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Some Horticultural Suggestions.

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SOME HORTICULTURAL SUGGESTIONS:

By F. S. EARLE.

Commercial horticulture is an established business at comparatively few points in Alabama. Vegetables have been grown and shipped in large quantities from the neighborhood of Mobile for many years; and Huntsville, in Madison County, at the extreme northern end of the State, has a national reputation as a nursery centre. In recent years there has been some planting of grapes and other fruits in Baldwin county, across the bay from Mobile; and there is a constantly increasing interest in fruit and truck growing at various points north of Mobile along the Mobile and Ohio Rail Road, in Mobile and Washington counties. Another fruit growing centre is at Fruithurst, in Cleburne county, on the Southern Railway, where the colony established by the Alabama Fruit Growing and Winery Association, is actively at work planting grapes and other fruits. Evergreen, Cullman and a few other points on the Louisville & Nashville Rail Road make some shipments of fruits and vegetables.

Why this State should be behind its neighbors in horticultural development is not apparent. Conditions of soil and climate are quite similar to those found in Georgia and Mississippi; and transportation facilities seem to be equally good; but the total shipments of fruits and vegetables from Alabama are very many times less than from either of its neighbors. Whatever the causes that have led to this condition, the present state of the markets does not justify the Experiment Station in urging the indiscriminate planting of fruits and vegetables for shipment to northern markets. It

is very desirable to have a more diversified agriculture; but it is far better and safer to continue growing cotton as at present than to rush into a new and untried business without first carefully considering those fundamental conditions on which success or failure will so largely depend.

The growing of fruits and vegetables for distant shipment is at best an uncertain and hazardous business. It depends for success on many factors, some of the most important of which, are entirely beyond the control of the grower. When everything is favorable the profits are larger than in other lines of farming; but as is the case in all lines of business in which the possible profits are large, the risks are correspondingly great. In our uncertain climate an entire crop, representing much labor and expense, may be destroyed by frost in a single night. If this danger is happily passed, vegetable crops are likely to be injured by the frequently occurring spring drouths; and both fruits and vegetables often suffer heavy loss from untimely floods of rain during the harvest. Then there are the numerous fungous diseases and insect pests to be reckoned with. Perhaps the losses from untoward climatic conditions would be no greater than with other farm crops, were it not for the imperative necessity for earliness in order to escape the competition of points further north. This frequently compels truckers to plant so early as to take heavy extra risks. Even with an abundant crop safely matured the troubles and risks of the fruit and vegetable grower are by no means ended. There are probably ten men who grow fairly good crops, where there is one who handles and markets his crop in such a way as to get the best possible profit from it. These products are all perishable. They can not, as a rule, be held for better prices, but must be marketed as fast as they mature. On account of this very perishability dealers seldom care to purchase these products at the farm but compel the grower to ship on commission thus assuming himself the heavy transportation charges, and

the danger of damage in transit. The further risk of loss through dishonest dealers has also to be considered; but these points will be discussed more in detail on an other page.

It is not intended by these remarks to discourage the growing of fruits and vegetables for shipment at those points where the business is established; or where the conditions of soil, and transportation facilities are especially favorable. In fact, these unfavorable factors are already too well known to all who have had practical experience, for a restatement of them to have such an effect. They are, however, factors that must be reckoned with, and it is to warn beginners in the business that they are mentioned here.

On the other hand, the rapid increase in horticultural production during the past few decades has been fully equaled by the wonderfully rapid increase in the consumption of such products. This leads to the belief, that as the general business depression of the past three years passes away, prices for horticultural products will advance, and the business will become more generally profitable. Then, too, these years of depression will cause many people to drop out who have gone into the business unadvisedly or as a temporary makeshift, thus leaving the field to those who make commercial horticulture their chief business.

There is something about this business that makes it very attractive to many people. Its very uncertainty adds an element of interest. Parts of the work are so light that they can be taken part in by all the members of the family. Children quickly become interested; and the boys are more likely to follow in their fathers' footsteps and stay on the farm than in other lines of agriculture. The strenuous activities of the shipping season, when every faculty is strained to the uttermost to get off the perishable crop without loss, leaves its imprint on the individual, making his mind more active and alert. Fruit growing communities, are proverbially more

intelligent and progressive than those engaged in other rural occupations.

In the nature of the case, however, it is a business that will never be engaged in by more than a small part of the people of the State. There is another phase of horticultural production, however, in which all are nearly equally interested; and that is the growing of a better and more abundant supply for home use and for the local markets. While apples, potatoes and cabbage are shipped into Alabama by the car load, and turnips and ruta-bagas by the barrel, there is certainly room for continued horticultural agitation and instruction. In our climate it is possible, with a very small outlay of time and money, to have an abundant supply of fresh vegetables on the table every day in the year; but how many are there, who avail themselves of this opportunity? Most people plant something of a variety in the early spring; but with this their gardening energy for the season is exhausted. The okra and butter beans, and perhaps a few tomatoes will continue to bear throughout the season; and these, with collards, cow peas and field corn must be the reliance during the hot months, to be supplemented in the fall by a small patch of turnip greens. In the small towns the supply of even these standbys is irregular and uncertain.

In view of these facts the issuance would seem timely of a series of bulletins giving short practical directions for the cultivation and marketing of the principal fruit and vegetable crops, under the conditions prevailing in this State. In the present bulletin some suggestions are offered on such general topics as soils, fertilizers and marketing, leaving the different special crops to be discussed at some future time, taking up with each the problems connected with its growth and marketing; but paying particular attention to its uses in the home garden, and the means by which a better and more continuous supply can be secured at a minimum cost of money and labor.

SOILS FOR HORTICULTURAL CROPS.

In selecting a location for truck farming, or commercial fruit growing, the character of the soil should be carefully considered ; for, next to suitable transportation facilities, it is a question of the greatest importance. The kind of soil to be selected will naturally depend on the crop to be grown. For the home garden almost any of the soils of the State can be made to answer a very good purpose. An essential requirement for both fruits and vegetables is good drainage, either natural or artificial. This is especially necessary where earliness is a question of importance, for wet sodden soils are always cold and backward in the spring. Soils with a certain amount of sand are easier to cultivate, and will be more suitable for most vegetables than heavy clay soils. They can be planted earlier in the spring and will mature crops earlier. Most fruits on the other hand will, in this latitude, thrive better and be freer from disease on rather stiff clay land than on very sandy soils. Perhaps the most notable exception to this statement is the case of the Oriental pears (LeConte, Keiffer, &c.,) which seem especially adapted to the moist sandy soils of the coast region. The ideal truck soil is a moist but not wet, black sandy loam, containing abundant vegetable matter; and preferably resting on a not too impervious red clay subsoil. It should be nearly level or with a gentle southern exposure. Of course the greater the natural fertility the better, but after all this is not a vital question, for there are no soils so rich that they will stand continuous trucking without frequent and heavy applications of fertilizing material. The mechanical condition, and moisture holding capacity of the soil is really of greater importance to the truck farmer, than its chemical composition; and these must be maintained by continually adding to its supply of vegetable matter, either by applications of stable manure, or by plowing under green crops. Only comparatively level lands should be planted to truck

crops. On steep broken hillsides too much fertility is lost by washing and there is too much extra labor in cultivation. All stumps, rocks or other obstructions should be carefully removed in order to admit the use of modern cultivating machinery.

Very broken hillsides are sometimes utilized by planting them to fruit trees and especially to grape vines. Fine fruit can be grown in such locations, and in some cases it may be the best way of using such lands. It is however usually unwise to plant commercial orchards on land so rolling as to prevent rowing the trees and cultivating both ways, on account of the added labor in cultivating and harvesting where the rows have to circle the hillsides. Only high lying lands should be selected for orchards, especially of the stone fruits, not only on account of the better drainage, but because of the greater freedom from spring frost, and a less liability to loss from rot. High land fruit is finer colored and more attractive than that grown on low lands. A flat topped hill with the land sloping away in all directions is an ideal location for an orchard, especially if there is a good red clay subsoil. The character of the top soil is not so important. It may be a little sandy, in which case the fruit will be a few days earlier; but a stiff red clay throughout, with only a small amount of vegetable matter, will give fruit of the highest flavor, best color and best shipping quality. As stated before these remarks do not apply to the Oriental pears and only partially to apples. Parts of the mountain country of north Alabama are admirably adapted to apples; but in the central and southern parts of the State they are a little out of their latitude and the trees are likely to be short lived in dry and exposed locations. They will be longer lived and more fruitful in lower and moister lands, though in such locations the fruit is always duller in color and more liable to rot.

IRRIGATION.

Next to good drainage, an abundant water supply is one of the most important factors in producing vegetable crops. Our annual rainfall would be ample for the needs of all crops, if it were equally distributed, but this is not always the case. Our drouths are never as prolonged and destructive as those sometimes occurring in the States further west; but there is seldom a season when the ability to apply water to his crops at will, would not be of great benefit to the truck farmer. The deeper rooted orchard trees seldom suffer seriously for water, but young vegetable plants are often pinched quite severely during April and May; and during our long dry falls most gardening operations are impossible, except on the moistest lands, without artificial watering.

In many parts of State the streams are fed by springs so that they continue to run, even in the dryest weather. It would be a very simple and inexpensive matter to turn this running water onto the adjoining bottom lands if they were devoted to trucking purposes; and in other parts of the State storage reservoirs could be built at small expense which would be filled by the winter rains. Of course a much less quantity of water would be required here per acre than in the arid regions of the West, for a single irrigation would usually be sufficient to carry a crop through a period of drouth.

Along the larger water courses, water can be profitably lifted onto the land by steam pumps. This is not an untried theory, but is in practical use by some of our most progressive truck farmers. In those parts of the State where artesian water can be obtained this furnishes an admirable source of supply for irrigation purposes.

This question is one that is destined to attract much more attention in the future than it has in the past; and those who are studying a location with reference to its suitability for the truck business would do well to examine its capabilities for irrigation.

MANURES AND FERTILIZERS.

Many questions reach the Experiment Station as to the best fertilizer for the different fruits and vegetables. Such questions are hard to answer unless something is known of the local soil conditions; yet there are certain general considerations that are nearly always applicable.

In the first place see that the soil is in the best possible mechanical condition; for it is useless to buy expensive fertilizers to throw among clods; and equally useless to buy fertilizers to feed weeds and grass, for they will choke the crop all the more rapidly when the ground is enriched, if they are allowed to grow unchecked. In other words, thorough cultivation should always accompany heavy fertilization.

The important ingredients of all fertilizers are nitrogen, phosphoric acid and potash. The other mineral foods of plants are usually sufficiently abundant in all soils. A complete fertilizer is one in which all of these substances are present. An incomplete fertilizer is one in which some one or two of them are wanting. Just what the roll of each of these substances is in the economy of the plant cannot be exactly stated; yet it is known that an abundant supply of nitrogen and potash promotes the growth of the wood and leaves, giving the foliage a dark green luxuriant appearance, but at the same time it usually somewhat retards maturity. The phosphates, on the other hand, promote fruitfulness and tend to hasten development and maturity. Different kinds of plants draw on these different fertilizing elements in varying proportion, some taking up more of one substance and some more of another. Numerous attempts have been made to construct fertilizer formulas* to fit the exact requirements of each crop. These special formulas are sometimes useful, but on our poorer Southern soils the chief requirement is a good complete fertilizer abundantly applied;

*Some of the best of these formulas are given by the North Carolina Experiment Station. See Bull. 112, pp. 92-95.

and so far as practical results are concerned it will usually answer about as well to take this fertilizer, for the different vegetable crops usually grown, all from the same pile, as it will to mix special lots to try and hit the special wants of each. The needs of fruit trees will be discussed further on ; but for vegetables the best one fertilizer is undoubtedly stable manure. Where it can be obtained in sufficient quantity it may be used almost to the exclusion of anything else. It is a complete fertilizer, containing all three of the necessary elements in about the right proportions ; and besides greatly improves the mechanical condition of the soil by increasing the vegetable matter it contains. The only exceptions to its beneficial effects are where a drouth immediately follows its application in a raw or unfermented state, or before it is thoroughly incorporated with the soil ; or in the case of a few diseases, like potato scab, that seem to be worse where the soil has been dressed with stable manure. For quick growing crops it should be well rotted or it should be incorporated with the soil some time in advance of planting. If the quantity is limited, apply in the row, opening out a deep furrow and bedding on it in advance of planting ; but in the case of heavy applications it is better to broadcast and plow in during the winter. On lands naturally deficient in phosphoric acid, like all those of the pine belt, or when continued applications of stable manure have been made year after year, it will usually pay to add two or three hundred pounds per acre of acid phosphate in the drill, even where heavy applications of manure are made. The effect of cotton seed is much like that of stable manure. Experiments conducted by this station (see Bull. 78) go to confirm the high manurial value of the whole or crushed cotton seed.

Many truck farmers are so situated that they cannot obtain a sufficient supply of either stable manure or cotton seed. In such cases commercial fertilizers must be depended

on, supplemented by green manuring. Any good brand of high grade, complete fertilizer, will give good results if used in sufficient quantity ; but it will generally be found cheaper to buy the ingredients and mix them at home. Nitrogen is much the most expensive element in commercial fertilizers. It is supplied by the trade in the form of cotton seed meal, castor bean meal, fish scrap, slaughter house refuse, nitrate of soda and sulphate of ammonia. In this State cotton seed meal will usually be the cheapest and most available source of supply, though nitrate of soda is useful where a very quick acting fertilizer is required. The supply of phosphoric acid comes from Carolina and Florida phosphate rock, and from bones. Thomas slag is a residue from iron works that is sometimes used for the phosphate it contains. Here our most economical form of phosphate comes from the ground phosphate rock that has been treated with sulphuric acid to render it soluble. This is commercially known as acid phosphate. It should analyze from twelve to fifteen per cent. of available phosphoric acid. The supply of potash comes from hard wood ashes and from certain salts that are mostly mined in Germany. Cotton seed hull ashes where they can still be obtained make an excellent source of potash. It is usually used in this state in the form of kainit ; but sometimes the muriate of potash is used. These are both products of the German mines. Kainit is the crude salt. A good quality will show about twelve and a half per cent. of potash, the remainder being common salt, magnesium chloride, and other impurities. The muriate is a refined product and should contain fifty to fifty-five per cent. of potash. The sulphate of potash is preferred for some purposes, especially for tobacco, where it is supposed to give better burning qualities than the muriate ; but it is more expensive and is probably no better for most crops. The proportion in which to mix the different ingredients should, of course, vary with the character of the soil, and to some extent with the crop to

be raised. Each large grower should experiment for himself until he finds what is best suited to his particular needs. In the majority of cases the following formula will perhaps be as useful as any other :

Cotton seed meal 3 parts (by weight.)
 Acid phosphate 3 parts.
 Kainit 1 part.

This will give about 3 % of nitrogen, 7 % of phosphoric acid and $2\frac{1}{2}$ % of potash. This is a smaller per cent. of potash than is sometimes recommended, and quite likely on some soils or with certain crops a larger proportion would be useful.

In mixing the fertilizer select a place on the barn floor or on smooth hard ground. Spread down a layer two or three inches deep of one of the ingredients, then another layer of another, and so on until the required amount of each is spread down. Then begin on one side with hoes or shovels and chop it down and pull it over so as to thoroughly mix the different layers. When it is all worked over to one side begin again and work it back, and continue working it back and forth until the color blends and becomes uniform to the eye.

When very large quantities are used a part may be broadcasted to advantage; but it is usually best to apply in the drill from two to three weeks before planting. The row can be opened with a single shovel plow and the fertilizer scattered as evenly as possible in the furrow. Before covering run another furrow in the bottom of this one with a narrow bull tongue or scooter, to mix the fertilizer with the soil; then bed on it, using either a single shovel or light turning plow. Just before planting knock off the beds by running over two rows at a time with the back of the harrow or with a plank drag. This will leave a bed of fine slightly compacted, fresh earth to receive the seed; and it will destroy such weeds as have sprouted. The amount of fertilizer to use per acre will depend on the richness of the soil; and on the crop

to be grown. Eight hundred to a thousand pounds of the above mixture will usually be sufficient for beans, tomatoes and sweet potatoes; while Irish potatoes, cabbage and onions will use twice that quantity, or even more, to advantage.

As soon as early crops are harvested the land should be planted to cow peas. After such heavy fertilizing they will make an enormous growth, which can be turned under for green manuring; or better still, be made into hay, and be fed to stock in order to make more stable manure. The roots and stubble will be left in either case to enrich the soil. The cow pea like many other leguminous plants, is able, by means of the tubercles on its roots, to draw on the store of atmospheric nitrogen, which most plants can not do. It is this that makes this plant so useful in building up the soil. It is a nitrogen gatherer and, as has been stated, nitrogen is the most expensive element of soil fertility. If the land is not to be used for a winter crop, it will be best to allow the pea vines to lie on the ground as a mulch till toward spring before turning them under, as bare plowed land leaches badly in our heavy winter rains. On lands infested with "root knot," which is often so troublesome to vegetables and to some fruit trees, it is not advisable to plant cow peas since, unfortunately, they serve as a nurse plant for the nematode worms that cause the knots. On such soils a crop of millet, sorghum or broadcast field corn may be grown and turned under. This will supply vegetable matter to the soil, but it will not increase the supply of nitrogen, as is the case with the cow peas.

The importance of rotation of vegetable crops should be mentioned in this connection. Different crops draw differently on the elements of soil fertility, so that while it may be partially exhausted for one crop, or class of crops, others may grow on it luxurantly. It is, however, on account of the greater liability to disease, when one crop is grown continuously year after year, that the necessity for rotation is

more particularly urged. There are a few crops, like onions, that can often be grown with good results year after year on the same land, when heavy fertilization is practiced; but in most cases it is far better and safer to follow a systematic rotation.

It is hard to get the soil too rich, or too full of vegetable matter for the best production of vegetables. With fruits the case is different. To secure the best results on thin lands orchards must be fertilized, but it must be done with care and judgment. Excessive applications of stable manure, or other nitrogenous fertilizer, should always be avoided, especially after trees reach bearing age. Such applications induce a rank, sappy growth that makes pear trees much more liable to blight, and will surely cause destructive rotting of the stone fruits. With apples there is less danger, and they may safely be fertilized quite heavily. Excessive wood growth is, however, never desirable in a bearing orchard of any kind. The trees should be carefully watched, and be given such treatment as will give a crop of well developed fruit; and, at the same time, a moderate growth of well matured wood. The leaves should always be of a dark rich green, for pinched yellow foliage indicates starvation.

It is usually best to use the available stable manure for the garden, and depend on commercial fertilizers for the orchard. While the trees are young, the mixture recommended for vegetables can be safely used; but a much smaller quantity will be required. If the land is to be used for orchard purposes alone, two to four pounds to the tree or vine will be ample. It is a common practice to plant some truck crop in a young orchard. In such cases the trees will need no fertilizer, other than that given to the vegetable crop. Another common practice is to plant a young orchard to cotton; and, everything considered, this is perhaps the best treatment, as the long season of cultivation required by the cotton is just what is needed by the trees. In this case

an added amount of fertilizer will be useful, as cotton is given so little, compared to what is required for vegetables.

It is always advisable to sow oats or rye in the orchard in the fall to prevent washing and leaching during the winter; but this crop should always be plowed under early in the spring, and in no case be allowed to mature. Nothing is harder on young trees than a small grain crop. In sections where crimson clover can be successfully grown, it makes the best of winter cover crops for an orchard; since, like the cow pea, it is a nitrogen gatherer, and constantly adds to the fertility of the soil. If no other crop is grown in the orchard cow peas may be sown late in the season, say from the middle of July to first of August. They can be allowed to lie on the ground for a winter mulch, or they can be turned under in the fall, and the ground be reseeded to some winter growing cover crop, as recommended above. They should not be planted early in the season, for nothing should be allowed to interfere with the thorough cultivation of a young orchard from March to July.

After about the second summer it will not pay to attempt to grow vegetable or cotton crops in the orchard, as the trees will begin to draw too heavily on the soil; but the crops for winter cover should be continued.

As the trees reach bearing age, the proportion of cotton seed meal, or other nitrogenous material, in the fertilizer should be materially reduced, and more acid phosphate be substituted. The formula may now be:

cotton seed meal,	1 part	(by weight)
acid phosphate,	4 parts	“ “
kainit,	2 parts	“ “

This will give approximately 1% of nitrogen, $7\frac{1}{2}$ % of phosphoric acid and 4% of potash. When the soil is naturally rich and the trees are very vigorous, or when cow peas or crimson clover are grown and plowed in, the cotton seed meal may be omitted entirely, until such time as the lessened

growth and yellow color of the foliage, indicate its need. In fact an orchard can not be fertilized by rule, but should be treated each season according to its needs, as indicated by growth and condition; always remembering that a heavy crop greatly exhausts the vitality of the trees, and that it should always be followed by increased fertilization.

Bone meal makes an admirable fertilizer for fruits and especially for grapes. High freight rates make it rather expensive in this State, and the same temporary effect can be had at less cost from the mixture of cotton seed meal and acid phosphate recommended above; but it must be admitted that the effect of the bone meal is more lasting.

HOT BEDS AND COLD FRAMES.

Hot beds and cold frames are indispensable to the truck farmer and market gardener for starting tender plants in the spring, and they should be much more generally used in private gardens. The more elaborate forcing houses for growing vegetables under glass, and the hot beds heated by flues with fire heat, so much used further North, will not be discussed here. Hot beds heated with manure, and glass or canvass covered cold frames are all that are necessary in this climate for starting such plants as tomatoes, egg plant, peppers, cucumbers and cantelopes in the Spring; or for growing lettuce and radishes, or carrying cabbage plants through the winter. The regular 3x6 ft. glazed hot bed sash are, of course, the best cover for such beds, and every extensive grower should have at least a partial supply of them; but they are expensive, and almost equally good results can be obtained with ordinary unbleached domestic, or sheeting, if supplemented by an abundant supply of hay, corn stalks or pine straw, to use for extra covering during very cold nights. Indeed this extra covering will be needed almost as much with the glass.

To make a hot bed, select a well drained spot with southern exposure, and dig a pit two feet deep the size of the

proposed bed. Fill this with fresh horse manure from the stable and tramp it down well. If the manure is trashy or old, add some cotton seed meal to insure active fermentation. Pour on water enough to dampen the mass thoroughly without soaking it, and cover with six inches of rich soil. Now build a frame of rough boards a foot high on the south side, or front, and two feet high on the back. The frame is usually built six feet wide, on account of the length of the sash. The double width, or ten-fourths sheeting, is also just right to cover a six foot bed. One by three inch strips are put across every three feet, for rafters to support the sash or cloth. When cloth is used it is sometimes tacked onto light frames, the size of sash; but it is much more convenient to leave it in one piece, about two feet longer than the bed. Bring one edge even with the back side of the bed, and nail fast, using strips or lath on top of the cloth, to prevent the nails tearing out. Bring the free edge of the cloth down to the front of the bed, and nail it fast between two 1x2 in. strips, so as to form a roller. If the bed is long, place the upper and lower strips so as break joints, and thus make a continuous roller the entire length of the bed. The roller should hang down half way on the front side of the bed. Its weight will then help hold the cover in place. Such a cover can be rolled up by one man in a moment's time, on a bed sixty or even a hundred feet long, and the bed can be covered again as quickly; but the shifting of that amount of sash is a matter of considerable labor. The sides and ends of the bed should be banked with earth, and the cover closed. In three or four days the manure will get pretty hot. Sink a thermometer into the soil, and do not plant seed till the temperature gets down to 90°, or a little below. After planting, water slightly, if necessary, and cover the bed tightly, till the seed is well up; then give ventilation whenever the weather will permit.

The construction of a cold frame is the same as that of a hot bed, except that no pit is dug and no fresh manure is

used. The soil for both hot bed and cold frame should be plentifully enriched with compost, or well rotted stable manure. When growing plants on a large scale, the cold frame is generally made double width, with a ridge pole of 2x4 in. scantling supported on light posts about two feet high. Two curtains ten-fourths wide, or two lengths of sash, are necessary to cover such a twelve foot bed ; but it requires less lumber than a six foot bed, as the sides need be only one foot high. The single bed is built running east and west, so as to face the sun ; but the double bed should run north and south, so that the morning sun will shine under the ridge from one side, and the afternoon sun on the other, thus leaving no part in continuous shade.

Such plants as tomatoes, peppers and egg plants should be started in a hot bed ; but as they can be grown very close together when young, a small bed will answer for starting a very large number of plants. When about two or three inches high, they should be shifted to the cold frames, and be planted in regular rows four to six inches apart each way. A bed 12x60 ft. planted in this way, will hold plants enough for about an acre of land. A marker is a convenience in transplanting, made by putting pins, the required distance apart, into a light strip, an inch or so shorter than the width of the bed. The pins pressed into the soil mark the entire row across the bed at once, and by always placing the end of the marking stick against the same side of the bed, the plants will be made to row both ways quite accurately. This is an important point when taking the plants up to move to the field.

Plants can usually be held in such cold frames from four to five weeks, according to the weather. Tomatoes will require from four to six weeks in the hot bed, and egg plants and peppers six to eight weeks, so seed should be sown from two to three months before it is expected to move the plants to the open ground. The hot bed is usually located near the house or barn, where it can be easily cared for, but each

cold frame should be located near the center of the land it is expected to plant from it, even if water has to be hauled to the beds in barrels. About two weeks before planting time open furrows, scatter in the fertilizer, and bed on it as previously described. When just ready to plant, if the land is level enough for cross cultivation, mark it off with deep furrows running across the beds. If the land has to be circled, the beds must be split by a deep furrow, and the plants spaced by guess in the row. Planting should follow the marking off as closely as possible, so as to have moist soil to draw about the plants. The bed should be well wet down a few hours before planting, so that the dirt will stick together, and not crumble. Now take down the frame, and haul away the lumber. Then take a long bladed knife, and slice down deeply midway between the plants, running the knife in both directions, so as to cut the soil in the bed into squares, with a plant in the center of each square. Now lift the squares of earth carefully on a spade, and place them on hand barrows or stretchers. When the stretcher is full two men take it and carry it along the rows. It is set on the ground, and the carriers lift the plants, one by one, with a flat paddle or trowel, and place them in the freshly opened furrows. Other hands follow immediately with hoes and draw the dirt about the plants, firming it with their feet. Large plants can be handled in this way without wilting or checking their growth, and with no danger of loss, even in quite dry weather.

Another class of plants, like cantaloups and cucumbers, will not bear handling in this way. These must be planted in boxes or "dirt bands" in the cold frames. These bands are furnished very cheaply by the fruit box factories, as they are made from sap wood, and other poor material. They consist of thin veniers, three or four inches wide, and grooved so as to fold into a four or five inch square, with a lap on one side. The prepared dirt is shoveled back from one end of the bed, the bottom is leveled down, and the

bands are folded into shape, and are packed closely together in rows running across the bed. When the cleared space is filled by them, the dirt is shoveled back into them, and another space is cleared, and so on till the bed is completed. The dirt should be well packed in the boxes by using a stick for a rammer; and seed should be planted in each box, about four weeks before it is expected to put the plants in the field. It used to be thought necessary to tack these bands together before placing them in the beds, but it is found that the mould that forms on the wood when it is buried in the ground, serves to hold the bands together, till carried to the field. The boxes are lifted on a spade, and carried to the field in hand barrows, exactly as the squares of earth are with the tomato plants. Plants in dirt bands dry out much more rapidly, and require more frequent watering, than those in solid beds. Some growers cut the corner of the dirt band, and remove it before hilling up the plants in the field; but this is not necessary, as the roots pass freely out at the bottom and the band soon rots away. Such hardy seeds as onions and cabbages can be sown in cold frames in the fall, and the plants will be ready to set in the field in late winter, or early spring, so soon as the heaviest freezing is past, in time to use the same frames for some of the tenderer crops in the spring.

MARKETING AND TRANSPORTATION.

As has been previously stated, there are many who succeed in growing good fruits and vegetables, who fail to market them, so as to get the best results. The price of these goods depends so much on the condition in which they reach the market, and in their presenting an attractive appearance to the eye of the customer, that no pains or expense should be spared in securing the best possible results in this direction. No old or dirty barrels, or other packages, should be used. Let everything be as neat, clean and attractive as possible. Above all, grade the goods with great

care, and throw out everything that is unsound or unsightly. The culls may be of some use at home for stock feed; but it is worse than useless to load up the markets with such stuff. Avoid all attempts at false packing. Do not put all the choice specimens on top of the package, and the culls in the middle. The buyer is just as smart as you are, and is constantly on the lookout for such deceptions. Be careful however that the package is smoothly and evenly filled, with the contents just high enough, so that the cover presses it all firmly, so as to prevent jostling about and bruising in transit. Stamp your name and address plainly on every package, as a guarantee of good packing; and as a trade mark that will come to have great value, when it becomes known that your goods are always carefully and honestly packed.

These suggestions apply equally well, whether your market is in the next town, or a thousand miles away; but as most southern growers depend on distant shipment, for marketing their crops, the question of transportation becomes a most vital one. In the early days of the business, nearly all horticultural products were shipped by express. This has never been a satisfactory method, on account of the high charges, and the frequent damage from rough handling; and in the present state of the market, except for near by points, or for a few high priced articles, the rates are absolutely prohibitory. It is certainly not advisable to undertake growing any of these crops, for distant shipment, except at those points where the business is being carried on extensively enough to secure car load freight rates, and fast freight transportation.

The bulkier products, like cabbage, watermelons and potatoes; and in some cases pears and apples, can be safely handled in ordinary open or ventilated fruit cars, such as are provided by all the roads. For the more delicate fruits and vegetables, refrigerator transportation is indispensable. The added expense is considerable; but it is more than re-

paid by the greater safety in transit, and the better condition on arrival. In fact, many of these products cannot be shipped by freight in open cars at all; but must either go by express, or in refrigerators. In such cases, both cost and condition greatly favor the refrigerator car.

Many difficulties, and much prejudice were formerly encountered in shipping fruits under refrigeration. Dealers and buyers were afraid to handle fruits that had been on ice, claiming that they would melt down and spoil, as soon as they were removed to the warmer air. This belief was wide spread, and deeply seated, and it has taken much time, and many practical demonstrations to fully convince the trade of its falsity. It probably originated in attempts to save fruit that was already overripe, and on the verge of spoiling, by placing it in the ice box. Such fruit will be preserved for some time if kept cold enough; for cold arrests the growth of the organisms of decay. The decay is only arrested, however, for these organisms are not killed by the cold, and as soon as such fruit is again brought into a warm atmosphere, they rapidly complete its destruction. If, however, the fruit is taken from the field at the proper stage of maturity, and is placed at once in a refrigerator car, the cold prevents the beginning of incipient decay; and the fruit will arrive at its destination in a condition to keep almost as long, after taking it from the car, as it would have kept in the open air at the time it was picked. Strawberries must be in the best possible condition, and the weather not too hot, for them to stand thirty-six hours transportation by express; or in other words for them to reach market, in good condition, on the second morning after picking. In the writers experience strawberries have been repeatedly sent from southern Illinois to Detroit, a three days run by refrigerator freight, and have been successfully reshipped by express, to Canadian points, that were not reached till the second morning after leaving Detroit.

Again, no fruit is more perishable than a fully ripened peach; but peaches fully mellow, and ready to eat, have been put in refrigerator cars in California, and, after a six days run to Chicago, have been reshipped by express to New York, reaching there in condition to bring good prices. Of course, to endure such severe tests, it is necessary to have the fruit very carefully assorted and packed. A very few specked peaches, or rotting strawberries, would spoil an entire package before reaching so distant a market. Good judgment, too, is necessary in picking fruit at the proper stage of maturity for refrigerator shipment. Of course it should not be too ripe, but the mistake is much more often made of picking it too green. In shipping by freight in open cars, it is often necessary to pick pretty green, but with most fruits this is done at great sacrifice of quality. Under refrigeration fully matured ripe fruit will keep better, than that which is grass green. This is an important point in favor of refrigeration; and one that many growers do not understand, for it enables fruit to be put on the market after its full flavor and quality has been developed. The flat, insipid quality, and lack of flavor so often noticed in California fruits on the eastern markets, comes very largely from the pernicious habit of green picking. A peach that is ripe enough to be fully mellow, is hard to handle without bruising; but they should hang on the tree till fully grown and colored. A peach that would be mellow, if left on the tree till to-morrow, is in just the right condition to pick to-day. Pears, on the other hand, should be picked green, at least ten days to two weeks before softening; and should be ripened in a close dark place. For this reason, they can be safely shipped in tight boxes or barrels in open cars, unless it is intended to place them in cold storage on arrival. In this case they should be shipped under refrigeration, to retard the ripening process as much as possible.

Refrigerator cars were first built for the meat trade. The meat was hung in cold storage houses; and was loaded into

the cars at, or near, the freezing point. In a tight, well built car such a cold load would warm up very slowly; and a small amount of ice served to carry it safely to its destination. When it was attempted to use these cars for fruit, the hot load, fresh from the fields, soon melted the limited ice supply; and the cars invariably arrived heated, and in bad order. To use these cars successfully, it was found necessary to build cooling houses at the shipping points, in which the fruit could be cooled off before loading, as in the case of the meat. This caused delay in getting the fruit on the market; and made much additional expense. It, however, demonstrated the success of refrigeration for the transportation of fruits; and soon cars were built especially for the fruit trade, with sufficient ice capacity to cool off a load of hot fruit in transit, and to keep it cool. At the present time there are a number of refrigerator car lines, with specially built fruit cars, that are actively competing for the fruit and vegetable carrying trade; so that any point, having sufficient business to offer, can secure efficient car service, with competent men to look after the proper loading and icing of the cars. Each line, of course, claims to have the best cars; and for difficult service there would certainly be considerable choice between them, but with the numerous re-icing stations that are now available, any of them will give satisfactory service, if properly loaded and handled.

The main points to consider in selecting a refrigerator car, for transporting produce, are first, its ice capacity, and second, its insulation. The ice tanks should hold at least five tons of ice, and six tons is even better. The position of the tanks, whether overhead or at the ends, is a question of minor importance. The car should be tightly built, with double walls and roof, with the space between them filled in with some non-conducting material, or by numerous linings of building paper, with dead air spaces between them. The doors should be built like the walls and be of the same thick-

ness; and they should fit as nearly air tight as possible. Of course the car should be sweet and clean.

It is usual for the refrigerator companies to furnish their own men for loading the cars, for proper loading is a point of so much importance, that they do not care to trust the reputation of their cars to inexperienced men. The important points to secure in loading are first, that the packages be so spaced, that the cold air has immediate access to all sides of them, and, second, that they be so secured, that the load cannot shift by the bumping of the cars while in transit. These points are usually secured by piling the crates, or other packages, one above another in tiers or ranks, from three to six inches apart; and with lath or strips between each layer. Strips are placed upright against the end of the car, and a row of packages is placed on the floor, with the ends set snugly against these strips, and carefully spaced. Light half inch strips, as long as the width of the car, are placed across the ends of the packages; and the front one is nailed down, with a light nail, to the head of each package to prevent side shifting. Another row of packages is placed on these strips, each one directly above one in the lower row. These are again stripped and nailed, and so on to the top. The next course is placed with the ends snugly against the ends of the first course, so that the air spaces are continuous. When the center of the car is reached, begin in the other end and load in the same way. A space will usually be left at the last, too narrow to admit another course of packages; and the car must now be braced, to prevent the courses from shifting endwise. Pieces of 1 x 6 in. board are set up against the ends of each rank of packages; and other strips are nailed across these uprights, near the bottom and the top of the car. The distance between these opposite cross-pieces is now carefully measured, and pieces of board are cut for braces about an inch longer than this space, so that they will have to be driven home with considerable force. The braces are toe-nailed in place, to pre-

vent their falling, if they should chance to loosen in the bumping of the car. When thus loaded and braced, the contents are absolutely immovable, yet each package is separated from its neighbors, on all sides, by a layer of cold air, which, when it becomes warmed by the hot fruit, rises, and is carried by the currents thus generated to the ice, where it is quickly cooled again, and where it deposits the moisture that may have been taken up from the fruit. This rapid circulation of the air is very important, and the ice, instead of making the fruit damp, as might at first be thought, really serves to dry it very effectually.

In conclusion, a few words in regard to commission merchants may not be out of place. As has been stated, nearly all fruits and vegetables from the South are consigned to dealers, who sell them on commission for the account of the shipper. The markets are so variable, and these perishable goods suffer such frequent losses in transit, that this system adds seriously to the other risks of the grower. It is usually advisable to sell at the shipping point whenever a good cash offer can be obtained, even if the price offered is something below current quotations. It is only occasionally that this can be done, and shipping on consignment is often a necessity.

The merchant now has the game so completely in his own hands that shippers are naturally suspicious; and, if poor returns are made, they are very likely to conclude that "commission men are all thieves." It is unfortunately true that dishonest men are found in this line of business, as in all others; and southern shippers have often been mercilessly swindled. It is equally true, however, that in every market of importance, there are as honorable men engaged in the produce commission business as can be found in any other line of trade; and it should be the first care of the shipper to post himself fully as to the character and reliability of the man who seeks his trade. Every shipper should investigate in advance of the shipping season, and decide on

one or two good houses in each of the markets he expects to use. He should correspond with these houses, posting them on the character and quality of his expected crops, and he should ship to them regularly throughout the season. In this way the dealer and his customers become acquainted with the quality of the goods, and, if they come regularly, it is often possible to sell them in advance of arrival. A dealer takes an interest in a regular shipper, and will look out for his interests. It is never good policy to ship to one man to-day, and another to-morrow, acting on the whim of the moment, or yielding to the persuasions of the last solicitor who asks for your shipments. It is equally bad policy to scatter a small shipment among half a dozen houses in the same market. Make your trade of some importance to the commission man, by sending good goods regularly, and it will be to his interest to see that you are given satisfaction. The men who abuse the commission men most are usually those who ship the poorest and most dishonestly packed goods.

Another point: keep your dealer posted, in advance, of the amount and character of your shipments; and of the total shipments that are going to his market from your locality. Insist on his keeping you posted as to his market, and on his making you prompt returns. Do not let him send you weekly or monthly statements, but demand account sales and check for each lot sent, on the day that it is sold. Do not be afraid to spend a few dollars in telegraphing. Send a night rate message notifying the dealer of the amount and quality of each shipment made him, and require a daily wire from each market you are using, giving quotations from actual sales. This will cost something, but no produce shipper can afford to consign his goods without this necessary information.