet corn is one of the most important crops. One hardly ever sees even a small back-yard garden without a few stalks of sweet corn, while the canning industry has grown to such enormous proportions as to require thousands of acres of corn every year. Sweet corn cannot be grown in the South unless the seed is gotten from the North every year. It thrives best in the crisp climate of the Northern States and of Canada.

This is the crop that gave rise to the famous joke at the "World's Fair" in Chicago. The Englishman asked the girl in charge, "What do you do with so much corn?"

"Oh," she said, "we eat what we can, and what we can't we can."

Afterwards Johnny Bull tried to tell the story. "So funny," he said; "she told me that they eat what they can, and what they can't they put in tins—why don't you laugh?"

Sweet corn requires more attention than field corn, both as regards earliness and the proper development of each plant. For this reason it is planted in hills rather than long drills, and in warmer and quicker soil, with quickly available fertilizer. Ground that has been plowed deep the fall before, and fertilized with well-rotted manure makes a good soil; if the ground be hard or cold, a handful of commercial fertilizer may be added to each hill.

Although corn is a hot-season plant, it is practically a surface feeder, so it cannot withstand drought as well as potatoes or other crops. That is why it is well to plow deep and make a good moisture-holding bottom in order to get good corn of any kind. That is also the reason for the frequent surface tillage given the growing plants.

Seed is planted for the early crop as soon as the ground is warm enough, and as corn rots quickly either in cold or damp ground, it is well to plant freely. Coating with tar perhaps

preserves it, at least from the crows. The idea is to get as many ears as possible from each plant, so give plenty of room, the rows being three to four feet apart, and each hill from two and a half to three feet apart. For early crops use Early Minnesota, Early Vermont, Cory and Crosby and other popular brands. The Stowell Evergreen is the standard for late crops. Corn may be sown successionally, at intervals of a week or two, either for the home garden or for market supply.

In growing for market, earliness should be borne particularly in mind. The whole profit in corn may hinge upon even one or two days' delay. In fact, where you are competing with many other gardeners, a half day may make a big difference. You can get ahead only by having quick and well-prepared land, planting the earliest varieties and giving the crop good tillage after it has begun to grow.

Some gardeners force early sweet corn by placing a handful of fine manure in each hill, stamping it down hard with the feet. Loose dirt is then kicked over it and sprouted seed planted—that is, seed that has been soaked in warm water until germination has really begun within it. This is a good method where the soil is moist so that the seeds may get a quick

start, but it is no good in dry soil. The manure acts like an individual hot-bed for each hill of corn.

Where this plan is used, thorough culture must be given, or the corn roots will remain in the manure during growing time and suffer from drought.

Corn is not the only crop that is benefited by the use of the feet in planting. Wherever the soil must be compacted about the newly planted seed, the feet can be used to advantage. So true is this, that Peter Henderson, the well-known New York gardener and seedsman, wrote a pamphlet called "The Use of the Hands and Feet in Planting," which is sent free upon application. It is well worth reading.

When it first comes into the market, sweet corn usually brings 25 cents a dozen ears; that is the time for the wide-awake gardener to sell his crop. Later it may fall to five cents a dozen, and usually sells as low as 10 cents; there is no profit in that.

If you pick the first ears as soon as they are well set, the second setting will be much better for it. (Very small, immature ears are fine cooked or raw, to eat, cob and all, but our people are not used to that.) It takes about a peck of corn to plant an acre in hills, and, if well

attended to, the plants should yield from 8000 to 10,000 ears to the acre.

The insects and diseases include wire-worms, cut-worms, chinch-bug and corn-stalk disease. Short rotation, including fall cultivation of the land, will check the wire-worms. See Cornell Bulletin 107. Treatment for cut-worms is fully described in Cornell Bulletin 104. Ditching, plowing and harrowing are bad for the chinch-bug and good for your corn. Read Ohio Bulletin 69, Kentucky Bulletin 74, and New York Report 15, pp. 531-533.

It would be fruitless to take up your time with a discussion of corn-stalk disease here, when you can get it all by simply sending for Nebraska Bulletin 52.

OKRA OR GUMBO.

Although okra is really a Southern States perennial, it is cultivated as an annual, the seeds being sown every spring. It is grown for its pods, which are cut while still young and tender, and are much used for soups and stews. Of recent years the pods are also canned and dried for use in winter.

Okra takes about the same treatment as sweet corn, the seeds being sown where the plant is to grow, except in the Northern States. There the

seeds are often planted in boxes, pots or sods turned over, simply because the season is not long enough to ripen the plants. The real okra is a large-growing plant that must be planted from one to three feet apart in rows that are three to five feet apart, but the dwarf and early-maturing varieties that are grown in the North, may stand as close as one foot apart in the row. There are no important insects or diseases.

MARTYNIA.

Martynia is grown solely for its half-matured pods which are used in pickles. The plant needs a warm soil, sunny exposure, and much room, as it spreads over three or four feet. It thrives under the same cultivation as is given corn and okra, and may be planted in frames or in the open as soon as the weather is warm enough. It is annual and native from southern Indiana to the Gulf.

CHAPTER XXIII.

HERBS, SWEET AND CONDIMENTAL.

A GREAT variety of plants, medicinal, flavoring and decorative, are herbs, but we will consider only those used for cookery and usually called "sweet herbs." The very name brings memories of fragrant smells. If we cannot all say, "I know a bank whereon the wild thyme grows," yet few who have ever known a garden are unacquainted with the odorous bed of thyme, sage and mint. Although there is not such heavy demand for them in this country as in Europe, yet their use is growing, the favorite being sage.

Sweet herbs may be divided, both as to culture and as to products, into two classes:—the annuals and the perennials: those grown for their foliage, and those for their fruits. All are easily grown and demand little attention, and though they may be bought at any drug store, yet they who have once raised their own herbs find a pleasure in them that they will not like to miss. Annuals and perennials may be grown together and a very little plot of ground is enough to grow them all. Choose a place where they will not interfere with plowing and cultivating and let them stay, planting the annuals in the same place

each year, and renewing the perennials as soon as they begin to lose their aromatic qualities or otherwise to fail. The annuals should be sown every year, but perennials may be propagated by division of clumps. Discard all the older clumps and replant only the newer, younger portions.

Those that are prized for their foliage, such as sage, thyme, hyssop, mints, tansy, horehound and wormwood, are usually cut when the plant is in full growth before the stalks have become woody. Cut the stems near the ground, tie them in bunches and hang them to dry in the attic, if you are fortunate enough to have such a treasure-hole, or in some cool, dry place. You may also cut the herbage from time to time during the season, but this weakens the plant and necessitates replanting. Those that are grown for seeds, such as caraway, coriander and dill, are allowed to ripen, but are picked before the seeds begin to fall. They are dried in-doors and the seeds threshed out for winter use. Bailey, in his "Vegetable Gardening," has a list divided as follows:—

ANNUALS (OR GROWN AS SUCH).

| | |
|--------------------|---|
| Anise | Clary (biennial) |
| Sweet basil | Dill (biennial) |
| Summer savory | Sweet marjoram (biennial or perennial) |
| Coriander | |
| Caraway (biennial) | |

PERENNIAL.

**Sage
Lavender
Peppermint
Spearmint
Hyssop
Marjoram
Balm
Catnip
Pennyroyal**

**Rosemary
Horehound
Fennel
Lovage
Winter savory
Tansy
Wormwood
Costmary
Tarragon.**

CHAPTER XXIV.

PERENNIAL CROPS.

THE vegetables in this group have little in common except their cultural wants or requirements, but these are so different from the needs of annuals that it is convenient to group them together. Because they occupy their places more or less permanently, it is necessary to choose a spot that will not interfere with the regular plowing and tilling of the farm or garden. Perennials need tillage in the spring and fall and are fertilized by top dressings, at both seasons.

ASPARAGUS.

The chief of the perennials is asparagus, which requires a deep, rich, moist, cool soil, with a warm exposure. It originally grew in rotten sea-weed on the shores and is a gross feeder, so the soil cannot be too rich. Sub-soiling to the depth of two feet is good for asparagus. It used to be thought that a layer of salt at the roots made a good fertilizer, but salt is no longer used in that way. It is, however, used to keep down weeds in the asparagus bed, especially the German salt known as kainit. This kills out weeds, saves cultivation, and adds potash to the soil.

If the land you have is hard and coarse, you should prepare it by planting it with some crop that needs a great deal of tillage, such as potatoes, for two seasons before you plant asparagus. During this time you should apply all the manure the land will carry, because, as the bed will last for twenty years, in the Northern States, you will have no other opportunity to put the soil in proper condition. Don't be afraid of making the soil too rich. Asparagus can take all you can give, and will repay your generosity.

As you make your asparagus plantation practically for a lifetime, you must exercise care and judgment in choosing the site. In a family garden a long row, say 75 to 100 feet, if you have the space, at the rear of the garden, is a good place. This not only puts it out of the way of other crops, but it also gives you a good background in summer and fall, for the herbage of asparagus is ornamental. Asparagus used to be planted in beds, but under new methods of farming, this plan has been abandoned. Rows are more satisfactory. When grown as a field crop this allows of horse-tool tillage and saves much labor.

Asparagus roots are wanderers and reach out for food in every direction, even more horizontally than perpendicularly, which is why

it is unwise to have rows closer together than four feet. Seedsmen sell asparagus plants, but it is usually better to grow your own plants, although they take so long to mature. Seeds may be soaked in warm water for a day before planting and are then sown in drills and covered about an inch deep. The plants should be thinned to stand three or four inches apart in the row.

Give frequent tillage throughout the entire season, and in the spring following they will be ready to plant in their permanent place. Here they are set deep, in a furrow or trench, say six to ten inches, so that the young crown of the plant is covered two or three inches deep with loose earth or good fine compost. As the plants grow the trench is gradually filled. If filled at first, the young plants might not be strong enough to push their way up.

You will see from this that the asparagus plot must be deeply sub-soiled, for if you do not have the land properly prepared at the first, you will never have good results. Besides, unless the soil is rich in humus, asparagus cannot thrive at all, for it requires a moist soil at the roots all the season.

When you have planted your yearling seedlings you must give them another year before

you do any cutting. A few stray shoots may be picked off, but it is advisable to wait until the plants are in their third year before cutting. To cut earlier may permanently injure your crop. It is also possible to injure it by continuing it too late each season, although every stalk should be removed even if it be too poor for use. The crop should be cut clean, and all cutting should be over before July 4th, in the middle Atlantic States. After that the tops do the growing and the more they flourish the better your asparagus will yield next year, for it is from the foliage which springs up that the roots and crown secure energy for the next season's work.

The tops should be mowed late in the fall, and generally speaking it is better to burn them than to allow them to rot on the bed as some growers do, because when the asparagus berries are plentiful you are apt to have trouble next season with seedlings; and even when this is not so, it interferes with the fall tillage which is so necessary.

Just as the young plants were covered with earth and manure the first year and thoroughly tilled in the spring, so must spring and fall tillage be carried on every year. The manure put on the plants in the fall, serves not only as a winter

protection, but if not too coarse, may be cultivated under in the spring and afford that much more fertilizer to feed the crop. If it is too coarse for that, rake it off, cultivate thoroughly and then cover again with litter or manure, to afford nourishment and to preserve the moisture of the soil as well as to protect the young shoots in case of late frosts.

The whole value of asparagus lies in its tenderness and succulence, and the large shoots are most apt to have these qualities. The plant cannot grow large shoots unless it has plenty of food. Only rich soil and good tillage can supply the food needed.

Usually asparagus is cut off three or four inches below the surface with a long sharp knife, but one noted asparagus grower objects to this practice for two reasons. First, it increases the temptation to cut too low so as to get the stalks of uniform length as the market requires, whether or not of uniform quality; and second, it tends to waste and to the injury of the plants. He would substitute for this practice, careful hand-picking or breaking. The gatherer takes two rows at a time and breaks off the shoots just beneath the ground at the lowest point where the shoot will break with a clean snap.

When set at the proper distance of three by four feet apart, it requires 3630 plants to the acre, and 1 pound of seed should furnish that many plants. But seedlings vary so much, that some growers recommend sowing from four to five pounds of seed to every acre, so that only the best need be kept. A good yield is about 400 dozen bunches to the acre. Asparagus is always sold in bunches, the stalks of uniform size and length, and tied near the tops and butts either with bark or string; though many growers are now using rubber bands as being better for the stalks and a saving of time for the gardener.

Asparagus is usually sold green in this country, although if artificially blanched it is just as tender. When asparagus is grown for blanching it should be planted deeper than ordinarily. It is hilled up with a furrow plow just as celery is hilled up, and blanches as it grows. Blanched asparagus is in higher favor in Europe than here.

Asparagus is a native of Europe and Asia, and has been cultivated for more than two thousand years. It belongs to the lily family and several of its very near relations are cultivated in greenhouses for their graceful foliage.

The asparagus beetle is the worst enemy and must be steadily fought. In young beds, apply

fresh air-slaked lime as soon as the larvae appear. It should be put on while the plants are still damp with dew, and only the greatest thoroughness can accomplish anything. Destroy all volunteer shoots. As the beds are cut, leave some small trap-shoots upon which the beetles will gather; cut these twice a week and destroy. In hot weather brush the insects off and they will bake on the soil in the sun.

It is so risky to use poisons on asparagus that is to be eaten, that Paris green may be used only in very rare instances; then the mixture consists of one pound of the poison to fifty pounds of air-slaked lime. Two applications are made, about a week apart.

Some gardeners turn a hen with chickens, or a number of young chickens, into the asparagus field as soon as the crop is cut. This is one of the best ways of keeping down the beetles, and the scratching of the fowls cultivates the crop. This will lessen your own work and increase the value of your chickens to you.

Rust is the chief disease, and for this there is no sovereign remedy. Every effort should be made to secure only vigorous plants, and in very dry weather irrigation should be practiced, if possible. Early in the autumn, cut, carefully gather together and burn, all affected stalks,

and all asparagus brush whether garden or wild. Read Massachusetts Bulletin 61; Iowa Bulletin 53; Farmer's Bulletin 61, p. 30.

RHUBARB.

Of all the perennial garden plants rhubarb is the easiest to grow, and the most inexperienced may be sure of success. It is very hardy and the roots remain in the garden all winter, even in climates where the frost is heavy and the cold quite severe. But in spite of its hardiness and willingness to flourish under ordinary conditions, rhubarb responds quickly to good care and gives such enormously increased returns that it pays to attend to it.

Rhubarb likes a deep, rich soil, thoroughly cultivated and fertilized before the plants are set out. It is usually more satisfactory to propagate by roots than by seed, although some growers prefer to raise their plants from seed. Like asparagus, rhubarb will last twenty years, if given a good start and if the roots are occasionally separated. All this time it will yield large, tender, juicy stalks if the soil be in good condition, and if a little tillage is given to the plant in fall and spring.

Set out the plants in rows where the soil has been fertilized, is deep and in good tilth. The

best strains of rhubarb will not produce good stalks if the land be hard or the sub-soil high and hard. The rows should be four feet apart to allow of horse tillage. The plants may be from three to four feet apart in the row. During the growing season they require the same sort of surface tillage that you would give to corn or potatoes. If you are making the most of your rhubarb bed, you will give it quite a heavy coat of manure in the fall, to act as mulch to keep the soil from freezing too deep, and also to preserve its texture. During the storms of winter, the manure leaches away somewhat and fertilizes the roots, so that they are prepared to make an early growth in the spring.

The season for selling is short, as early in the summer the demand for rhubarb gives place to strawberries and other small fruits. It is the grower who has it early in the market who reaps profit from rhubarb.

By means of the New Rhubarb Culture, rhubarb may now be forced for market out of season, and then it brings the best prices of all. Roots are left in the garden until they have been frozen and are then transplanted to specially prepared beds and forced for the Christmas trade. These beds may be in the open field if one has a system of heating by

steam forced through trenches, or they may be in specially constructed forcing houses; or, simplest of all, they may be in the house cellar, even though the floor be of concrete.

Rhubarb requires but little moisture and when it is being forced, it need not go deep to find its food, if the soil it has is rich enough. Three inches of earth will give it all the hold it needs, and if the light is completely excluded, the growth will all go to stalk.

If you have a cellar bed, screen it off from the rest of the cellar so that no light can reach it; a small kerosene-oil lamp with a chimney that has been thoroughly smoke-blackened, will give all the heat necessary to start growth. The stalks begin to shoot up looking for light and will do almost nothing in the way of leaf-growth because of its lack. In this way the whole energy of the plant is diverted into profit-making stalks.* The roots that have been forced for the Christmas market cannot be used again the following season. They need a season's rest. (Read J. E. Morse's "New Rhubarb Culture.")

But this absence of leaf, which is so desirable

* NOTE.—You can get long stalks in the garden by putting a small cask, or half-barrel, with the ends knocked out, over the plant. The stalks will grow to the top and blanch some while growing.

in forced rhubarb, would be injurious to the garden rhubarb. In out-of-door growth, the vigor and fruitfulness of the plants in any growing season, are largely determined by the spread of leaves in the preceding season. For this reason, after the cutting season is over, the plants are encouraged to develop leaves; the smaller and weaker ones being cut off that the large ones may grow still larger, but all seed stalks should be cut, so as to preserve the vigor for next season's growth of stalks.

When ready for market, rhubarb is tied in bunches of two to five stalks and an acre will produce about 3000 dozen bunches. That is a pretty good return when it requires only about a pound of seed to sow an acre in the first place.

Rhubarb is native to eastern Asia and has no serious insect enemies or diseases.

DOCKS AND SORRELS.

Those who are fond of very early greens will be glad to know of the garden varieties of docks and sorrels which come earlier than any other pot-herbs. They were originally imported from France where they are in general use.

The best varieties are the Spinage Dock and the Large Belleville, really a sorrel. The Spinage Dock is a week or ten days earlier than the

Belleville, has larger, crisper, greener leaves and a less acid taste. Cornell Bulletin 61 says: "All these docks are hardy perennials, and are very acceptable plants to those who are fond of early greens. Some, at least, of the cultivated docks, can be procured of American seedsmen."

ARTICHOKE.

The Jerusalem artichoke, the variety best known in this country, and the French Globe or true artichoke, have little in common, yet both are used for food. The eatable part of the true artichoke is the flower-head, which should be cut before it has fully spread, else it will be woody. It is a strong-growing, upright, perennial, reaching a height of four or five feet, with large leaves. It is not always satisfactory to plant from seeds, as they cannot be guaranteed to reproduce truly. But when seed is sown it may be where the plants are to stand or in hot-beds.

The advantage of hot-bed sowing is that the plants may give heads the first year, while those planted in the garden require two seasons to produce eatable heads. The best means of propagation are the suckers which grow freely about the root crowns. Suckers are planted where the plants are to mature and give heads the second year.

Although the artichoke is perennial, it weakens after yielding two or three crops, so that it is well to replant part of the bed each year, thus keeping a succession of vigorous plants. In cold climates the heads are protected during the winter with a mulch of straw or litter. When boiled tender and served with Hollandaise sauce, made of melted butter and flour, the artichoke is a delicious vegetable, but it is comparatively little known in this country.

The Jerusalem artichoke is grown for its tubers, which are underground as in potatoes, and it needs much the same preparation and tillage as potatoes. It is usually fed to stock, especially pigs, but of late it is coming to be recognized as a good food for man, too. "If you will feed the pig, the pig will feed you," but we need not go through that troublesome process; for a varied vegetable diet alone is healthy for most persons—and much cheaper.

Artichokes are really more nourishing than potatoes, and the improved varieties may be used in place of potatoes. The plant is perfectly hardy, being native to the Northern States and Canada, and will take care of itself when once started, although it is better for having its roots divided, by digging them up. It will run wild, if wholly neglected, and become a troublesome

weed, propagating itself indefinitely by means of its straggling, far-reaching, tuber-bearing roots. The only way to cure this damage is by thorough tillage, the first of which consists of fall plowing and the turning of pigs into the patch to root up the tubers.

The artichoke is more prolific than the potato, and will yield all the way from 250 bushels to 1000 bushels per acre with only ordinary care. For eating, the best variety is the Improved White French. The Jerusalem artichoke is not likely soon to supplant any other garden crop in this country, but it might well become a regular garden crop, as it will grow on land too poor for most other plants, requires little care, yields heavily, and is good food for man and stock.

SEA-KALE.

Sea-kale is one of the least known of the perennial garden crops, although where it is known it is well liked. It is a low, fleshy-stemmed plant whose shoots and young leaves are blanched and eaten as asparagus is. The plants may be grown from seed; in which case all but one main stem are to be cut off as soon as they appear; or it may be grown by division of roots. In either case, it is well not to cut from the plant until

the second season. The shoots are blanched either by covering the crowns with fine, loose soil for a foot or even more, in the early spring, or by covering the crowns with a box and allowing the shoots to grow up in the dark.

After the young shoots have been picked off, the plants are allowed to grow as they will; for, like asparagus and rhubarb, the vigor, size and yield of the next season depend upon this season's growth of leaf and root. It flourishes best in deep, rich and rather moist soil. The plants should not be less than three feet apart each way, and they are much benefited by an autumn dressing of light manure or straw.

CHAPTER XXV.

SPECIALTIES.

IT is well to grow a variety of crops for your own experience and your own table. But for profit, it is best to specialize, because if you read up all you should know about several crops, you will have no time to raise them.

Specialization is the rule now in all lines of business, and as the farmer gets to be more and more a business man, he will adopt business methods, and push ahead. The big farm, partially cultivated, and covered with a great variety of crops which require as many varieties of cultivation to give good results, is a thing of the past, except where some individual farmer is too stupid to read the handwriting on the wall. It never paid as it ought, and it entailed tremendous labor. Now big areas are only cultivated where lots of help is employed, and diversity of crops can only be successfully practiced under the same conditions.

Today the custom of cultivating small areas is increasing, and where it is done for profit, the grower more and more tends to specialize. Secretary Critchfield, of the Pennsylvania State Department of Agriculture, said some years ago that "the greatest amount of money in

farming was to be made in specialties," and that the country boy in deserting the farm was "running away from opportunity." This has since been proved true, and today it is possible for either girl or boy to make a good living from even a small piece of land, if she or he will only give intelligent attention to the matter.

It requires labor, to succeed in farming, but so does any other calling, if one wishes to master it, and there is no calling that assures so much independence. People must eat, and the food must be grown for them, whether the times be hard or easy; and even should times be so hard that you can't sell your product freely, you can eat it freely, and you can not be sure of food and room if you are in a shop or in an office. The American farmer and gardener are the nearest to free workers in the world.

The most unlikely things may bring profits when grown as specialties. One man who has a farm in Lewisburg, Pa., is making a good living from raising chestnuts. His profits on their sales average several thousand dollars a year. He made a study of chestnut growing, until he knows a lot about it, and has grafted young trees with Japanese and Paragon chestnuts, thus increasing the quantity and improving the

quality of his crop. He has done so well at this, that the Pennsylvania State Agricultural Department has issued a bulletin setting forth in detail Mr. Sober's method of chestnut culture. If you are interested you can get the bulletin by writing to Harrisburg, Pa., for it.

Mushrooms offer a pretty good opportunity to make money, if careful attention is given to detail, but they are still mighty uncertain wild things. It is impossible to give the details of cultivation of specialties within the limits of a book, but if you apply to the Department of Agriculture you can get much information.

The Department publishes three bulletins which cover the subject:—Cultivation of Mushrooms, No. 204; Food Use of Mushrooms, No. 279; and Growing Mushrooms for Home Use, No. a233. Some mushroom farmers near Wawa, Delaware, according to a report in the *Philadelphia North American*, are clearing from \$2000 to \$3000 a year from four or five acres.

Asparagus, celery and many other garden crops lend themselves readily to special cultivation and yield a good profit. So also do onions and even potatoes. One man at least claimed to have produced as many as 3000 bushels of potatoes from one acre in one year. He published a pamphlet setting out his method, but

it is now out of print. So big a yield entails too much labor for the average grower, but a third of that number of bushels would yield a handsome income. But, ordinarily, it does not pay to raise potatoes in a small garden.

Mr. C. E. Ford, who lived in Cherokee County, northeastern Texas, tells of raising two such incredible crops of potatoes annually from his land, and his method seems simple as set out by Finney Sprague of Chicago in a small book which was published in 1905.

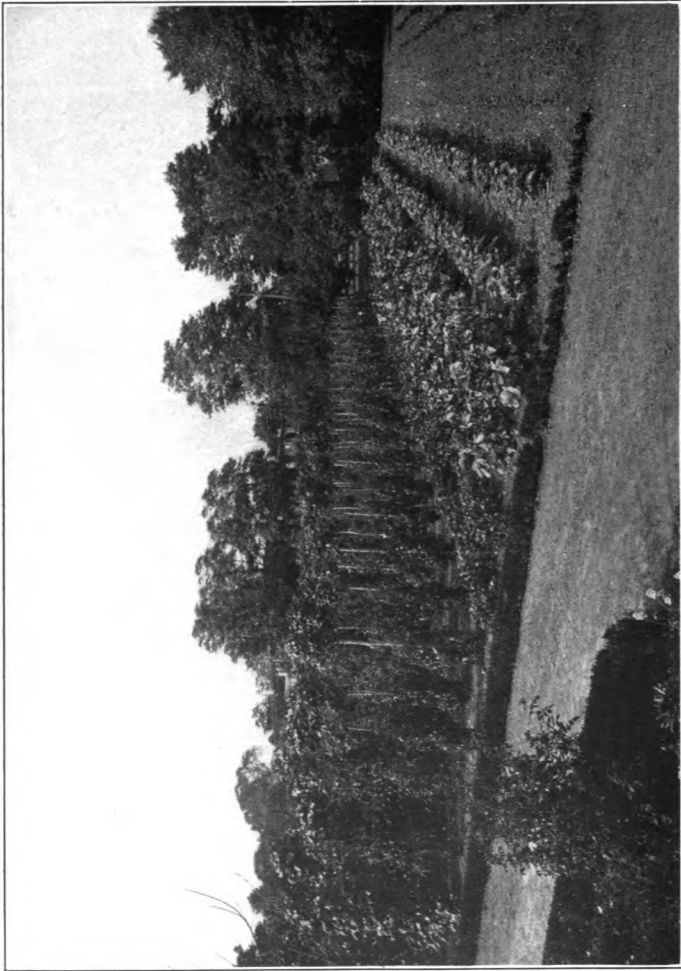
Mr. Ford had a sandy soil with a clay sub-soil three feet below the surface, which he says he ridged up into dykes; then he used immense quantities of cotton-seed for fertilizer as well as liquid manure. One of the important features was his rich fertilizing, and though it sounds expensive when compared with the ordinary quantities of manure used, it is really cheap if anything like such results can be had. Commercial fertilizers suited to potato growing may be used in place of cotton-seed, and the grower claims that the method may be followed from Canada to Texas successfully, securing at least two crops of potatoes a season.

According to his method, the seed used must be of uniform size, running about 80 potatoes to the bushel, and averaging about $\frac{3}{4}$ of a pound

each in weight, smooth and bright. Half of such a potato is used to each hill, or if the potatoes weigh only six ounces, a whole potato is allowed for each hill. For intensive cultivation the potato must be sprouted before planting and for this purpose you need a "sprouting room." Any room, say 10 x 12 x 7 feet, if warm, dry, double-walled and lighted will serve the purpose; or you can construct such a house with sawdust filling between the double walls and double ceiling, having two windows, and a roof over all: an old ice house would do.

Lay two rows of two by four inch scantling on the dry earth floor, near the sides and across the end of the room opposite the door, and place on them a double row of barrels, each filled about three-quarters full of potatoes, or about three bushels to each barrel. When these have been filled this way, lay scantling across the barrels so as to accommodate other tiers of barrels, until you have about 50 barrels in the room. No earth or water must be used in the barrels; just the plain potatoes. In the centre of the room place your heating apparatus, which may be a small "bake oven" in which one barrel of charcoal will supply all the necessary heat during the four to six weeks of sprouting; or a small stove burning coal or





A SHELTERED SUBURBAN GARDEN PATCH.

wood so that a *low* fire may be kept day and night to maintain a temperature of 80° to 90° Fahr., or, even a small oil-stove may be used.

Here the potatoes will sprout and send out rootlets having thousands of small tubers upon them, from the size of a bird's eye to that of a marble. If you start this sprouting four to six weeks earlier than the ordinary time of planting, you will get your crop just that much ahead of the regular season.

Only the best of seed potatoes are used, and Early Rose is the favorite variety, but Mr. Ford says, "that sort is best which is known to grow best in the section of the country where you live." In the ordinary culture of potatoes, it requires about 30 bushels of seed to the acre, and 300 is a large yield. By Mr. Ford's method, it takes 140 to 150 bushels to the acre, and the returns are claimed to be 3000 (three thousand) and more bushels. That is, using four or five times as much seed, you get 10 or more times as large a yield.

If you intend to experiment on this way of planting an acre, let it be as nearly square as possible, which will give you about 70 rows, each about 209 feet long. Ideal potato land is so light that the soil offers little resistance to the growing of the tuber; so thor-

oughly tilled and filled with humus as to be quite moist without being wet, and so richly fertilized as to contain a very large quantity of plant food.

Starting on the left side of your acre, with a narrow plow, turn a furrow to the left the whole way across; then turn and go back, turning a furrow to the left as you go, far enough from the first to leave a ridge about four to six inches across between them; then go round the whole thing once more, inclining the plow to the left all the way, and guiding it so as to leave the ridge. This will use up the three feet allowed to each row. Continue across the field after the same fashion, seeing that each row is three feet from each other row, and that the unplowed ridges or "balks," as they are called, are also three feet apart.

Mark the places for the hills on the top of those ridges, placing each hill 18 inches from each other hill. The plowed earth between the ridges is what is turned back to cover seed, to make the hills and to cultivate with afterwards, while the wide ridge affords a good surface for depositing the seed and for the expansion and growth of the tubers.

Two or three days before you intend to plant, harden off your potato sprouts by putting out

the fire and opening door and windows until the temperature is as nearly as possible that of the outside. Then, all being ready, have the barrels carried to the potato field, on a hand-barrow by two men, not wheeled on a wheel-barrow. Knock off the hoops and staves, so that the sprouted mother potatoes may be freely but carefully handled.

Separate the mother potatoes with a wooden paddle, as it will do less injury than an iron one. The loss need not be more than 10%. Lift out one mother potato, being careful not to break the sprouts or rootlets. If the potato be a 12-ounce one, cut it in halves lengthwise, not crosswise, so that each portion shall have as many as 15 little tubers on it, so far as you can estimate quickly by counting with the eye. Lay each portion where the hill is to be, on opposite sides of the ridge, with the roots spread down the sides of the ridge, thus making a double hill, planted with anywhere from 40 to 60 little tubers, ready to resume growth at once.

Never plant less than 15 tubers to each hill, and if the half mother has less than that number, add a portion of another mother until you have that many. Only in this way can you estimate how many bushels you

will have. If each half has more than 15 tubers plant them all. If you use 6-ounce potatoes for seed, plant the whole mother in each hill. Cover the seed with two furrows of the turning plow.

If the ground has been properly prepared, cultivated and irrigated during drought, practically every one of these tubers will grow to a uniform-sized potato, and 75 to 80 of them will make a bushel. Thus 70 rows with 140 double hills to each row, every hill containing 25 matured potatoes will, he says, give 245,000 potatoes, which at 80 to the bushel means 3060 bushels; if 30 potatoes to each hill, there will be 294,000 or 3675 bushels.

If a second crop is desired, have the mother potatoes ready when the first crop has been marketed and the ground once more thoroughly fertilized. Of course, whether it is first or second crop, the best tillage is none too good. Anything that stops the growth of the tuber at any stage, is fatal to your hopes of a uniform-sized crop, so be sure that there is no danger from drought.

In the case of the second crop, do not allow the potatoes to remain in the ground until touched by frost. This means pretty close watching, as the ripening of the potato is largely a matter of the last three weeks of

growth, so they must not be dug too early, any more than too late.

Although this method will give far larger results than any other yet reported, it may not be practicable, nor may it give such phenomenal crops always; still, it is not the only case of enormous crops. As far back as 1828 crops from 900 to 1340 bushels per acre had been grown in England, and in 1884 the Editor of the *Rural New Yorker* reported a yield of 1391½ bushels from an acre on the paper's experimental farm. In the light of such figures, the average of 100 bushels looks too mean to be considered. Why not grow more?

Potatoes cease to grow when they become dry, so the grower must see that the land is irrigated, and liquid manure is the best material, although plain water will do, if the soil is richly fertilized. Many growers now plant on flat land and hill up only to counteract too much moisture.

Then there are profits in small fruits if intensively cultivated. Strawberries will always find a market if they are large, ripe, sweet and clean. Anybody can grow small, sour ones, and they will sell, but there is no profit in the price. The market is never so glutted that fine, large fruit will not bring a fancy price.

Be sure in picking, to have three baskets on a board, and have the picker assort the berries as picked. Usually, this will about double the price that you can get. A good yield is 6000 quarts per acre, but they have been known to yield all the way from 21,000 to 35,000 quarts per acre. (See "A Little Land and a Living," pp. 141-143.)

The good price is for the garden product that is better than its kind, and specializing on one thing helps to make you grow the best of that thing. You naturally try to find out all you can about it, and if there is an improved method, or somebody has grown a larger crop than you, you are going to know how he did it. Grow your family vegetables on a portion of your plot, but if there is room at all, save the rest for some specialty.

If you cannot grow crops at all, perhaps you can specialize on raising animals. You have a considerable variety to choose from, because, as I have shown in "A Little Land and a Living," and also in "Three Acres and Liberty," there is a market for everything, from bees and poultry to fish and silver foxes. (The foxes were sneered at, first off, but the Department of Agriculture has just published a bulletin on breeding foxes.)

CHAPTER XXVI.

WATCHING AND SPRAYING.

NOW suppose you have prepared your soil properly, and planted your seed carefully; that your transplanting has been done, and your crops are growing; do you think your work is done, and you have only to wait for sun and rain to do the rest? If that is your idea, you are not cut out for a farmer. Get out of the business as soon as you can. There are no "soft snaps" in farming or gardening, on either a large or a small scale. But the man in love with his job, no matter what it is, is not looking for soft snaps, nor does he find his work hard. There is a reward in tilling the soil and in watching "the green things growing," as Riley has it, that is not excelled by the rewards of any other calling.

It is absolutely necessary that you should watch your growing crops, for only in that way can you keep in touch with their needs. The parent who neglects to watch his children and to look out for their physical needs, generally has doctors' bills and anxiety. A little watchfulness would have revealed the first stages of decay in the teeth; the early signs of adenoid growths; the symptoms of eye-strain, or the

irritable state of the digestive organs, and the trouble could have been stayed. To be sure, the ounce of prevention costs something, but not nearly so much as the pound of cure. It is a question of business foresight, as well as parental affection, to watch the child, and the crop, and forestall disease.

Crops need careful watching, and to forestall most diseases there is nothing better than spraying. Once upon a time the man who sprayed his crops was a rarity, and his neighbors were not sure that he had not taken leave of his senses, but now the man who does not use the spray, is the notable exception—a monument of foolishness.

If you take the pains to find out what your soil will grow, you will know what insects and diseases are likely to attack your crops, and you can plan your campaign against them with intelligence.

Begin at the beginning, which is in the winter. First find out what spraying mixtures are best for dealing with the pests you are to meet. This can be done by writing the Department of Agriculture or by the study of books. Then study agricultural papers and Department bulletins as to the best spraying machines or nozzles on the market, and buy what you need.

Where any doubt about the quality of seed

exists, it is often a wise precaution to spray it before planting, but you must spray your growing crop on the very first sign of insects or diseases. Remember that bugs do not like poison, and will not go where it is; therefore, you must take it to them in good quantities. Partial spraying is little better than none. Do the job thoroughly, when you start in to do it at all. See that the whole plant from root to top is thoroughly saturated—stem, branches and leaves. One spot untouched by the spray makes a sure refuge for the bug. Don't sympathize with his homeless condition at the expense of your crop.

Bordeaux mixture is a cure for almost every variety of plant disease. It consists of sulphate of copper (blue vitriol) and lime, diluted with water. The principal use of the lime is to make the mixture stick to the plant and to render the copper sulphate less caustic, and one thorough spraying, if rain does not come for a day or two, will cling to the plant for a couple of weeks. This mixture can be safely used even before there is any sign of disease, and it then acts as a preventive. But where disease is severe, apply it every few days, because the new leaves and shoots offer so many breeding places for the disease spores.

To make 12 gallons of Bordeaux, use one pound of copper sulphate and one pound stone lime. Be sure to use wooden vessels, as vitriol eats tin; an oil barrel, sawed in halves, makes good tubs for dissolving the vitriol and slaking the lime. Put one to one and a half gallons of water in the tub and hang the vitriol over night in a piece of burlap, which just touches the water. Slake the lime in the other tub by adding water as fast as the lime takes it up, and no faster. When both are properly dissolved, fill the spray barrel about one-eighth full of water and add the solution of vitriol. Add enough water to the lime barrel to make $2\frac{1}{2}$ or 4 gallons and then strain the slaked lime into the spray barrel through a wire fly-screen or two thicknesses of potato burlap. Fill the barrel with water enough to make 12 gallons of mixture, and stir thoroughly for some minutes. If your spray has an "agitator" attachment, you need not trouble further, but if not, you must stir the mixture thoroughly every few minutes while spraying.

Bordeaux mixture should be made fresh for each spraying, but the vitriol and lime may be prepared ahead in large quantities, if they are not mixed, and are kept covered to prevent evaporation. Thus forty pounds of vitriol may be dissolved in 40 gallons of water, and forty

pounds of lime slaked in 40 gallons of water. Four gallons of each will make a basis for 50 gallons of Bordeaux mixture.

The only disadvantage to Bordeaux mixture is that it discolors the plant, it being a "blue whitewash"; and those who object to the discoloration often use the ammoniacal carbonate of copper, rather than the sulphate. But this is not so sure a remedy, neither does it stick so well. It is made by dissolving an ounce of carbonate of copper in a pint of water and adding it to a quart of ammonia. If the ammonia is strong, use only enough to thoroughly dissolve the copper, otherwise it will injure the plants. Cork the mixture tightly and when wanted for use, add from 8 to about 20 gallons of water to each ounce of the copper. This is used principally on fruit that is nearly grown, or upon purely ornamental plants, to avoid discoloration.

Bordeaux cannot cure internal diseases of the plants. These may be caused by insect borers at the roots, or by some incurable bacterial trouble, and in this case there is nothing you can do but root up the affected plants and destroy them, and then study out how you can prevent its happening again.

Sprays for insects usually consist of some form

of arsenic or of kerosene emulsion, and occasionally whale-oil soap is used. The most common form of arsenical poison is Paris green, of which about 2000 tons are used annually in this country; this is mixed in the proportion of one-half pound of Paris green to 100 to 150 gallons of water and one-half pound of fresh burnt lime.

However, where the insects are very bad, as potato bugs often are, the same amounts of Paris green and lime may be mixed with only 50 gallons of water. Paris green is too caustic to apply stronger than that, except in very rare, specified cases. The Paris green should be mixed with a little water till it is smooth, before it is added to the larger quantity of water. Sometimes it can be sprinkled on, but the only sure results are secured by using a spray, either hand or power.

Sometimes Paris green is added to the Bordeaux mixture, and the crops sprayed for insects and diseases at the same time. When this is done, you regard the Bordeaux as water, and add the Paris green in the same proportion as you would add it to water. In this case you need not add the lime, because the lime in the mixture is sufficient. London purple is sometimes used in place of Paris green for the same purposes, and in exactly the same

proportion and ways, but it is not so easy to know how strong it is as with Paris green, and it is being used less and less each year.

Another preparation is arsenite of soda, which is made of white arsenic, two pounds; carbonate of soda (washing soda) eight pounds; water two gallons. These must be boiled in an iron kettle, which should not be used for any other purpose, for about fifteen minutes, or until the arsenic dissolves. Some water will evaporate during boiling, so, before bottling, add enough to make the full two gallons. This will keep a long time if tightly corked. To make a spraying solution add one-half pint to 25 gallons of water. The quantity given is, therefore, enough to make 8 barrels of 50 gallons each. Unless mixed with Bordeaux, add two pounds of slaked stone lime to each barrel. Be sure to mark your bottle of solution plainly, "POISON."

Arsenate of lead clings to foliage better than any other arsenical poison, and since it does not burn foliage it can be used alone, in the proportion of from one to five pounds to 50 gallons of water. It was first used in 1892 against the gypsy-moth and is annually growing in favor.

All insects which feed on the outside of plants are divided into two classes—the chewing or

biting insects like beetles and larvae (worms), and the sucking insects, which include the various scales, plant lice, and squash bug. The chewing and biting kinds are killed with the Paris-green solution, but the sucking sort need kerosene and preparations which kill by contact.

There are many ways of making the standard kerosene and soap emulsion, but Bailey recommends the following method as the best:—Put one-half pound of hard soap into a gallon of boiling soft water; as soon as the soap is dissolved, add two gallons of kerosene or coal-oil. This mixture should be of a milk-like consistency, which can only be secured by running it through a pump vigorously for fifteen minutes or more. For use on plants or trees, it is diluted with ten to fifteen times its bulk of water. It can be used stronger than that on trees in the winter. It is sure death to scales and plant lice if applied early enough; this is another proof of the value of watching your growing crops.

Within a few years, pumps have been invented which will perfectly blend water and kerosene without the addition of soap, and this is by far the better remedy. Without soap, the proportion of kerosene can be increased to even one-fourth the quantity of water, without injury to the plants, if the application is made

while the sun is shining. This emulsion is fatal even to the dreaded San José scale. As experiments are constantly going on along this line, the up-to-date farmer or gardener will keep in touch with the latest discoveries.

Whale-oil soap, one pound of soap to four or five gallons of water, used to be a popular remedy, but it is rapidly giving place to kerosene emulsions, which are more easily prepared and less offensive. Tobacco dust will drive away cucumber and melon beetles, if liberally applied, and will lessen the ravages of the flea-beetle. But Bordeaux mixture well applied will do the same.

For treating cabbages or other crops late in the season, white hellebore is often substituted for Paris green, which is a deadly poison. It may be applied dry, alone or mixed with half as much flour; or in solution, one ounce to three gallons of water.

Spraying enormously increases the yield of any crop, and indeed sometimes makes all the difference between good crops and no crops. So long as insects and diseases exist, any patch in any part of the country is liable to attack. Because you have escaped so far is not to say that you always will escape, so be ready for emergencies. Timeliness and thoroughness are two

essentials, and these can only be secured by combining watching with spraying. It pays. Six years of potato spraying at Geneva, N. Y., increased the yield 122 bushels to the acre when sprayed five times during the season. Where only three sprayings were given, the increase was 93.6 bushels per acre.

You may be discouraged by these infinite details of care and management: but if you have not the time or the inclination to attend to them, that is not a reason for neglecting the study of Intensive Farming.

It is a reason for not undertaking a greater variety of crops than you can master; a succession of well-chosen plants will fill all the time you choose to give. I am showing how the best results can be obtained, but the most ordinary farmer will find his returns vastly increased by applying as much of these methods as he can manage.

For instance, at the South, the uneducated negro finds that his cotton crop is often increased, from half a bale per acre to two bales on each acre, by merely putting in a clover crop before the cotton.

Apply what you can learn, as far as you can: the power to learn more and to use it will come by use.

CHAPTER XXVII.

FERTILIZERS.

A FERTILIZER is something added to the soil in order to increase the crop yield. Chemical fertilizers are very valuable when very intelligently used—but look out for them. People seem to have a great love for all sorts of complicated ways of doing things that nature will do naturally, and any one who proposes unnatural processes like vaccination, or like medicining the soil, should be required to make a very strong case for it.

Besides, you remember the story about the darkey who has been playing poker. He said:

“Tell you, boys, I dun los’ a heap o’ money las’ night.”

“How much, Mose?”

“A hunnerd and eight-seben dollahs an’ fohteen cents.”

“Golly! dat wuz a heap o’ money.”

“Yas, siree, and de wust ob it wuz, de fohteen cents wuz cash.”

So it is with the boughten fertilizers. Sooner or later they have to be paid for in cash. The outgo is certain, but the income not so certain. Therefore, be sure you know just what you are doing, and why, before you buy. Of course

there are times when commercial fertilizers are absolutely necessary if only to start the growth, but we should be sure what we are getting.

When we try to find out something about fertilizers, we get such technical and complicated explanations about phosphates and nitrates and other "ates," that the ordinary amateur or beginner just takes some one's advice; while the professionals mostly stick to what they have been doing. But the subject is clear enough if it is clearly stated.

Nitrogen and potash are about the best elements in artificial fertilizers and perhaps the hardest to retain. We have learned that nitrogen can be best and cheapest added to the soil by means of certain cover crops, or crops sown only to be turned back into the ground as green manure. It is also present in large quantities in stable manure, if it has not leached away before being put on the field. But this book could scarcely tell you all about the best ways of handling manure to get the best returns. The Government, however, has done this, in Bulletin 192, and you cannot do better than send for it and study it carefully. You will learn from it the immense importance of taking proper care of the manure you have, and how to get the best possible results from its

use. Also, what sorts of manure are best for what special purposes.

If the manure is carefully handled, that which is obtained from stock fed for soiling purposes—that is, especially to provide manure—is the best. It contains almost all the elements that the growing crops took from the soil.

One well-fed dairy cow will produce $12\frac{3}{4}$ tons of manure in one year, says Prof. E. B. Vorhees, and this manure will contain about 117 pounds of nitrogen, 77 pounds of phosphoric acid, and 89 pounds of potash. This much stable manure, if all the constituents are saved by housing and careful handling, will grow about 70 bushels of wheat and the accompanying straw. As all this nitrogen, phosphoric acid and potash have been drawn from the soil first in the crops fed to the cow, the only way to keep up the fertility of the soil is to return them to it. In the form of commercial fertilizers these would cost more than \$30, or 20 cents per pound for nitrogen and $4\frac{1}{2}$ cents per pound for potash and phosphoric acid.

So if you keep one cow and feed her well, she will return to you almost her value in manure each year, to say nothing of the milk and butter your family can have. The family horse, as well as the cow, will give you valuable

returns in manure, if you know enough or care enough, to preserve it properly.

When immediate spreading on the fields is not possible, the manure, both liquid and solid, should be kept in a tight pit, or under cover. If too much litter has not been used, the liquid part will prevent loss from too rapid fermentation. But if there is litter enough to make the manure very dry, some water should be added from time to time to let fermentation go on without loss. Manure thus cared for will be ready for use on the land at any time that it is needed, and will contain practically all the necessary fertilizing properties.

A German proverb says: "The manure pile is the farmer's bank." All farmers these days know the value of good manures, which accounts for their buying so much commercial fertilizer, but some day they will know the value of saving the whole of the stable and barnyard manures, so as to avoid the cost of commercial fertilizers. Then there will be less of that unscientific talk of "depleted soils," and no grumbling about "decreased yields."

Sea-weeds, ashes, "mucks," and bones are all valuable as manures if handled properly. The Maine Agricultural Experiment Station, at Orono, Me., has published a bulletin, No. 74, on

the manurial values of these, which will be sent upon application, and is well worth the reading.

The farmer should remember that commercial fertilizers are only to be used to supplement manure, not to take its place, and that when he buys any, it must be the best. He cannot afford anything else. The man who says, "I know my land needs potash, but I cannot afford to buy it," is making a mistake. Suppose he should say "I know my children need bread, but I cannot afford to buy flour!" His neighbors would think he had gone crazy.

It is just as foolish to deny his land what it needs. He should get whatever it needs; for if a soil needs any certain ingredient, whether potash, phosphoric acid or nitrogen, it is cheap at a high price, while anything else is dear at a low price. Your soil must be fed as surely as your children must. You can get credit at the store or at the bank to buy fertilizer, when you could not get it to buy an automobile.

Potash is really one of the cheapest fertilizer elements on the market, but farmers get the idea that it is high because it is present in large quantities in all high-grade fertilizers, and almost absent from cheap grades. Just as a man's wages cannot be estimated by the number of dollars he gets each week, but rather by the

amount of the necessities of life that he can buy in return for the number of hours he has worked; so the price of fertilizer must be judged by the amount of plant food it contains, rather than by the money cost per ton. That is what makes high-grade fertilizer really cheaper than the low grades which cost less money.

For example, take the most popular of the \$25 a ton fertilizer, "2-8-2." This contains 12 per cent. of plant food, or 240 pounds to the ton, made up as follows: two per cent. nitrogen, eight per cent. phosphoric acid, and two per cent. of potash. This brings the cost of this cheap fertilizer to 10½ cents per pound of plant food to the ton. Now if the farmer bought a ton of plain muriate of potash, it would cost him \$50 per ton, but he would get 50 per cent. of plant food, thus making the actual cost only five cents per pound of plant food, less than half the plant food price of "2-8-2."

Few farmers want to buy the potash separately, and they complain that the manufacturer charges high for it in fertilizer where it is present in large quantities. But a little investigation will prove that this is not so. Take for example, the "2-8-10" grade which sells generally for \$30 per ton. Here you have 20 per cent., or 400 pounds, of plant food to the

ton. That brings the cost of plant food per pound to $7\frac{1}{2}$ cents instead of $10\frac{1}{2}$ cents as in the cheap grade. The manufacturer has added \$8.00 worth of potash to the mixture and has taken out some of the worthless filler, so that the extra cost in money to you is only \$5.00.

The increase in yield more than offsets that extra cost. There are still other potash fertilizers that contain no nitrogen, the lower grades selling for about \$16 per ton, and the higher grades for \$20 per ton. The plant food in the lower grade costs $6\frac{3}{4}$ cents per pound and in the high grade only a tiny fraction over $5\frac{1}{2}$ cents per pound. If you are spending your money for commercial fertilizers, you will find that the best is the cheapest. No matter what the mixture, if you figure it out, you will find that the high grade costs less per pound for plant food than the low grade. And it is plant food you are after, not worthless filler.

The New York Experiment Station in one of its bulletins offers the following comment on this point: "The high-grade goods sell on an average nearer to their actual plant-food value than do the low-grade goods. In general, the higher the grade of the goods, the lower the cost of each pound of plant food."

Before you raise any crop you must know your soil, not by chemical analysis which is interesting and often helpful, but by finding out what it will grow by nature and what is the easiest way that nature can be helped; and the quicker you can find out these things the better for your prospects. The simplest and quickest method of finding out what fertilizers your soil needs to grow your crops, is by using the paraffin basket. This is a very pretty experiment and one in which you can readily interest the children so that they may get their knowledge early.

The requirements are galvanized wire netting of one-eighth inch mesh; paraffin, which can be bought cheaply at any druggist's; and a pair of scales which will weigh accurately to one-fourth of an ounce.

Cut your netting into strips 10 inches long and $3\frac{1}{2}$ inches wide; fasten the ends of strips together by hooking the end wires into the mesh or with small rivets. Then cut the wire at the bottom of the cylinder so as to make lugs about a half inch deep and bend the cut pieces under to form a partial bottom. Cut a circular piece of netting that will fit inside and drop it in, thus completing the bottom of the basket. Melt the paraffin, and while hot dip the top of the basket into it for about one inch. Draw it

out, that it may cool, and dip again until a solid rim of paraffin is formed. Number each basket, as it is easier thus to keep a record of it. Place them on a tray, or in a shallow box, for greater ease in handling.

Gather the soil in small quantities from different parts of your field or garden and mix it together. If you took it from one spot it would not be representative, any more than a Congress elected entirely from one section of the country could rightly be called a House of Representatives for the American people. Divide this whole amount of soil into equal parts, having one more part than you have fertilizers to test, because you should have one basket of untreated soil to act as a check to judge results by. Eleven sorts are usually tested, which makes it necessary for you to make twelve baskets altogether.

1. Untreated soil.
2. Soil with dry manure, at the rate of five tons per acre.
3. Soil with lime, one ton per acre.
4. Soil with nitrate of soda, 200 pounds per acre.
5. Soil with sulphate of potash, 200 pounds per acre.
6. Soil with acid phosphate, 200 pounds per acre.

7. Soil with nitrate of soda and sulphate of potash, 200 pounds each per acre.

8. Soil with nitrate of soda and acid phosphate, 200 pounds each per acre.

9. Soil with sulphate of potash and acid phosphate, 200 pounds each per acre.

10. Soil with nitrate of soda, sulphate of potash, acid phosphate, 200 pounds each per acre.

11. Soil with nitrate of soda, sulphate of potash, and acid phosphate, 200 pounds each per acre, with lime, 2000 pounds per acre.

12. Soil with cowpeas, 5000 pounds per acre, with lime, 2000 pounds per acre.

It is important that the small portions of earth be fertilized in the same proportion as is here given for the field, so to $7\frac{3}{4}$ pounds of dry, finely pulverized soil, add one ounce of any one of these fertilizers. Mix very thoroughly and pass it through a sieve at least twice. This is still much too strong for use, so take one ounce of this fertilized soil and add it to five pounds more of soil, mixing and sifting as before. Then you have soil and fertilizer mixed at the rate of 200 pounds to the acre. For testing larger applications, make your first mixture with proportionally larger quantity of fertilizer.

For mixing lime with soil, take only $11\frac{1}{2}$ ounces

of soil to one of lime for the first mixture; for cowpea vines, four ounces of soil to one of vines, and only $1\frac{1}{2}$ ounces of soil to one of manure. One ounce of each of these mixtures to five pounds of soil will give the right proportion of each to the acre, or, one ton of lime, five tons of cowpea vines, and ten tons of manure to the acre.

After you have added the fertilizers to the soil, it is left standing in pans or boxes for several days, being watered with rain water or melted ice water and frequently stirred. Do not use well or hard water, for those contain lime or salts, only rain water. Moisten the soil at the end of a few days until it is in the best condition for planting seeds. You soon learn to judge this.

Divide the soil in each pan into five equal parts and put one part in each of five wire baskets, pressing it down at the bottom and sides. After this is done, brush off the soil that has been forced through the mesh of the netting. The basket should be filled to within one-half inch from the top. The baskets are now ready for planting.

A couple of days before planting, put wheat grains between moist cloths, cover with wet sand and place in a warm spot to start ger-

mination. Take from these sprouted seeds those that are of the same size and development, and plant six in a straight line in each basket, being careful to plant all to exactly the same depth. Then cover the soil in the basket about one-fourth inch deep with clean, dry sand, dip the whole basket, down as far as the rim you have already coated with paraffin, into melted paraffin; cool, and dip again and again until it is completely covered with hardened paraffin for about one-sixteenth of an inch, and you have nearly completed your task.

See that the pots have the best possible conditions of light, temperature and moisture, as nearly as you can make it like what they would have in the field, being careful to keep all the baskets of one set together. Water them frequently. If you have weighed some of the baskets as soon as planted, you will know how much water to supply, for you must keep weight as close as possible to what it was at the beginning.

Fifteen or twenty days are enough to show you what fertilizer your soil most needs, and you can then go ahead and get it ready for crops. This is a test solely for soil needs, not for plant requirements, so it is not necessary

to grow the plants any longer than just to show which basket flourishes best. It holds good in the field as well as in the basket.

One thing must be borne in mind, that weight must be accurate. If the farmer hasn't time or patience probably his wife would make the test. She has time and patience for everything that is put upon her.

CHAPTER XXVIII.

MORE ABOUT FERTILIZERS.

IN the past we believed that fertilizers acted as plant foods and that the substances to be applied must contain one or more of four elements which are probably the most important to the plant, namely: Nitrogen, phosphorus, potassium and calcium. Several other elements go to make up the plants; but these are considered most difficult for the plant to secure from the soil and were therefore of the most importance for the farmer.

Trials, by experimental work with different plants, soon showed that the forms of combination of these elements make a great difference. For example, nitrogen is now applied either in the form of nitrate of soda and of potassium, which is called saltpetre, or in the form of sulphate of ammonia; or, it may be applied as organic matter in dried blood, tankage, hoof- and horn-meal and even muck.

Both the nitrate and sulphate forms are readily dissolved, but the nitrate form is the one in which plants take up their nitrogen, so that either nitrate of soda or saltpetre is specially valuable for forcing a quick growth. The effect may be seen upon plants in a very few days after it is

first applied. But sulphate of ammonia, although it will dissolve, must be changed into a nitrate, in the soil, before the plants can use it, and this probably takes several days, hence, it is not quite so quick acting.

The organic forms of nitrogen vary much in their usefulness. The nitrogen of dried blood or tankage is the most easily absorbed. These substances are sometimes sown at seeding-time, and become useful later in the season when the soil becomes warm. Other forms, however, as muck, leather parings, etc., are used considerably in making some low-grade fertilizers. Notwithstanding the tradition that you must bury an old shoe at the foot of the vine, the nitrogen in these may never be of very much value.

The phosphorus is found in fertilizers both in forms that will dissolve and in forms that won't. Acid phosphate and dissolved bone contain a large portion of phosphorus in the form of a soluble phosphate of lime; this is often marked on the bag as being equal to 12, 14, or 16 per cent. of phosphoric acid. Ground phosphatic rock, also called "floats," and raw bone-meal contain phosphorus combined with lime in the form of an insoluble phosphate.

Basic slag is still another form of phosphate

of lime, which, although insoluble, readily becomes available as plant food in the soil.

Potassium occurs in various forms of combination, one of the most common being muriate of potash; another form is sulphate of potash. Kainit is another fertilizer which contains potassium, and wood ashes contain a small percentage. In all of these the potassium is generally spoken of as potash and the first two are said to contain the equivalent of 50 per cent. potash. Kainit usually contains 12 to 14 per cent. Wood ashes may contain about 3 to 6 per cent. Kainit and muriate of potash have an acid effect upon the soil, and it is wise to apply them some time before the crop is to be sown, even the fall previous, if the soil retains plant food fairly well.

The commonest kind of calcium is quick-lime or lump lime. When this is "air-slaked" it becomes what is called carbonate of lime. Fifty-six pounds of lump lime contain the same amount of calcium as 100 pounds of air-slaked lime, and in using these it makes very little difference whether we apply the quick-lime or the air-slaked, provided we apply equal amounts of calcium and that the particles are equally small in both cases. In other words, 56 pounds of quick-lime or 100 pounds of air-

slaked lime may be used, but both should be in as fine powdered form as possible before they are sown.

Like every other fertilizer, lime is of no use until it is dissolved, and the finer it is ground before it is applied the further it may be spread and the sooner it will dissolve. It is seldom wise to apply more than from one-half ton to a ton of quick-lime per acre at any one time; and it is safer to apply this quantity every three or four years rather than larger quantities at shorter periods. Lime should be applied to the land when there is a crop upon it which can use it with advantage. A crop like clover or alfalfa, which covers the land completely, will make the best use of lime. It may injure potatoes, because it makes the land more favorable for the growth of scab, a disease which attacks potatoes.

Much money can be lost by the unwise use of fertilizers, and the best way one can positively know whether it is wise to use them is to try it thus, say, with radishes, lettuce, or beans; a patch containing two or three rows may be fertilized in one way, the next one in another, others with various mixtures and, in order to determine the values of these it will be wise to leave untreated "check plats" between

some of the strips. The following outline will show how to make such an experiment on about half an acre:

| | |
|-----------|---|
| | Plat 1.—Nothing.* |
| | : 2.—200 pounds nitrate of soda per acre in |
| | : two or three applications. |
| | : 3.—600 pounds acid phosphate. |
| | : 4.—Nothing. |
| | : 5.—100 pounds muriate of potash. |
| | : 6.—100 pounds muriate of potash and 200 |
| | : pounds nitrate of soda in two or three |
| 198 feet. | : applications. |
| | : 7.—Nothing.* |
| | : 8.—100 pounds muriate of potash and 600 |
| | : pounds acid phosphate. |
| | : 9.—100 pounds muriate of potash. |
| | : 600 pounds acid phosphate. |
| | : 200 pounds nitrate of soda. |
| | : 10.—Nothing. |
| | |
| | 144 feet. |

One hundred pounds per acre is one pound for 48 square yards, a strip, say, one yard wide and 48 yards long.

It may be necessary to repeat the experiment several years, before we can be sure what will give the best results; but we shall learn much that will help even during the first year.

*NOTE.—If the yields of plats 1 and 7 do not agree closely, the effect of the fertilizer can be closely estimated by comparing the yield of each with the check plat nearest to it. Another interesting experiment is to lime one-half of each plat.

In mixing fertilizers, care must be taken not to mix those which injure one another; thus nitrate of soda and muriate of potash, both take up moisture from the air quite readily, and when mixed with other substances are liable to make the whole mass pasty, or even to run together and bake in the bag; these should be mixed but a short time before they are to be applied. Nitrate of soda and acid phosphate, when they are mixed and allowed to stand, become damp and act chemically upon each other, and the result is loss of fertilizer elements into the air; the same is true when basic slag and sulphate of ammonia are mixed together.

We are frequently advised to apply fertilizers to the crop while it is growing. Nitrate of soda is generally used in this way, and to aid in spreading it, it is often mixed with acid phosphate. Now both of these substances, as well as muriate and sulphate of potash, are likely to burn the foliage of plants with which they come in contact; hence, broadcasting these over growing plants on a damp morning is liable to do serious injury to the foliage; it is safer to apply them with a drill.

Value in Fertilizers.—In estimating the value of fertilizers it is the custom to speak of the unit of valuation. A unit is one per cent. of a ton,

or, in other words, 20 pounds. For example, if kainit contains 12 per cent. of potash and is sold at \$12.00 per ton, then there are 12 units and they cost \$12.00; therefore one unit costs \$1.00, and since the unit is 20 pounds, the actual cost of the potash is 5 cents per pound. If muriate of potash, guaranteed to contain the equivalent of 50 per cent. of potash, is selling at \$40.00 a ton, then we find that 50 per cent. potash is 50 units; if 50 units cost \$40.00, one unit will cost 80 cents, or in this form 20 pounds cost 80 cents; therefore one pound will cost 4 cents.

Now, if these are prices free on board the cars at New York, and potash is the thing we need, we must remember that in order to get equal amounts of potash delivered to our own farm, we must pay freight and haul four tons of kainit instead of one ton of muriate of potash. In other words, with these figures the higher-priced fertilizer, counting in dollars per ton, is really the cheaper article, counting in value.

Any one who will secure the latest fertilizer bulletin from the nearest Experiment Station will usually find the approximate values of one pound of nitrogen, phosphoric acid and potash in the different fertilizers worked out in some part of the bulletin. These may be used in

deciding whether it is better to buy and mix the fertilizers at home; then one may know what is going on the land and the form of combination it is in.

Manure contains all of the elements we have discussed in more or less fixed forms. The liquid manure from animals contains a large amount of the nitrogen passed from the body and is of particular value. The most useful parts of the manure are the ones which are easiest lost; hence, if manure is piled and allowed to ferment, or if the water from the roof of the barn is allowed to wash it, serious loss occurs.

A ton of fresh manure has all the value it ever will have, and if there is a piece of land upon which it can be spread, it should be done at once. The liquid manure should be soaked up by the bedding, and applied at once to the land. The holding of manure in piles or pits always causes loss of valuable elements. Sometimes we may have to hold it, but every effort should be made to arrange the crop so that it can be applied somewhere each day as made. Manure has a special value because it furnishes humus, which greatly helps the physical condition of the soil, and the bacterial and other microscopic life in the soil.

CHAPTER XXIX.

ROOT HOUSES AND VEGETABLE PITS.

IN the North, we have to protect our gathered crops and to store them safely for a profitable market, but we do not need an expensive barn or cellar for that. A root house or vegetable pit will do instead.

This is the way to make one: in a warm, sandy or gravelly soil a pit is dug from one to two feet deep and sixteen or more feet wide, the length depending upon the crop you have to store. The sides of the pit are lined with one or two planks placed edgewise and held in place by stakes driven into the ground. Stakes are then driven into the bottom of the pit throughout its entire length; these support the ridge-pole four or five feet above the floor of the pit. Boards are laid from the edge of the pit to the ridge-pole to form a sort of gable roof. The support of these is strengthened by another girder carried by stakes driven half way between the margin and the ridge-pole. Then longer boards, from twelve to fourteen feet in length, are laid from the edge of the pit to the ridge-pole, slightly overlapping each other, and nailed lightly in place at the top ends. The pit being only a temporary structure, the boards are not se-

curely nailed, as the same lumber will do for another pit next season. At distances of about ten feet some boards are left without nailing to serve as entrances, and at each place a stake is driven to mark the opening.

Such a pit will protect crops until severe freezing weather. After that, the board roof should be covered with straw, grass or other litter, and where the weather gets very cold, manure and earth are often added as the outer layer. The advantage of this pit is that it contains a large body of air which secures uniform conditions from day to day, and celery, leek, Brussels sprouts and even cabbage may be stored by setting in compact rows, so that they may make a slight root-hold and avoid shriveling.

But there are many varieties of pits used for storing vegetables, and in Kalamazoo, the American celery centre, the favorite celery storage house is a permanent structure with windows at regular intervals along the roof, to give the necessary light for the workmen. These houses have wooden ventilating chimneys, and are usually heated with stoves so that the temperature may not fall below freezing point.

CHAPTER XXX.

SOME SMALL FRUITS.

THE home garden would scarcely be complete without a strawberry patch, and hardly anything gives better returns.

Strawberries grow in various kinds of soil, but a light, sandy loam gives the earliest berries, because that is the earliest, warmest soil. It takes only a few well-developed, well-cared-for plants to supply a family with berries enough, and the care is no greater than would be given corn. But you should make a careful selection of your plants. Small, weakly plants, or plants that have already been in bearing, are no good for your purpose. Therefore, buy from an honest dealer. Plants for setting should have been grown for that purpose purely, and not have been allowed even to blossom, as the important thing is to have a vigorous root growth, and well-formed crown.

This sort of strawberry plant will yield large, delicious berries about ten to fourteen months after setting out, and although a plot containing 100 plants requires not more than a half-hour's work a week to keep the plants in condition, after they have been well started, yet the yield will be about a quart to each plant.

To get such a return, you must first put your soil in good condition for planting. Have the soil finely pulverized and thoroughly fertilized with well-rotted manure, ground bone or wood ashes.

Having prepared your bed and got good strong plants, it is now time to set them out. Before doing so, trim the roots even, and cut off all but a leaf or two on each plant. The easiest way is to take them in bundles of 25, fasten together and cut the roots of all at once. But do not expose the roots to sun and air during planting. Keep them covered with a damp cloth. Lay the roots carefully in the ground, spreading them out fan-shape, and see that the crown of the plant is level with the surface of the soil, and firm the soil well around the roots. A properly set plant begins to grow at once, becomes larger and has more fruit crowns than a carelessly set plant. So be careful to start right.

Set the plants out in rows 18 to 24 inches apart, and 15 inches apart in the row. If each plant is set in a little hill by itself as you would set corn, you will find it easier to cultivate and also to keep the weeds down. It is as necessary to keep strawberries clear of weeds as it is any other crop.

Cultivate as soon as all the plants are set, and continue to do so once a week during the whole season. Pinch off all blooms the first year and cut off the runners. By so doing the plant will spend its energy on root growth and in producing more fruit crowns for bearing the next year. It never pays to crowd strawberry plants. Give them room and keep them in hills with cultivation and you will get both pleasure and profit from your patch.

It pays to mulch strawberries. As soon as the first hard frost has come, cover the bed with about three inches of litter of salt hay or straw. This prevents the ground freezing and thawing during the winter. In the spring you clear a space over each plant for the leaves to come through, but leave the mulch on the ground. It not only keeps the soil from drying out, but it also keeps the fruit from getting dirty from sand or mud.

From the first ripening, pick your berries as soon as they redden, every day if necessary, and let the picking be done in the early morning, before the sun has dried them. The berries keep longer and have a better flavor.

As soon as the plants cease fruiting, remove the mulch and cultivate. A handful of bone-meal mixed with the soil between each plant

will have a good effect. In a few days the plants will put out runners. Allow one runner to grow from each plant, and layer this between the old plants in a straight row. "Layering" is covering the runner at one or more points with earth, or really planting it. It will develop roots at these points and become a strawberry plant. In from two to three weeks it will have got a good start, and then you can take up the old plants. In this way you can renew your own strawberry patch every year at little trouble or expense, if you get good plants to start with.

Some reference to the possible yields of strawberry beds has been made elsewhere in this book, so it will not be necessary to repeat here, but you will be making your own records soon, if you follow these simple rules.

Raspberries and blackberries succeed in any soil that is not too wet and heavy, and there are good profits in their growing. If you intend to take up the culture of these fruits, you will do well to read "Bush Fruit," by Prof. F. W. Card. The bushes of both should be cut back and pruned in the spring, the raspberry being easy to handle with ordinary hand-shears, but a blackberry hook is better for dealing with the sharp thorns of that bush.

As soon as the fruit is gathered the fruiting

canes of the season should all be removed; then in the spring, cut back all canes. This makes them stockier and stronger. They should be supported by wires stretched on either side and fastened to crossway pieces attached to stakes driven at each hill, for these fruits should be planted in hills, too.

Plantations are generally renewed every five or six years, although with good care yearly, they last longer. The yield varies from 1200 to 10,000 quarts an acre; the difference lies partly in the canes, and partly in the cultivation.

The home garden would scarcely be complete without currant and gooseberry bushes. They are easily grown, the gooseberry, in particular, requiring very little care and yielding large returns. It can be grown in clayey soil, though like the currant, it prefers a deep, moist, rich soil, especially a rich soil.

Strong one-year-old plants are the best to set out, and two- or three-year-old canes yield the best and largest quantity of fruit. All wood older than that should be carefully pruned. The same cultivation applies to both—well rotted stable manure and shallow spring tillage.

The worst pest is the currant worm, which eats the leaves almost as soon as they unfold. Dust the bushes with powdered hellebore when

the leaves are wet, or mix the hellebore with water and apply. Then there is the leaf-blight, which attacks the leaves as soon as the fruit is ripe, and almost strips the bushes of foliage. This should be sprayed with Bordeaux mixture to stop its ravages, because if allowed to progress it weakens the bush, and the fruit next year will be small and of poor quality.

The grape trellis is a common sight in the gardens of the New England and Middle States, but not so common as it will be when the gardener understands how comparatively easy it is to grow this fruit. A well-drained, thin soil, with a warm southern exposure will provide for starting a good grape-vine.

The vine needs a trellis support always, and the pruning must be looked after, else the numerous runners will draw from the plant so that it cannot fruit properly. Keep the runners pinched off during the fruiting season, and in the fall cut off the old canes, leaving only the new, vigorous canes for next season. It may be two or even three or four years before much pruning is needed, but after that it must be attended to regularly.

Each new cane must have plenty of space, light and air, to prevent rot and mildew of the fruit, so that the number of canes you can allow

to grow, depends upon the strength of the vine, the space to be covered and the root growth.

You may fancy other small fruits that you have room for in your garden. Any good agricultural paper will give you the information or name the book you need. Fruits are another means of making your plot pay, so you might as well grow a few at least.

CHAPTER XXXI.

THE POULTRY RUN.

EVEN the hen is intensively cultivated these days, and that makes room for her and her chicks on the small patch. It is perfectly amazing how little the ordinary farmer knows about poultry, although he has raised some, more or less, from time immemorial. The modern farmer is too wise to be caught with the extravagant stories found in some poultry papers, of the profits to be made from a hennery, though at the same time he is not wise enough to believe that with careful attention and improved methods, the hennery can be made to pay well.

It is for the benefit of the farmer who is neither too wise nor too ignorant to be taught, as well as for the villager and the intensive farmer, that this chapter is written.*

*NOTE.—This chapter has been specially revised by Milo M. Hastings, the author of a new and thorough work, "The Dollar Hen." Mr. Hastings was formerly the commercial poultry expert of U. S. Dept. of Agriculture.

It will be impossible in the brief space available to go into detail concerning all the up-to-date methods of poultry production. I can only call attention to the system by which the industry is being modernized and by which, also, it may be made to yield handsome profits to the intelligent and aggressive poultryman.

One of the new systems, Philo's,* extensively advertised, makes it possible for people with but little room to keep a small flock. By this system, the hens are always kept in confinement; but with some extra care and proper treatment they do well and yield great results; which is in harmony with the modern theory of intensive culture.

The first thing to be decided is what kind of poultry to keep. Chickens are the most popular of the various domestic animals suitable for the intensive farmer. Turkeys and guineas do not thrive well in confinement and are difficult to rear in a commercial way. Farmers who have free range, especially if they are adjacent to woodland, may do well with a few of these less domesticated birds. On the other hand, ducks and pigeons do even better than chickens in confinement, but there is less demand for the product.

The first essential for success with poultry, as with crops, is to secure good stock; the very best possible. To buy fowls simply because they are cheap is poor economy. Much better buy well-bred stock at five dollars and upwards,

* NOTE.—These systems mean small numbers together. A few eggs in the incubator; a few chicks in a brooder; a few youngsters in a colony coop; a few layers in a small house. The Philo poultry plant covers 40 x 40 feet.

for they will not only give more eggs, but their brood will be worth more, so that in a year you can build up a fine flock of your own.

The second essential is to keep them in small companies, not more than six hens in a pen; still better results can be had with four. These are the days of intensive culture and chicks will respond to it as surely as field crops. Like the crops, they need abundance of food, to force growth and vigor and egg production. Care must be taken in the selection of food, but you are always safe on lots of oats, wheat-bran and green stuff, with some lean beef now and then. Corn should be fed sparingly to heavy fowls, but is an excellent diet for Leghorns or for any chickens on free range. Running water, or plenty of fresh water should be furnished. An open water vessel is best, although almost any self-feeding fountain is good. Place it about ten inches from the floor that no dirt may be scratched into it.

Fresh air and sunshine are necessities, but drafts should be avoided. Cleanliness is vital; if only a few hens are kept, all droppings should be removed every morning, and sand or lime or ashes sprinkled on the roosts and boards. If the food is good and well balanced, the premises kept scrupulously clean, and the fowls

protected from storm and wind you will not be greatly troubled with disease or weakness. Daily care, never slackening, is the price that must be paid for success.

The poultry house should be in a sunny spot, on a hillside sloping to the south, if possible; but no one need be kept from chicken raising if such a spot cannot be had, for many successful plants are not so well situated. A light sandy soil offers the same advantages as a southern slope. Such locations or soils are not only much dryer but also much warmer, for the snow melts and the frost leaves the ground earlier in the spring than on northern slopes or in clay soils. The advantage of this earlier season is just as real as in a more southern latitude.

One of the main defects of poultry houses has been that they were built for people, rather than for hens; being too high, they are not easily kept warm in winter. The house itself should be well built to exclude storm and wind, but the southern side should be largely enclosed with muslin, which is much better than glass, as it affords an entrance for air without draughts, and furnishes plenty of light.

The roosting room may have a ceiling close above the roosts; this can be made of round poles or narrow boards, laid an inch or more

apart, and over these there should be spread a covering of hay or straw. This will give ventilation, and yet retain most of the heat, especially if a thin muslin curtain is placed before the fowls during the night.

In the warmer localities, on the Atlantic coast from New York south, and in the Mississippi Valley anywhere south of St. Louis, curtain fronts are not necessary, but, instead, a part or all of the south side of the poultry house is made of poultry netting.

If chickens are to be raised in large numbers, incubators must be used; those holding two to three hundred eggs are most commonly used. After the chicks are hatched, comes the serious question of brooding them, especially during the winter. All kinds of little chicks need air and sunshine even more than older folk, and not many buildings allow of either; consequently, we must consider brooding out of doors, where air and sunshine can always be had. Fortunately, the experimenting has been done by others, so now we may avail ourselves of the knowledge they have gained, as many successful people are doing.

With properly constructed brooders and brooder coops, it is perfectly practicable to care for chickens from hatching to full growth, out of doors, at any time of the year, without artificial

heat. This does away with all danger from fire and over-heating, and gives the chickens a vigorous constitution that will enable them to withstand all the ills to which chickens are liable.

These suggestions are not given as great discoveries, but they are a brief summary of the practical points of chicken raising, and are all workable. Some of them are given by the Rev. W. W. Cox, as the results of years of personal experience in the business. He is now making a specialty of raising White Orpingtons, and is brooding out of doors, with success.

There are many branches of the "chicken-tree," the more important ones being breeding stock, or fancy poultry; egg farming, broiler farming and roaster growing. Running a public hatchery, and selling day-old chicks, is the latest development, and is indeed so intensive that it links manufacture to farming, for the building site is the only ground required. These branches are recommended to the inexperienced poultryman in the following order:—1st, Egg farming; 2d, roaster growing; 3d, fancy poultry; 4th, broiler production.

Egg farming, properly conducted, is profitable in almost any locality. Roaster farming has proved a great success near Boston, but has not been largely introduced into other

localities. Fancy poultry is a money-making game for those who are successful in winning prizes at the show, and getting well advertised as breeders. The broiler business, seemingly the most profitable branch, has in practice been a source of loss to many investors. The cause of failure in the broiler business, lies chiefly in the difficulties of artificial incubation, especially in the winter season.

Incubation is to the chicken raiser what the hot-bed is to the tomato raiser. If incubation is a failure, the whole business must fail. For the poultryman with a few dozen, or even several hundred fowls, hatching with hens is to be recommended, unless he keep Leghorns or Minorcas; these varieties not being good brooders. Convenient arrangements for setting hens in large numbers will be a more successful investment than incubators. For duck farms or Leghorn egg farms, or any poultry business on a large scale, artificial incubation is a "necessary evil."

The Central Hatchery, only now being established here, although in use in Egypt for centuries, promises to solve this difficulty. The advantage of centralizing the hatching is that it admits of better methods than are available on a small scale, and also allows one

man to devote his entire energies to this feature. Such hatcheries may be handled either by private individuals, or, as in the case of the creameries, may be co-operative institutions run for the good of the whole community.

A continuous house can be built with small compartments for each flock, and separate runs for summer use, though the colony plan is preferred by some, and has its advantages, among them being the fact that the flocks are more widely separated, so there is less danger of any disease spreading; and if any particular house becomes infected, it can be cleansed without disturbing the whole plant.

The colony plan requires considerable less expense in housing and other equipment than the yarded plan. The expense for food is also decreased, because of the greater number of insects and green food that the hens get from the range.

The following plan of poultry keeping is, perhaps, the simplest known, and for that reason, the most successful. By "successful" I do not necessarily mean the most profitable, but the surest of paying a reasonable profit. The plan is that of using inexpensive colony houses, which are located in a large yard or small field. These houses are built very light;

they are floorless, and are moved frequently, either by team or by a pole-pry. By this method the droppings are distributed directly on the soil without the usual laborious work of scraping the dropping-boards.

In the poultry field some green crop is kept growing as much of the year as possible. As a general rule a crop cannot get a start in a poultry range, and so a plan of rotating the chickens in two or more fields, is desirable. No more profitable combination of "small" farming can be found than that of rotating poultry with the leafy vegetables (lettuce, spinach, cabbage, etc.) which utilize to the greatest advantage the rich, nitrogenous manure. Under this system, the hens are fed grain, chiefly corn, and beef scrap in hoppers, and water is supplied in the simplest way possible, preferably from a running brook. The chief point to be kept in mind is to cut down the number of necessary visits to the poultry houses, thus reducing the labor cost.

The custom of raising chickens on fresh ground every year is of value to the farm, but the one disadvantage has always been the expense of fencing. In a recent issue the *Rural New Yorker* told of the plan of one wide awake chicken raiser which can be followed by anybody. His plan is to sow sun-

flower seed with a drill, at the earliest possible moment in the spot where you wish the fence to be; then drive stakes at intervals along the row and stretch two-foot chicken wire over them. Even the wire will confine the chicks when they are small, and by the time they have grown big enough to get over that, the sunflowers have grown up and made a "chicken-tight" combination. Hens are too stupid to think of flying over such a barrier, yet the poultry raiser can come and go as if there was no barrier.

This is not only a cheap fence, but it affords the necessary shade for the fowls in hot weather. They lie about among the stalks scratching in the cool earth and getting a dirt bath at any time in the day. Then late in the season the sunflower heads are cut down and the pullets do the harvesting of that crop in short order. No other variety of fence can be used for food when its usefulness as a barrier is past. You could easily put up this sort of a fence yourself, and as the sunflower is a very hardy plant, you might even try sowing the seed in the fall, so as to get an early start in fence building in the spring.

You must be willing to give your time and attention if you are to succeed. One man who

has had a good deal of experience writes me about the new method of chicken raising as follows:—"No doubt it is a valuable contribution to the subject of intensive cultivation of poultry. It involves, however, the most intensive and persistent labor, to which very few men are willing to subject themselves, and I am one of that class. I have had enough. Still, I need more income, and I am thinking, just a little, of Indian Runner ducks, which demand cheaper buildings and less care than chickens. Yet I cannot raise much enthusiasm on the subject, and I shrink from the constant attention to details which even they require."

But even if you are not prepared to raise fowls after this fashion, there is no reason why you should not keep a few hens and raise a few chickens for your own family use. If you hatch in incubators, use eggs that are laid the day you put them to hatch, and with good management practically all of them will produce vigorous chickens that can be induced to lay early, if pullets, and can be fed for market, if cockerels.

Eggs are more profitable than chickens, especially if you can produce them out of season, and this depends upon the time of hatching, the feed and care. A flock of 25 fowls will produce eggs and chickens enough to add a tidy

sum to the income, if you feed and house them right. And the feeding need not be much of an expense, if you save the table scraps and give corn, cabbage and other green stuffs, buying whatever wheat and oats you can't raise. In winter, change their drinking water frequently and see that it is slightly warmed. If you cannot provide running water, then you must give them clean water many times a day all the year around.

As a matter of fact, the amount of effort expended is pretty closely related to the profits to be derived. Whether you raise hens, ducks, geese, squabs, or any of the many animals now raised for profit on the home acre, you must study their needs just as you must study plant needs, if you are to succeed. Only by the use of intelligence can you expect to reap profits, and to natural intelligence must be added study. A man could not expect to be a successful teacher of mathematics unless he had studied all the authorities in his special line, and kept himself in touch with all the new theories as they were advanced. So it is with the farmer. If he does not read the papers that deal especially with his calling, he cannot keep in touch with the improvements and discoveries constantly made in his line. He should take in at least two

standard agricultural papers. In a community where there is no public library, the farmers might agree among themselves to take one or more different papers each, and then exchange. In this way they could keep in touch with all, at the expense of only one or two.

It will not be worth while for anybody to take up this work with any hope of success, who expects to go at it with "a lick and a promise" idea. It is only by thorough, careful, intelligent and persistent effort that anything worth while can be accomplished. For the person who will undertake the task in that way, there is an opportunity; but he will need to have patience and some money while getting started and learning the business. By all means, start in a small way, and find out a lot of things which only experience can teach you; after that you can gradually increase your plant with comparative safety.

CHAPTER XXXII.

ORGANIZATION.

WE hear a great deal about the farmer waking up to the fact that his calling is a business that must be conducted upon business principles, if it is to pay. Anybody who knows anything about the farming methods, or lack of methods, of the past, will recognize that this awakening has not come a moment too soon. Neither is the farmer wide enough awake even yet. But the feeling is growing, and much of the credit is due to the farm papers, the agricultural colleges and the writers of books on farming and gardening on a small scale.

Somewhere, hidden in the heart of almost every man, is a longing to own a bit of land and grow vegetables or fruits; and it is to this man that the new order of things means most. He has had business experience, and will naturally apply business principles to anything he takes up.

It is not many years since agricultural colleges were looked upon with amusement, if not with scorn, by the very people whom they were intended to help. The "scientific" farmer was classed with that other hopeless being, the "book farmer." But the colleges and books

kept on doing their work, and the college-bred and book-made farmer kept on doing wonderful things with soils and crops, and now there is scarcely a farming community that does not number among its leading members a farmer of one or both sorts. So does time work changes.

Boys who intend to be farmers are now sent to agricultural colleges, and the wise farmer takes in good agricultural papers and reads agricultural books. He has organized himself into granges and other associations and is fast learning the value of co-operation. All this tends to elevate his calling, a calling which is naturally more dignified than any other, and to make himself and his labor of more real value to himself and to his fellows.

But even yet there is too much haphazard arrangement of the farmer's work, and for this reason he is always struggling and finding little leisure. It is partly due to the lack of organization in his work. If he has not too much land, and if every month has its appointed tasks, the farmer will move along from task to task, with at least as much leisure as his city brother. So get your work mapped out, and attend to things as they need attention, instead of leaving a lot of small things to pile up and in the end cause hurry and confusion.

Plan your work and work your plan.

In the month of JANUARY prepare for spring work in your garden. Whether you devote your plot to vegetables or fruit, lay it out now in your own mind or, better still, on paper. Get catalogues from seedsmen who advertise. Most of them get their catalogues out in January. They are business men and know the value of an early start. Make up your mind what you want to grow, being sure to plan for plenty of the things you eat,—and then select the things you mean to experiment with during the coming year. Follow a well-arranged planting-table, such as was published in *Suburban Life*, of New York City, in March, 1908.

If you have fruit trees on your plot, this is a good time to begin to spray them. If you don't get ahead of insects and diseases, they will soon get ahead of you. If you intend to do any grafting, secure the cions now and keep them buried in sand in a cold cellar, or even out of doors, until the sap begins to rise in the trees. Then you are ready to work without loss of time. If there are holes in the trees, clean them out and fill with cement. You won't have time for this in the spring, and the gypsy-moth, or some relative of his, will select the hole as a ready-made breeding-place. Paint all wounds or

breaks in the bark with good paint or tar. On warm days do the necessary pruning.

Look out for your live stock, even it if be only the family horse and cow. They will serve you better for careful attention. Warm the bit on cold mornings before putting it in the horse's mouth, and look out for signs of possible toothache. He suffers from that as well as you. Have him sharp-shod for slippery weather. If the barn is cold, blanket your cow as well as your horse, give her plenty of warm bedding and see that she and the horse have salt at hand at all times. Don't give either animal ice-cold water to drink. Take the chill off it. A hot mash will not do either of them any harm on a cold day. You like hot food in winter.

Look after the comfort of your poultry. Dust them well for insects. Give them fresh, slightly warmed water every few hours during the day. Vary their food somewhat and give some corn and meat-scrap. Be sure the meat is good, as spoiled scraps lead to disease. See that they have green food, and as much exercise as possible; keep their house clean and well ventilated, but free from draughts. If you are going to raise broilers, get your incubator busy, but it is too early for hatching chickens for layers. If you have no incubator, but mean to

get one later, read up all about them now. Don't buy blindly.

Get out your fencing stuff, if you have fences to build; and read up all you need to know about your soils and the value of fertilizers, etc. Don't wait until spring to know what it is best to do with your plot. Learn that in advance, so that when spring comes you may put your knowledge into practice without delay.

The same general instructions hold good for **FEBRUARY**. Give constant care to your stock whether many or few. See that your tools, planters, sprayers, plows, etc., are all in order. Many valuable hours are lost in gardening-time because of neglect of this precaution. Repair those that need it and are worth it, and consult catalogues for the new machinery you must buy, and buy only the best of its kind.

If you are using hot-beds or even cold-frames, you can prepare them and begin to plant some seed during February, such as radishes, lettuce and early cauliflower.

MARCH is still too early for out-door planting in the North, because if the seeds get chilled, they will be slower in growth than those planted later; but well-made hot-beds are getting in their

good work at this time. Eggplant, tomatoes, early cabbage, onions, parsley, peppers, etc., are all to be started before this month is out.

If the ground softens up so that you can go out on it at all for working, you may sow your grass seed and spring oats and barley that they may get the advantage of spring rains and be well grown before the dry, hot weather sets in. You find many farmers neglecting their stock at this time of year, but it is bad policy. Keep up their rations.

If the storms of winter have strewn your plot with branches of trees and other wreckage, clean it all up; the wisest plan is to burn it. Clean the out-buildings; sort over your seed, and see if any insects have got at them during winter; test them between moist papers or cloths as described, to see which are worth planting; clean out vegetable bins, burying all decayed vegetables. Be ready to take advantage of the very first of the out-door-planting weather. Every day of preparation now counts for three in results.

APRIL is a busy month in farm and garden. Preparation-tillage is in order, if the ground is not too moist. Too much stress cannot be laid upon the importance of thorough prepara-

tion of the soil before the planting begins. What you neglect in this line cannot be made up later in the season, and you will suffer in field and pocket. Be sure that your soil is neither too wet nor too dry when you begin operations, and when you are through, be just as sure that it is thoroughly pulverized and fertilized, so that it can retain moisture and afford the right bed for the tender seeds. Then plant all the hardy crops as directed in the chapters on crop raising in this book.

Get your neighbors to co-operate with you in clearing out neglected roadside corners and in destroying weeds. It will pay. All the crops in the neighborhood will profit from this action. Don't turn the stock out to feed until the grass has made some growth. You don't want the roots gnawed out.

Even in the northernmost parts of the New England States, much of the out-door planting is done in early MAY and the rest a little later in the month. Now is when you begin to realize the value of having done all your preparation work early. Planting potatoes, peas, beets, cabbages, turnips, to say nothing of beans, corn, pumpkins, squashes, cucumbers, etc., will take all your time every day that is not spent

in cultivating and using the wheel-hoe. Besides, your strawberry beds will be needing a good deal of attention, and your chicken-run should have its location changed for awhile.

There are no idle times for the intelligent farmer, but the beautiful month of JUNE is generally the busiest. Indeed, it is often so busy that the farmer does not have time to know how beautiful it is. But you can have time. Arrange your work; drive it instead of letting it drive you, and you will be surprised how much time you have to look up and to realize that it is a glorious thing just to be alive. But this cannot be if you have neglected your work from month to month. The smell of ripening strawberries, of new-mown hay fill the air before this month is gone; the sky is the bluest, the grass the greenest, the trees the freshest of any month in the year. Don't lose those delights without having known that they have come. Cultivate yourself as well as your soil, and life will be better worth the living.

JULY is the real haying month in the Northern States. There are scores of things to do. Many of the fall-crop vegetables are to be sown this month, and the ground must be put in good

condition as soon as the early crop is off. But busy as you are, it is good to take a day off occasionally and see what your neighbor is doing. Perhaps he has some scheme by which he has forced his crop ahead of yours. If so, compare notes and learn what you can.

In New England they sow the winter crop of turnips in the early days of AUGUST. Be careful that the root-maggot has not got into the ground where you plant them, for, if he has, you would better save yourself the labor of planting in that spot. You want to starve the maggot, not to feed him. Cultivate all your crops carefully this month. Perhaps they didn't get all the attention they needed during haying, and as the weather is apt to be pretty hot and dry, you must do all in your power to keep the moisture. Therefore, good maintenance-tillage is in order. Cut down the weeds on the roadside that have escaped you before. It is a costly mistake to allow them to go to seed. You will have to work a good deal harder and get less for it next year if you let them go to seed this year. "One year's seeding is seven years' weeding."

If you have fruit trees, SEPTEMBER is one of the finest months in the year, both for the looks

of your place, if it has been properly kept, and also for your profits. The early fruit brings good prices, and if you have shown foresight in planning out your garden, you have planted some fruit trees that will pay you. Harvesting begins this month, and you want to be sure that everything is in readiness. Have your bins and cellars thoroughly cleaned and aired, so that there may be no delay when crops are ready to be stored.

OCTOBER calls for extra care for your fruit trees, because frosts are to be expected. Winter apples should be picked before they are fully ripe and kept in a cool place, but where they cannot freeze. If you intend them to last all winter and into the spring, you should sort and pack them carefully, seeing that no bruised fruit gets into your barrel or box. One bruised apple in a barrel may cost you half a dozen or more of the finest.

Although in some places it may be necessary to begin fall plowing earlier than NOVEMBER, yet, generally speaking, this is the month for that work, and unless frosts come early, you can plow about all through the month. It is the month for finishing up the fall work and getting

ready for winter. There is no better time for gathering up whatever rubbish may have accumulated—all the vines and garden waste that you cannot use for plowing under—and making a bonfire of it. That is a work the boys will delight to help in, and if you will save the actual burning for evening, you will make them extra happy, and glad to do some more cleaning up. Work is best done in the way that brings the greatest amount of pleasure.

DECEMBER has its joys and its work as well as June. The stock are almost always shut up now and get only what you give them, either to eat or drink. Be careful to keep their troughs scrupulously clean, and occasionally feed both horses and cows a little molasses. To keep the stable well ventilated, take out a window and fit in a frame covered with muslin or cotton sheeting. This will help out the ventilation and shut out the draughts. If it is hinged at the bottom, so that it can be opened on clear days, it will be all the better.

And now just a word for man's other faithful friend, and the children's guardian, the dog. He feels the change in the weather, too. If he should begin to scratch his ears or rub them on the ground, clean them carefully with lukewarm

water in which bran has been boiled, and add a little white castile soap. When you have rinsed and dried them dust a little dry boric æid into them. He'll be more comfortable and so will you. Stonehenge or Youatt "On the Dog" will tell you all about him.

See that your farming tools are all well housed where neither rain nor snow can get at them. If you were too busy to thoroughly clean and oil them before putting them away, do it now. The long winter evenings will afford you plenty of time to read up on any matter in which you are interested. At the end of the year you will be astonished to find how much you have accomplished without being rushed or over-worked, just because you organized your work and followed a definite plan. Like all other good things, it pays.

When we are exhausted or rushed, it shows that either we have been doing the wrong thing, or doing the thing wrong.

CHAPTER XXXIII.

A FEW PRACTICAL "DON'TS."

DON'T imagine that you cannot do anything with a bit of ground. You can.

Don't run away with the idea that the farmer's life is all fun or all labor. It isn't. It is a mixture of both, and fun and labor are equally healthful and profitable.

Don't think that breaking up the surface soil for an inch or two is the same as plowing. It is not. The old proverb is good advice for the farmer—"Plow deep while sluggards sleep." To plow in the fall is to lessen your spring work by at least a third. Spring plowing is easier because of it, and the work of the harrow is lighter.

Don't begrudge manure. All forms of life require food. If you want your plants to grow, feed them.

Don't plant tiny, tender seeds in hard, cold, lumpy soil and expect them to grow. They won't. Pulverize your soil, warm it with sun, air and manure; make a cosy little bed for your seeds, and while they snuggle into it, they will be sending out little sprouts all the time to see what the rest of the world is like. Just as it is good business policy to treat your hired help as

if they were human beings with feelings, instead of mere tireless machines, so it pays to make your seeds comfortable.

Don't forget that your plants like air, and that what they get by their stems and branches is not enough. The roots have to breathe. So keep the earth about them stirred somewhat, that the air may get to them.

Don't skimp the supply of moisture. Although you don't want to drown out the seeds by soaking the ground, yet you must so till it that it holds all the moisture the plant needs. You find your craving for water greater in summer than in winter, especially if you are working hard. Well, the plant is working hard, if it is growing. See that it has its drink of water always at hand.

Don't decide to let the weeds on the roadside grow, just because they seem "nearer the other fellow's plot" than yours. There are no "other fellows" in a matter of this kind. It does not take long for the weeds he has to get to you. If he doesn't know the importance of cleaning even the road, and you do, just set him the example. He'll soon ask you why you did it. After that, he'll probably do his share. At any rate you will have done yours.

Don't try to grow more and better crops than

your neighbor, just for the "fun of getting ahead of him." Grow them to prove how much can be done with your facilities, and to show him, as well as yourself, how much more pleasure and profit he can find in gardening than he has known before. Next year he'll probably show you a thing or two.

Don't think you have to emigrate to some far-away spot to make a living from the earth. All soil can be made to produce if you use brains as well as labor. Begin where you are, no matter how small the plot. Learn to do it in little before you try it in large. If you have no plot where you live, try to get the use of a vacant lot in your town or city. Put up a tent and live in it. You and your family will be the better for roughing it a bit. There's lots of fun in camping if you go about it in the right spirit.

Don't be afraid to ask advice from the Department of Agriculture. They are conducting their experiments for your sake, if that's the sort of knowledge you want. If it were not for you and thousands like you, they would not need to discover so many of Nature's secrets. Get the benefit of their discoveries.

Don't think you can farm without proper tools, any more than a man could print a paper without a printing press. The old-fashioned,

small hand-press, would stand a poor show beside the new power presses. So with old-fashioned, hand-gardening tools. You can do more work with a wheel-hoe than with ten hand-hoes, and it isn't so painful either. Get only the tools you need, but be sure to get them, and get the best of their kind.

Don't let your tools stand out in all weathers, and don't forget to clean them and see that they are oiled. A dirty farm implement may mean the spread of disease; unoiled bearings may mean injury from rust or breakage. Save time and expense by a little care.

Don't expect eggs from dirty or ill-fed fowls. The natural returns from such conditions are vermin and sickness; and you'll get them.

Don't expect to take everything out of the soil and put nothing back. The soil is like a bank account, so long as you keep adding to it, you may draw from it. But if it is all "draw" and no "add," then you will soon come to the end of your resources. Feed your soil and it will feed you.

Don't plant poor seed. You can't afford it. The best is cheapest. If you have poor seed on hand, throw it away—or perhaps it might do for the chickens. No loss can be so great as the loss of planting it.

Don't forget that women are apt to make good gardeners, because they are willing to "fuss over" necessary small matters. If you do not like to attend constantly to "little things," if you "hate details," you will be unlikely to make a big success of intensive culture. The man who does best is the one who loves to compare soils and fertilizers and seeds, and to try how many seeds sprout and how long they take; who is interested in the temperature of every hot-bed; who watches for just the day to use the wheel-hoe on this row and the hand-plow on that; who finds the time only too short while he sets out onion seedlings; who enjoys putting up nice bunches of vegetables or packages of fruit. In short, the man or woman whose interest is in watching the crops instead of the clock, is the one who succeeds in garden work.

Don't delude yourself into thinking that you must have a fine house before you can take up gardening. A shack is as good as a palace, and better, if you can afford the one and not the other. Anything that can be ventilated and made weather-proof will be enough. After you have made your fortune, if you have not in the meantime learned the value of simple living, build your fine house, and be as splen-

didly uncomfortable as even the worst Philistine could desire. But while you are earning your fortune, be comfortable. It pays.

Don't think you must throw up your job and rush into farming for a living, unless you have had some experience, or have a snug little bank account to depend upon while you are learning. Get your experience on a small piece of land first, while still holding down your present job. Be sure you like the work and that you are willing to give all necessary time and attention to it.

Don't think that this list exhausts all the "don'ts," practical or otherwise. There are dozens of others. But it is well to leave something to the imagination and to experience. You'll learn them for yourself and remember them better for it. Nevertheless, it will do no harm to attach the rules for farm buying submitted to the American Jewish Association. They run as follows:

Don't think about buying a farm if your wife won't live in the country.

Don't believe in agents when they tell you gold-brick stories.

Don't chase after big farms.

Don't buy a farm unless you have money enough left to buy a cow.

Don't run too much in debt when you buy your farm.

Don't pay a deposit on your farm until you have consulted a lawyer.

Don't forget to insure your farm buildings in a reliable company.

Don't buy a farm unless you are able to meet the mortgages.

Don't buy a farm unless you have consulted those who know.

Appendix I.

THE island of Guernsey in the English Channel, only from four to seven miles long, and three to four miles wide, supports a permanent population of 41,000 and an additional visiting population each year of about 30,000 persons. Only 11,623 acres are under cultivation, but if the glass houses and frames were placed in line they would extend for twenty-eight miles, or all around the island, and up the centre for almost its entire length, and would average about 10 feet in width. The farming lands are valued at twelve hundred dollars (\$1200) an acre, and are rented at 10 per cent. of their value. The exports of this land in fruits, vegetables, flowers and cattle, amount to more than two and three-quarters millions (\$2,752,000) annually. In addition to this, the farmers produce all that the 71,000 persons consume, as well as hay, oats and forage for horses and cattle; and about \$500,000 worth of butter, poultry, eggs, pork and beef. At a conservative estimate, the island produces about four and a half millions' (\$4,500,000) worth of farm and garden stuff each year, or a little less than four hundred dollars' (\$400) worth to the acre.

Don't you think we Americans, with our improved machinery and intelligence, can get much more out of our land—when we try?

If the State of New York were all cultivated and populated at that rate it would produce nearly \$15,000,000,000

worth annually and sustain 233,641,473 people, or about three times the population of the entire United States. So we are not going to suffer from "over-population" or "pauper labor" just yet.

Appendix II.

FRENCH GARDENING, AND OTHER GARDENING UNDER GLASS.

INTENSIVE cultivation reaches its climax for the present in what is called the French System, in vogue in and about Paris, and in some parts of England, where rents are so enormously high that even an inch of space counts, and must be made to produce its utmost. It has not been in favor in this country, because, so far, the pressure of rent has not compelled people to look so much after the inches. But, if the present land-tenure system continues, there is no telling when the French system of cultivation will become a necessity. In its simplest terms, the French system is hot-bed cultivation with perfect fertilization and irrigation, usually without artificial heat. The secret of it is—manure, unlimited quantities of it, of the finest quality and rotted to about the condition of leaf-mould. The beds are made on the top of the earth, the foundation being fresh stable manure that has been turned several times and thoroughly sweetened. Cover an area sufficient to accommodate the number of frames you intend to use, with great quantities of manure, so that after it has been tramped, pressed and rolled flat, it will be from 6 to 8 inches deep at least. Sometimes it is made two feet deep. The frames are then placed on this bed, the manure extending well beyond them on every side, and

a distance of 18 inches is left between the rows of frames. A layer of fine, rich, dark soil, mixed with manure that has been rotted during the previous season, is then spread on, to the depth of six inches, pressed down and raked. The bed is then ready for planting. Generally four crops are grown in each frame, radish, lettuce, carrots and cauliflower being the usual combination.

The radishes are sown first, quite thinly, then a thin layer of carrot seed. These are covered with about half an inch of fine soil well pressed down. Cabbage-lettuce is next set out, the plants being placed nine inches apart, and, so far, three crops are growing at the same time. The fourth, cauliflower, is not planted until the radishes are off,—in about three or four weeks,—the lettuce has been cut and the carrots are showing well above the ground. Then three or four cauliflower plants are set in each frame between the carrots.

But one of the most interesting parts of this work is the growing of the lettuce and cauliflower plants for transplanting to the hot-bed frame. These are grown under "cloches" or bell-shaped glasses 17 inches across the bottom and 15 inches high, on a seed-bed prepared just as the hot-bed was prepared, except that the manure foundation is anywhere from 12 to 15 inches deep after being pressed down. These beds are not covered with frames, but the cloches are placed on them in two rows, and within the circles made by them the seed is sown.

As soon as they come up, they may be transplanted from the cloches to the hot-bed direct, or they may be pricked out under other cloches, four plants to a glass,

usually one Cos lettuce and three cabbage-lettuce. These are again transplanted to the hot-bed where the radish and carrot seed were sown, and follow the radish in being picked. Lettuce seed is also sown in cold-frames about the first of October and successive sowings are made until the end of that month.

Immediately after the lettuces are picked the bed is watered and weeded, and among the growing carrots the cauliflower is set out. Cauliflower is grown under cloches, the seed being sown as lettuce seed is, under the glass or in the open seed-bed, from October to November, and pricked out under the cloches as soon as the plants are well up. They can be planted out in the hot-beds in February, and are ready for market between the middle of May and the first of June. About April the process of hardening begins, and by the end of that month the frames and sashes are removed and the beds stand in the open. During the time the crops are growing under glass, they need a great deal of attention, that neither the sun nor the frost may injure them. For this reason they are covered, uncovered and re-covered several times during each day with mats or frames.

When the cauliflower is off, the bed is forked over and planted with endive, spinach, celery or other garden crop. When the season's crop has been harvested in October, the soil is gathered up in a great heap, and the beds are topped with decayed manure in the leaf-mould state. This is the best thing to plant in, and if one had enough of it, the crops could be grown on a concrete

floor; because in such soil plants find all that they need.

To bring it down to the fine point, the French system consists of manure, more manure, irrigation, availing of every ray of sunlight, and unremitting care. It requires three years to get the system in good working order, and here such intensive cultivation seems unnecessary. It shows what man will do in the way of developing the possibilities of nature, when by law or custom he is debarred from free access to the land, and must needs make a very small portion yield a great return.

We are not in much danger of Malthus's over-population, and the much-talked-of "pressure of population." Where so tiny a piece of soil can be made to support so many and give them a good living, too, it is foolish to argue that the cause of poverty is found in the increase of population. This country alone could support many times the population of the whole world today if natural opportunities were free. It has been said that 80,000,000,000 could then be more comfortably supported here than 80,000,000 now are. To find the cause of most of the poverty, and even crime, in the world, we must look beyond the population statistics to the restrictions and monopolies that prevent population from providing for its own needs from natural sources. And when once you begin to investigate monopolies, you will find the mother of them all—Land Monopoly.

A new sash for use in hot-beds and cold-frames has been placed on our market within a year or two, for

which its makers claim many desirable things. It seems as if their claims were being well sustained by the experience of those using the Sunlight Double Glass Sash, as it is called. The frames are made of red cypress and are fitted with rustless springs and stops to hold the glass in the grooves and thus do away with the expense and bother of glazing. There is a space of dead air between the two layers of glass, which resists the cold from without, and prevents the escape of heat from within. The sash are sufficiently air-tight for ordinary weather, and when the thermometer falls, the moisture which has gathered between the two layers of glass, freezes and seals the sash practically air-tight.

The makers claim that Sunlight Double Glass Sash save more than half the labor, worry and expense of growing plants in cold-frames and hot-beds, and insure better plants, and, therefore, better crops, than can be secured under the same conditions from single-layer sash. They do away with the necessity of covering the frames with mats or boards, being warmer than the single-layer sash even though covered with mats or boards. Frames or beds filled with half-hardy plants, such as lettuce, cabbage or cauliflower, need no extra covering even in zero weather; and as far north as northeastern Ohio, with the thermometer nearly down to zero, even tomatoes, peppers and eggplants have been raised without additional covering, although this may not always be done. Light is never excluded from the growing plants by night or day, and in the short winter days of this climate, there is some advantage to that. Even

when snow and ice lie on the sash, there is some light getting to the plants, and in clear weather the heat from the sun's rays during the day is stored up in the bed and held by the double glass with the air-space between. That is why even in zero weather the half-hardy plants need no extra covering.

It is quite possible that the gardeners of this country may make a system of their own for intensive cultivation, to equal and perhaps excel the French system with its repeated covering and uncovering of the frames. The sash are made in Louisville, Ky.

Appendix III.

AT Maylands, Mr. Joseph Fels' "colony" in England, all the land is under intensive cultivation, and the rules for getting the best results from hot-beds are simple enough for anybody to follow. They emphasize the advice given in this book and are, therefore, printed as an appendix, so they may be easily consulted. They are furnished by the superintending gardener of Maylands, Mr. Thomas F. Smith, Maylands, Essex, England, for this book, and are as follows:—

GENERAL INSTRUCTIONS TO MAYLANDS SMALLHOLDERS.

"It is possible to put the frames to a variety of profitable uses during the winter and spring, but under the special circumstances of our community, and the arrangement for co-operation, it will be best for all to follow one plan, and the produce can then be handled in bulk. To this end, I suggest that the frames be used for radishes and cabbage-lettuce, then cleared for pricking out tomato plants; afterwards, during the summer, used for cucumber or melons.

"During the last week of September, prepare a bed of about a square yard by digging. Break it up fine; cover it with two inches of prepared, sifted, well-rotted manure and soil in equal proportions. Sow broadcast, thinly, a few inches of cabbage-lettuce seed—Watkin & Simpson's Early French Gold Frame will be very suitable. Cover with $\frac{1}{2}$ inch prepared soil and press evenly all over.

Place a wooden framework round the bed and cover with a sash. Do not water. If the sun shines brightly in the middle of the day, cover the sash, and uncover as soon as the sun's power is gone. In 4 or 5 days the plants will be up, and as soon as they can be handled they must be pricked off in frames standing on beds prepared in a similar way to the seed-bed, except that the soil inside must come half way up the board. Prick them out 2 inches apart, and do not water. They will stand here during the winter and the work now is to watch them carefully, remove any decayed ones or any showing mildew. If any mildew shows, dust over lightly once or twice with flowers of sulphur. Keep as dry as possible. In hard, frosty weather cover the frames with mats, but remove these whenever possible, and give air on very mild days.

"Towards the latter end of January prepare the hot-beds, by mixing well together equal quantities of old, dry manure and fresh manure. In both cases this must be 'long.*' Shake out the lumps and lay the manure down to the depth of 18 inches. Keep level and beat down gently with the back of the fork. Make the beds wide enough to extend at least 9 inches beyond the frames. Tread the manure down and level up any hollows. Lay the frames on straight and level. Fill up inside one-third the depth with similar manure to that used for the bed, then add 2 inches or so of the prepared

* NOTE.—"Long" manure contains a good deal of litter that has not decayed, so that the manure does not break up into fine particles as "well-rotted" manure does.

soil. Rake the soil well, to leave it level and remove lumps. Put on the sashes and cover with mats. Any of this work must be finished the same day it is begun and covered up. This is of importance, as frost, snow, or rain might set in, and spoil the bed. The remaining beds must be made in the same way, all joining up so as to form one entire bed without any spaces between. The frames are butted together at the ends, and are set 1 foot apart between rows.

“Two or three days after finishing the first bed, it will begin to get warm, which may be seen by the damp inside the glass. Now sow radishes (French Breakfast Radishes—white-tipped) thinly broadcast. Cover them up lightly with dry prepared soil, well sifted; press down evenly. Set out the whole bed with lettuces at 9 in. apart. Before planting, the lettuces must be carefully examined, all decayed leaves removed, and doubtful plants rejected. Use only the strongest plants. Handle very tenderly, so as not to bruise them. Cover the bed every night with mats. When the radishes are up, give a little air on the opposite side to the wind, but be careful not to overdo this, as the lettuces thrive better with very little air. If any decayed leaves are seen on the lettuces, remove them. If the heat in the frames slacks, as may be seen by the radishes not moving quickly enough, place littery manure all round and between the frames up to the lights. The radishes will be ready for gathering the fourth week from sowing, and should be cleared off a bed within 10 or 12 days. When they are all gone, water the bed well between the lettuces with a

fine 'rose'-nozzle hose. Choose a dull, mild day for this, between 11 and 12 o'clock. The lettuces will be ready for marketing five or six weeks after planting, which will be about the middle of March.

"About the beginning of March, make up a hot-bed for one frame of three lights or sashes. Make it two feet thick, and at least a foot beyond the frame all round. Fill up the inside as before, and pack round outside. When the heat is steady, sow the tomato seed, thinly, in rows about $1\frac{1}{2}$ inches apart, keeping at least $\frac{1}{2}$ inch between the seeds. Cover and press down, then scatter lightly all over, a sifting of fine rotted manure. Water well, cover up, putting mats on. In seven or eight days the seed should be germinated. Keep a watch on it and remove the mats the moment it is seen to be breaking through. Water gently with a fine rose, using chilled water. Give all the light possible now, and water as required, keeping the soil just nicely moist. As soon as the first pair of rough leaves show, begin to prick off; if the pricking off is not commenced early the plants will be getting 'drawn' before it is finished.

"After cleaning the beds from which the lettuces were taken, fork over lightly and add 3 inches more soil; press all down very firmly and prick out tomato plants 3 inches apart. Do not water. Keep close for a few days until the plants begin to move, and cover at nights. As the plants show growth, water gently and give air on mild days, gradually giving more water and air until the first week in May, when the lights may be taken off on all mild, genial days. By the middle of the

month leave air on at night, and the last week the lights may be removed altogether. The weather must be carefully watched, as May is a very changeable and treacherous month; it is very usual for frosts and cold weather to return about the middle of the month, and protection must be given if necessary.

“The ground where the tomatoes are to be set out, should have been prepared during the winter by digging or deep ploughing; a moderate dressing of natural manure should have been added if the ground is poor, but the ground which has previously been heavily manured and cropped with vegetables will be preferable, no manure being added for the tomatoes. After digging, give a dressing of basic slag 10 cwt. to the acre. Have all finished not later than end of February.

“About the middle of May, if the ground is dry, dress with sulphate of potash 1 hundredweight and sulphate of iron, ground fine, $\frac{1}{2}$ hundredweight to the acre, then go over all with a hoe and chop down all weeds and level all hollows; do not rake. At each end of each row, where it is intended to plant the tomatoes, drive in a pointed stake of 2 by 4 in. roadway to the row, at a slight angle away. The stake should enter the ground 2 ft. and stand out 1 ft. 9 in. Then in direct line with the stakes, at intervals of 10 ft. drive in studding boards $\frac{3}{4}$ inch x 2 in. x 2 ft. 6 in. long, to stand out of ground 1 ft. 9 in. The narrow way of the board should be in the line of the row. Now fix 16s gauge galvanized wire to the stake at one end, and draw tight and fix to stake at the other end. Fix wire to top of stakes by

small wire staple. This should all be done before the plants are set out.

“During the last week in May and first week in June, the plants should be set out. Water well in the frame, then gently pull the plants and place as many upright in a basket as it will hold. Drop about twenty at 18 in. apart; then one person with a small, thin graft, or a garden trowel, should insert it about 4 in. into the ground at an angle, and press upwards, slightly raising the soil without disturbing it. A second person should insert the damp roots of the plant in the nick and tuck them carefully to the bottom, into the damp soil; remove the tool gently and press the soil firmly on to the plant with the heel. Do not water. I have tried many ways of planting tomatoes in the fields, and this I found to be the best method where large numbers have to be planted. Where only a small quantity are being handled it is best to grow them in strawberry baskets or pots, and put the plants out with the roots undisturbed.

“In a week or two, if the weather is genial, growth will be observed, and then a dressing of nitrate of soda may be given, about 2 hundredweight to the acre. It should be crushed fine and mixed with three times its bulk of dry earth or ashes. At the end of June the plants should be thoroughly sprayed with strawsonite. After spraying, it will be time to go over the plants, and remove all the side shoots, keeping the plants to one stem only. When the plants have grown long enough to reach 6 in. above the wire, they should be again trimmed

of shoots and tied to the wire, resting the stem of the leaf on the wire before tying. Leave the tie rather slack for expansion of stem. After trimming and tying, spray again with strawsonite. This work should all be completed by the beginning of August, if the season is suitable to growth. If rain falls immediately after spraying, repeat it.

“The fruit should begin to show color by the middle of August, but this varies considerably with the season and the age of the plants when set out.

“As soon as the fruit shows pink, it should be gathered and taken to the packing shed. Do not gather the fruit green if it can be helped, but wait for a change of color. These gatherings should be continued at least twice a week so long as the fine weather continues. If the weather changes to wet after a long dry spell, it is very probable that many of the fruit will crack, and then it is advisable to gather the fruit green, if quite fully matured; this will save them from cracking. If the weather is cold and dull, the plants should be sprayed with Evans' Aseptic Spray. This will not leave a stain on the fruit. After the second week in August, the plants may be topped, as this will help the fruits to swell, and fruit setting after this date will probably be useless. Keep the side shoots removed, and remove and shorten bottom leaves to let the sunlight into the plants. Remember this: plants allowed to grow close and crowded are much more liable to disease, and spraying does not thoroughly cover them; also plants with many shoots make less fruit, of a smaller

size, and take longer to ripen; therefore anyone taking the trouble to raise plants and set them out, and neglecting them afterwards, is acting very foolishly.

“Continue to gather the fruits as ready, keeping a sharp look-out after the end of September for signs of frost. When this is feared, gather all the full-grown fruit on the plants whether green or not—they will ripen in-doors; but exercise some judgment, and do not gather fruit which is not full grown. This may color, but even if it does, it will be shrivelled and a bad color, and will spoil the market for better fruit. It is better to leave the immature fruit on the plants, as the frost may pass without doing any material damage, and there may be several weeks more of mild weather, which will give several more pickings of full-grown green fruit. I have picked in this way until the first week in November, some years.

“The fruit must be graded into ‘best smoothing,’ ‘small smooths,’—which description does not include very small fruits, but only those just too small for an even sample,—‘seconds,’ and ‘thirds.’ Seconds are good sound fruit, but include all the misshapen ones. Thirds are sound odds and ends—it is better to avoid the grade if possible. The fruit is sent to markets in baskets.

“Tomatoes may be obtained from the open in July by sowing the seed a month earlier, and growing on with more room in pots. If each plant has 9 in. square of space, and is properly attended to, it will have small fruits set when planted out, and ripe fruit can be gathered in July.

“Ridge Cucumbers. Prepare a good hot-bed as for tomato seed, and on the last day of April, sow the cucumber seed, two together, at $1\frac{1}{2}$ in. apart all over the bed; cover with soil, press down, do not water, close up and cover with mats. The seed will be up in 2 or 3 days. Give water, plenty of light, but no air; cover at night. Have ready a mild hot-bed—the bed the lettuces were removed from, if forked over, will probably do. As soon as the rough leaves are showing, lift each pair of plants gently with a little soil and pot into large 60s, burying up to seed leaves. Water as required. Harden gradually by end of May, and plant out first week in June at 2 ft. apart in rows, and 4 ft. between the rows. A bed into which a heavy dressing of manure has been dug during the winter will do very well. As soon as set out, the plants must be protected by some means, such as placing a flower-pot at night over each plant, or with paper cones pegged down. It is also advisable that hurdles covered with straw be run down every 3 or 4 rows to break the wind. If the plants are helped in this way for a week or two, they will repay it later on. After planting they should be watered, and this should be repeated if the weather continues dry. Before they begin to run, mulch all down each side of the rows with long straw stable manure. Fruit should be ready middle of July.

“For using the frames after the above plants have been removed, I recommend Frame Cucumbers. Melons would do equally well, but are rather more difficult to grow, and I advise cucumbers for a year or two until

experienced. Make up a hot-bed precisely the same as for Ridge Cucumbers. Fill as many 60s pots as are needed half-full of prepared soil after covering the drainage hole with broken china. Put one seed of Telegraph Cucumber on the soil in each pot, fill half the remaining space with soil and press down with the bottom of a pot. The soil should be of a nice dampness when used, as the seeds are better unwatered; the pots, if new, should be soaked in water before use. Cover up close and keep mats on until seed is up, then only mat at night. Give no air, water with tepid water as required, shade from strong midday sun and keep interior of frame moist by dewing over early each morning. Give the plants room for the leaves to spread. As frames are emptied of the tomatoes and ridge cucumbers, without waiting for all of them, fork them over lightly and raise slightly in centre; on this mound put half a bushel of prepared soil, which should consist mainly of chopped sod with the grass removed, a little decayed manure, and a little finely sifted burnt earth or old mortar rubbish. Cover up close for a day or two for the sun to warm the soil, and then put two plants in the middle of the light, about 6 in. apart. Pinch out the centres, allowing only one shoot to grow from each plant. These should be taken from one plant upwards and the other downwards in the frame. Keep the growth thin; remove old leaves, one now and then; avoid overcrowding; if this seems likely, cut some of the shoots right out. Keep the frame moist, give plenty of tepid water, whiten about half the glass in the centre and splash the remainder.

If these instructions are carried out, there will be an abundance of cucumbers to cut for market.

“The frame cucumbers are packed in flats, numbered according to size, but usually 3 to 4 doz. Put a little hay at the bottom, then cover with paper, put one layer of fruit very carefully on this and a sheet of paper over, a little more hay, another sheet of paper, then a layer of fruit and so on. Three layers generally fill the flat.

“Ridge cucumbers are generally sold by count or in bushels, but when grown especially fine may be sent in flats as above.”



Appendix IV.

THE *Farm Journal* for November, 1908, gives the following condensed list of the short courses offered by the various State Agricultural Colleges:

Specialized knowledge is the keynote of modern farming success. Why not give your boy or girl a chance to acquire some of this knowledge? In winter there will be a let-down of farm activity, and many of Our Folks could, if they tried, attend one of the short agricultural courses provided free by nearly every State. In many cases the only expenses are for board, books, etc., and the total cost of a few weeks' course is thus very small. Many grown farmers attend these courses; there is no age or citizenship limit in most States.

For catalogues and full information write to any of the addresses given, mentioning this book. For instance, if you live in Alabama, direct your letter as follows: "J. F. Duggar, Alabama State Agricultural College, Auburn, Ala."

Alabama. J. F. Duggar, Auburn: Offers a nine-month course in agriculture, and a two-year course.

Arizona. R. W. Clothier, Tucson: Offers a two-year course in irrigation, engineering, farm management, dairying and vegetable gardening, designed especially to equip students for farming under Arizona conditions.

Arkansas. John N. Tillman, Fayetteville: Short winter course in agriculture begins first Monday in January, lasting two weeks.

California. E. J. Wickson, Berkeley: Five different short courses covering special branches of farming. Write for particulars.

Colorado. B. O. Aylesworth, Fort Collins: A short practical course in agriculture and domestic science is offered by this institution.

Connecticut. C. L. Beach, Storrs: Dairy and creamery short course of twelve weeks. Pomology course of twelve weeks. Poultry course of six weeks. All courses open Tuesday, January 5th. A six-week forestry course begins November 2d.

Delaware. H. Hayward, Newark: Offers a six-week special course, from January 4th to February 15th; and a special "Farmers' Week" from January 4th to 8th, inclusive.

Florida. Andrew Sledd, Gainesville: A two-year course specially adapted to the farmer's boy. The instruction is of an applied nature with sufficient technical research to lead the student to question well the reasons for the various farm operations. College moved from Lake City to Gainesville.

Idaho. H. T. French, Moscow: Short courses are offered in dairying, extending one year; and farmers' short courses in dairying and horticulture, extending six weeks, beginning about middle of January.

Illinois. Eugene Davenport, Urbana: Offers a two-week course in agriculture, and also in household science, beginning January 13th.

Indiana. J. N. Skinner, Lafayette: Four courses of eight weeks each, beginning January 18th, as follows: Agriculture and horticulture; animal husbandry; dairying, household economics.

Kansas. E. R. Nichols, Manhattan: Offers a ten-week farmers' short course, beginning January 5th; a ten-week short course in dairying, beginning January 5th.

Kentucky. Clarence W. Mathews, Lexington: The college is now occupying its new building, offers a ten-week business course in agriculture, beginning January 4th. Tuition free to residents of the State.

Maine. W. D. Hurd, Orono: Offers an eight-week course in dairying, farm crops and horticulture; a special poultry course; and a "Farmers' Week."

Maryland. R. W. Silvester, College Park: Ten-week course in agriculture begins Tuesday, January 5th. Terms: Board, \$40 for whole course; tuition free.

Massachusetts. J. A. Foord, Amherst: 1, dairy farming; 2, horticulture; 3, general agriculture; tuition free; begin first Wednesday in January and continue ten weeks. Bee culture; begins fourth Wednesday in May and continues two weeks.

Michigan. R. S. Shaw, East Lansing: Eight-week courses in general agriculture, horticulture, creamery and cheese making, beginning January 5th. No charge for tuition; board and lodging cheap.

Minnesota. E. W. Randall, University Farm, St. Paul: Farmers' short course opens January 15th and continues four weeks. Dairy school opens November 16th and continues four weeks.

Nebraska. A. E. Davisson, Lincoln: The winter course opens January 4th and closes February 20th.

New Hampshire. Fred Rasmussen, Durham: A ten-week course in dairying begins January 5th.

New Jersey. E. B. Voorhees, New Brunswick: Offers three short courses, beginning December 1st and closing March 5th, as follows: General agriculture, dairy farming, market gardening and fruit growing.

North Carolina. C. L. Newman, West Raleigh: The seven-week course in agriculture begins January 11th; the one-week course in agriculture, January 4th.

North Dakota. J. H. Worst, Agricultural College P. O.: Winter short courses in cooking and sewing are offered for the young ladies. Also winter lecture courses for the men about farming, stock raising, etc.

New York. L. H. Bailey, Ithaca: Five winter courses, in general agriculture, in dairying, in poultry husbandry,

in horticulture and in home economics. These courses begin December 8th, close February 24th. (See also New Jersey.)

Ohio. H. C. Price, Columbus: Offers a ten-week course in agriculture, and a similar course in dairying; both begin January 11th. Also a four-week course in domestic science, beginning February 1st.

Oklahoma. J. H. Connell, Stillwater: Several instructive short courses are offered. Write for particulars. Five hundred students attended these courses last year.

Pennsylvania. Alva Agee, State College P. O.: Five winter courses in agriculture, beginning December 1st and continuing for twelve weeks. Write for particulars.

Tennessee. H. A. Morgan, Knoxville: An excellent series of short courses are planned for the new year. Write for particulars.

Texas. S. E. Andrews, College Station P. O.: A two-year course in practical farm work. Send for details.

Utah. Registrar, Agricultural College, Logan: Offers winter courses in agriculture or forestry, domestic arts or mechanic arts, beginning January 5th.

Washington. E. E. Elliott, Pullman: Offers an eight-week course in dairying and a twenty-week course in agriculture.

Wisconsin. H. L. Russell, Madison: Offers a twelve-week dairy course, beginning November 4th; a general course (fourteen weeks), beginning December 5th, and a ten-day farmers' course, commencing February 2nd.

Wyoming. J. D. Towar, Laramie: The winter course of eight weeks begins January 4th.

Information regarding the short courses of several State colleges was not received in time for insertion here, and so such States are necessarily omitted from the foregoing list.

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