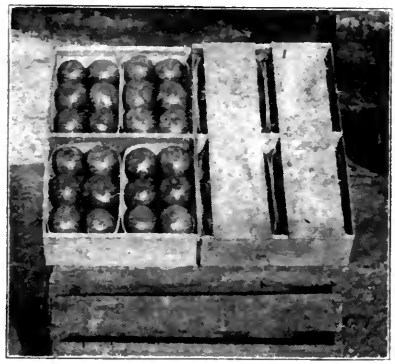
UNIVERSITY OF ILLINOIS

Agricultural Experiment Station

BULLETIN No. 144

GROWING TOMATOES FOR EARLY MARKET

By JOHN W. LLOYD and I. S. BROOKS



URBANA, ILLINOIS, FEBRUARY, 1910

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10. The results of five years' experiments in Union county show that the leaf spot of the tomato (Septoria lycopersici) can be controlled by spraying with Bordeaux mixture. Page 79

11. Tomatoes for shipment to distant markets should be picked before they are fully colored, but for local markets may be allowed to ripen on the vines. Page 83

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13. The standard package for tomatoes produced in southern Illinois is the four-basket crate. In the ideal pack each basket contains twelve tomatoes. Page 85

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GROWING TOMATOES FOR EARLY MARKET

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Tomatoes are grown by nearly every market gardener and in some localities the shipment of tomatoes to distant markets is an important industry. Early tomatoes usually bring much higher prices than late, and it is the early crop for which most gardeners strive. Several factors have a bearing upon the successful production of early tomatoes, and it is the purpose of this publication to consider somewhat in detail the methods employed by commercial growers in the production of this important crop, together with the results of certain experiments conducted by the Illinois Agricultural Experiment Station.

INFLUENCE OF CHARACTER OF PLANTS UPON YIELD OF TOMATOES

The size and character of the plants at the time of transplanting to the field have a marked influence on the yield of early tomatoes. The age of the plants and the conditions under which they have been grown determine their size and character. Plants ten or even twelve weeks old, that have made a slow, steady growth, and have been provided with sufficient room so that they have remained stocky, and have retained all their lower leaves in a vigorous and healthy condition, are capable of giving quick results provided they can be transplanted to the field without seriously disturbing their root systems. However, an old plant that has begun to stretch for light or to lose its lower leaves, or to turn yellow because of outgrowing its allotted space, is inferior to a younger and smaller plant occupying the same space. Within reasonable limits, then, the size and age at which plants are to be set will be determined largely by the amount of space they can be allowed while growing, and the provisions which can be made for transplanting them without disturbing the roots.

In order to secure some definite data regarding the influence of the age and character of the plants upon their yield of early fruits, some tests were made at Urbana in 1908 and 1909. In 1908 different lots of plants were grown as follows:

1. Seed sown in flat in greenhouse March 1. Seedlings potted up in 2½-inch pots March 21, and shifted to 4-inch pots April 10. Pots transferred to coldframe April 14.
2. Seed sown in 2½-inch pots in greenhouse March 1. Seedlings thinned early to one in a pot, and shifted to 4-inch pots April 11. Pots transferred to coldframe April 14. Plants shifted to 6-inch pots May 5.
3. Seed sown in flat in greenhouse, March 1. Seedlings pricked out into other flats, 3"x3". March 21, and set in soil of coldframe 6"x6" April 14.
4. Seed sown in hotbed April 1. Seedlings shifted to coldframe 3"x3' April 20.
5. Seed sown in coldframe April 20. Plants set in field without previous shifting.

Ten plants from each lot were set in the field May 16, when the oldest plants were approximately eleven weeks old. A hot, dry wind was blowing at the time the planting was done, and the plants grown without pots suffered considerably in the transplanting, while the pot-grown plants did not wilt in the least.

These five lots of plants, grown under different conditions until time of setting in the field, but set in the field the same day and given identical treatment thereafter, afforded an excellent opportunity of testing the influence of the early treatment and age of the plants upon the resulting crop. The following tabular statement gives the date the earliest fruit ripened in each plat, the date when the various plats averaged one ripe fruit per plant, and the yield of early fruit in pounds per plant. In this connection, "early fruit" means all marketable fruit which ripened previous to August 11. Up to that date, all the tomatoes suitable for market were sold to Champaign and Urbana grocers for $2.25 per bushel. After that date, local tomatoes became abundant and the price dropped rapidly to 50c per bushel, and remained at approximately that figure the rest of the season.

TABLE 1.—YIELDS OF EARLY TOMATOES FROM PLANTS GROWN UNDER DIFFERENT CONDITIONS, 1908

Lot	Treatment	First ripe fruit	Date ave. one ripe fruit per plant	Lb. early fruit per plant
1	Seeded Mar. 1 in flat; shifted to 2½" and 4" pots.....	July 15	July 24	4.12
2	Seeded Mar 1 in 2½" pots; shifted to 4" and 6" pots..... ..	July 11	July 21	5.91
3	Seeded Mar. 1 in flat; shifted to other flat; then coldframe 6" x 6".....	July 15	July 27	2.91
4	Seeded Apr. 1 in hotbed; shifted to coldframe 3" x 3".....	July 24	Aug. 5	1.65
5	Seeded Apr. 20 in coldframe; not shifted.....	Aug. 10	Aug. 14	25

These figures show that Lot 2 was plainly superior to all the others in every respect. How much of this superiority was due to the starting of the seeds in pots, so that the root systems of the plants were not disturbed in shifting as was the case with the seedlings started in the flat, and how much to the final shift to six-inch pots, was not determined. It is true, however, that the plants

FIG. 1. TOMATO PLANTS AT LEFT FROM SEED SOWN IN POTS (LOT 2); AT RIGHT, FROM SEED SOWN IN FLAT, AND SEEDLINGS SHIFTED (LOT 1). APRIL 24, 1908.

started in pots were larger at all stages of their development before setting in the field than those started in flats on the same date, and that after being set in the field they were the first to set fruit. The advantage of setting large plants of considerable age, is clearly shown by the markedly greater yields of early fruits from the plants started March 1 as compared with those started April 1 and 20.

That there is no advantage in retaining plants in the coldframe after the normal season for putting them in the field, even if they are given ample room in the frame, is illustrated by the performance of ten plants that were grown under the same conditions as those in Lot 1 up to the time the latter were set in the field, but were then shifted to 6-inch pots and held in the coldframe till June 1. These plants were in thrifty condition when placed in the field and suffered no apparent injury in the transplanting, but they were slow in coming into bearing, not ripening their first fruit until July 17, and producing only 1.79 lb. of fruit per plant before August 11.

In 1909, further tests were made, the first seed being sown earlier than in 1908, with a view to having large, well-developed plants ready for setting out at the earliest date the weather would permit. The various lots of plants were grown as follows:

1. Seed sown in flat in greenhouse February 13. Seedlings potted up in 3-inch pots March 13, shifted to 4-inch pots April 3, and to 6-inch pots April 19. Pots transferred to coldframe April 19. Plants set in field May 4. At the time of setting in the field these plants were large and well developed and not in the least pot-bound. A few were in bloom.

2. Grown the same as lot No. 1, but held in the coldframe until May 15, when they were set in the field. At the time of setting, these plants were rather tall and the foliage was lighter in color than it should have been owing to the long time the plants had been held in the coldframe. These plants were 13 weeks old when set in the field.

3. Seed sown in flat in greenhouse February 27. Seedlings potted up in 2½-inch pots March 23, shifted to 4-inch pots April 12 and to 6-inch pots April 24. Pots transferred to coldframe April 24. When set in the field, May 15, these plants were in ideal condition, being 8 to 10 inches tall and extremely stocky, with dark green foliage all the way to the bottom. Blossom buds were visible on every plant, but no blooms were open. Roots could be seen next to the pot but the plants were not in the least pot-bound.

4. Seeds sown in 2½-inch pots in greenhouse February 27. Seedlings thinned early to one in a pot, and shifted to 4-inch pots April 12; shifted to 6-inch pots April 24. Pots transferred to coldframe April 24. Set in field May 15. These plants did not make a good growth in the 2½-inch pots and were still small even when shifted to the 6-inch pots. The slow growth of these plants was directly opposite to the performance of those similarly grown in 1908, and was probably due to some difference in the soil used in the 2½-inch pots. Altho small when set in the field, as compared with plants of Lot 3, these plants were short, stocky and of good color.

5. Seed sown in flat in greenhouse February 27. Seedlings pricked out into another flat 3"x3", March 23. Plants set in soil of coldframe 4"x5", April 22. Set in field May 15. These plants were rather tall when placed in the coldframe and did not make a very satisfactory growth there. They should have been allowed more space. They were too tall and the foliage was rather light colored when they were set in the field.

6. Seed sown in flat in greenhouse February 27. Seedlings potted up in 2½-inch pots March 23, and shifted to 4-inch pots April 12. Pots transferred to coldframe April 24. Set in field May 15. These plants were treated the same as those of Lot 3 except that the final shift to 6-inch pots was omitted. When set in the field, they had begun to stretch for light, and were about 14 inches tall. The lower foliage was yellow and the roots were pot-bound.

7. Seed sown in flat in greenhouse March 27. Seedlings pricked out into another flat, 3"x3", April 16. Flat transferred to coldframe April 24. When set in the field, May 15, these plants were rather small, that is, about six inches tall, but were stocky and in good healthy condition. They were planted with the dirt adhering to the roots, and did not wilt in the least.

8. Seed sown in flat in greenhouse April 17. Flat transferred to coldframe as soon as seedlings were up. Plants set in field May 15 without previous shifting. They were at this time about three inches tall, and were just putting out the first pair of true leaves. Since they were set without dirt adhering to the roots, they wilted badly, even tho care was taken to prevent undue exposure during the planting. They were the only plants which wilted after being set in the field.

All plants were given identical treatment after being set in the field, except for the tillage received by the plants set May 4 before the others were transplanted. Any differences in earliness and yield, then, must have been due to differences in the plants caused by differences in age and methods of handling. The following tabular statement shows the date of ripening of the earliest fruit from each lot, the date at which each lot averaged one ripe fruit per plant, the yield of marketable fruit before August 1, and the yield up to August 12. The reason for making this division of the yield of early fruits is that up to August 1, the price of tomatoes on the local market was $2.40 per bushel, while from August 1 to 12 it averaged $1.40 per bushel. After that the price dropped to 60c, and did not reach above 80c at any time later in the season.

FIG. 2. TOMATO PLANT IN IDEAL CONDITION FOR SETTING IN FIELD. FROM LOT 1, AS SET, MAY 4, 1909.

TABLE 2.—YIELDS OF EARLY TOMATOES FROM PLANTS GROWN UNDER DIFFERENT CONDITIONS, 1909

Lot	Treatment	First ripe fruit	Date Ave. one ripe fruit per plant	Lb. per plant	
				Before Aug. 1	To Aug. 12
1	Seeded Feb. 13; shifted to 3", 4" and 6" pots. Set May 4.....	July 13	July 21	3.73	9.89
2	Seeded Feb. 13; shifted to 3", 4" and 6" pots. Set May 15 ...	July 13	July 17	2.05	6.41
3	Seeded Feb. 27; shifted to 2½", 4" and 6" pots. Set May 15	July 10	July 19	2.52	7.20
4	Seeded Feb. 27 in 2½" pots; shifted to 4" and 6" pots. Set May 15.....	July 15	July 23	2.50	7.46
5	Seeded Feb. 27 in flat; shifted to other flat, then coldframe. Set May 15.....	July 15	July 19	1.46	5.34
6	Seeded Feb. 27 in flat; shifted to 2½" and 4" pots. Set May 15	July 15	July 21	2.22	5.69
7	Seeded Mar. 27; shifted to 3" x 3". Set May 15.....	July 23	July 30	.96	5.37
8	Seeded Apr. 17. Not shifted. Set May 15.....	Aug. 7	Aug. 11	0.00	.79

This table shows that the early plants set May 4 did not ripen their first fruit any earlier than some of the other lots, but that they made by far the heaviest yield of early fruit. These plants were set before the normal season for planting tomatoes in this locality, and before it was really safe to set them, for altho the weather was warm and pleasant at the time they were set, a frost occurred a week later and caused slight injury to the plants. However, favorable weather followed, and the plants were evidently not seriously checked in their development. That holding the plants in the coldframe after they have reached the fullest development consistent with their allotted space seriously interferes with their production of early tomatoes is well shown by the record of Lot 2 as compared with Lot 1. This same point is further illustrated by the showing of Lot 6, held in 4-inch pots, as compared with Lot 3, in which plants of the same age had been shifted to 6-inch pots, so that they were not checked in their development previous to setting in the field. A comparison of Lots 2 and 3 also shows that the younger plants produced the better results by reason of being unchecked in growth previous to setting. Altho the plants of Lot 4, grown from seed sown directly in pots, were much smaller than those of Lot 6 at the time of setting in the field, and were a few days later in ripening their earliest fruits, the

yield of fruit before August 1 was approximately the same and the yield up to August 12 was greater for the plants started in pots. In fact, this lot produced the highest yield of early fruit of any of the lots set in the field on the same date. This corroborates the results obtained in 1908, tho the differences are not so striking.

The plants shifted from the flat to the soil of the coldframe (Lot 5) were no later in ripening their first fruit than two of the lots of pot-grown plants of the same age, but the yield before

FIG. 3. TOMATO PLANTS OF SAME AGE, IN SIX-INCH AND FOUR-INCH POTS, FROM LOTS 3 AND 6 RESPECTIVELY.

August 1 was considerably less. However, they had produced quite a satisfactory crop by August 12. As already explained, these plants did not grow very well in the coldframe, on account of being allowed to become too tall before being shifted to the frame and not being given sufficient room. Plants properly grown in the coldframe, and handled as carefully as these were in the transplanting to the field would probably have made a better showing. It is interesting to note that plants grown from seed planted a month later than this lot were only eight days later in ripening

the first fruit, and by August 12 had produced a slightly greater yield. The plants of this last lot (No. 7) were in excellent condition when set in the field, so that altho small and young, their more thrifty condition enabled them to overtake the older plants. This is another illustration of the fact that the condition of the plant may be more important than its age.

That the differences in the plants at the time of setting in the field influence chiefly the yields of early fruit and have comparatively little influence on the later yields is well illustrated by the performance later in the season of the plants under consideration. In 1908, the plants in the different lots, which had yielded all the way from .25 lb. to 5.91 lb. of early fruit per plant, produced very nearly the same amount of late fruit per plant, the lowest yield of late fruit being 8.51 lb. per plant and the highest, 9.66 lb. In 1909 the differences in yield of late fruit were somewhat greater, the yields varying from 7.77 lb. to 11.01 lb. per plant. Plants that had produced a heavy crop of early fruit continued to produce abundantly until killed by frost. Also plants that had produced only a light early crop on account of securing a late start, likewise produced heavily late in the season. This indicates that, as grown on the black prairie soils of Central Illinois, the tomato plant is capable of continuing in bearing until killed by frost, regardless of the time it begins. The production of a heavy crop early in the season does not impair its vigor enough to seriously affect the yield of late fruits. This means that all the extra early fruits a tomato plant can be made to produce are practically clear gain.

HOTBEDS

While the ideal method of growing tomato plants involves starting the seed in a greenhouse late in winter, most growers have not the advantage of greenhouse facilities, and are therefore obliged to resort to the use of hotbeds. These are of two types: the fire, and the manure, hotbed. The former type is better adapted to starting the plants in cold weather, but either type will answer for receiving the plants at the first shift.

CONSTRUCTION OF FIRE HOTBEDS

The essential features of a fire hotbed are a long sash-covered frame underlaid by two flues connected with a fire-pit at one end and chimneys at the other. An ideal location for the hotbed is a gradual slope to the south or east. Such a location insures full exposure to sunlight, protection from cold winds, good draft for the flues and drainage for the fire-pit. An area six feet wide and from 80 to 100 feet long is marked off in such a way that

one end of the bed will be a few feet higher than the other. A row of posts is set along each side of this area, those on the north or west side extending 18 inches above the level of the ground and those on the south or east side 12 inches. These posts must be set about 2½ feet deep to prevent their being heaved out by frost. The distance between the posts will depend upon the length of lumber to be used in making the frame. For 16-foot lumber, the posts should be placed 5 feet 4 inches apart.

After the posts are set, boards are nailed onto the inside of these rows of posts to make the walls of the bed. It is well to allow the boards to extend two inches above the tops of the posts, so that the latter will not interfere with the sash.

The dirt should be dug out from between the walls to within three inches of the posts on either side. At the upper end of the bed, it is dug out to a depth of six inches, the depth gradually increasing until the lower end of the bed is reached, where it is 2½ feet. The excavation is extended several feet beyond the

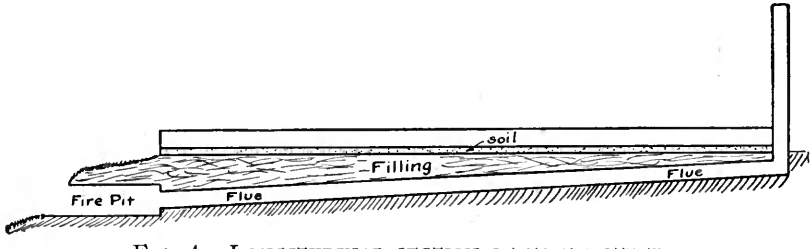

FIG. 4. LONGITUDINAL SECTION OF FIRE HOTBED.

lower end of the bed. This extension is made one foot narrower and 1½ feet deeper than the bed proper. Six feet of the upper part is to be used for the fire-pit, the lower part being dug out for convenience in firing. The sides of the pit are walled up with rock or brick to a height of two feet and covered with broad flat rocks well supported by iron bars, or the cover may be entirely of old boiler iron.

From each side of the back of the fire-pit, a trench twelve inches deep and nine inches wide is dug diagonally toward the side of the bed. When within four inches of the side of the excavation the direction is changed and the trench cut parallel with the side of the bed. These trenches are covered closely with flat stones to prevent dirt from filling them. The dirt which is first filled in over these stones is well packed to prevent smoke from going thru into the dirt of the bed. Thus, flues are made which conduct the heat and smoke under the bed to the chimneys at the upper end.

In localities where rock is not easily obtained, sewer tile 4 to 6 inches in diameter are sometimes used for flues in place of the rock-covered flues above described. In this case, it is unnecessary to excavate the full width of the bed, since the tile can be placed in the bottom of trenches dug to the proper depth.

Chimneys for the upper ends of the flues are made by nailing together four ten-inch boards. The board on the side toward the flue should be a foot shorter than the other three so as to allow an opening into the chimney.

As the flues are finished, most of the dirt which was dug out is shoveled back into the bed, filling it to the original level or perhaps two inches higher. Boards are nailed across the ends of

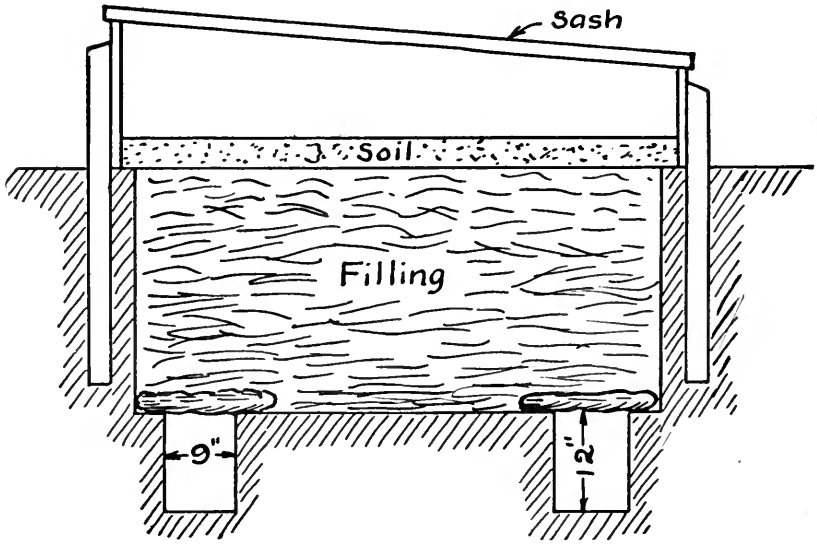

FIG. 5. CROSS-SECTION OF FIRE HOTBED.

the bed. The fire-pit is covered about two feet deep and the remainder of the dirt is banked against the outside of the walls of the bed. Additional dirt should be piled against the walls to bank them to the top, for the severe weather of February and March will make it necessary to protect the plants as much as possible.

To be in readiness for use in the spring the bed should be completed in the fall, and the soil put in for growing the plants. This should be about four inches deep. Soil rich in humus and relatively free from weed seeds is secured. This is usually enriched with well-rotted manure in the proportion of one load of manure to ten loads of soil. After the soil is put in, the bed is left open to the weather until late in December, when it is covered with sash to keep out rain and snow.

The sash are supported by cross-bars resting on the walls of the bed. Each cross-bar is made by nailing together two strips of wood, one of which is 1″x3″ and just long enough to fit loosely between the walls of the bed, and the other is 1″x2″ and as long as the sash, so that the ends may rest upon the sides of the bed. These supporting strips afford a base on which to slide the sash in opening the bed, and also insure good connections between adjoining sash.

Early in February, about a week before the seeds are to be planted, a fire is started in the pit in order to warm the soil in the bed and put it in condition for working. A hot fire is required for several days to get the bed into good condition at this time of the year, but after the soil has once become warm much less fuel is needed to keep up sufficient heat.

CONSTRUCTION OF MANURE HOTBEDS

When only a small number of plants is wanted, it is usually preferable to grow them in a manure hotbed, rather than go to the labor and expense of constructing a fire hotbed. A manure hotbed may be made very cheaply by placing a sash-covered frame on top of a flat pile of fermenting manure. However, such a bed is badly exposed to winds, and is less satisfactory in cold weather than a bed made by placing the frame above a pit containing the manure. The pit may be merely an excavation in the ground or may be walled up with plank or even brick, if a permanent bed is desired. The bed must be in a well drained location if the manure is placed in a pit; otherwise water would likely seep into the pit and interfere with the proper fermentation of the manure.

The preparation of manure for a hotbed should begin at least three weeks before the hotbed is to be used. Fresh horse manure from grain-fed animals should be placed in a compact pile. The manure should contain a fair amount of litter but should not be too strawy. If it is rather dry, it should be moistened with water as it is being piled. As soon as fermentation has become well started, the manure should be thoroly forked over and re-piled. Care should be taken to break up all lumps and place the coolest manure from the outside of the original pile in the midst of the new pile, to insure uniform fermentation of the entire mass. As soon as the whole pile is steaming, the manure may be placed in the pit, or in a flat pile eight feet wide if the bed is to be constructed entirely above ground. The manure should be thoroly tramped as it is being piled, and care taken to have it uniformly compact thruout the bed, so that it will not settle unevenly and let the soil sink away in spots after the bed is in operation. A good plan is to put the manure on in layers about six inches deep, and tramp

each layer thoroly before putting on the next. When the bed is completed, the manure should be about two feet deep. If a pit has been used, the manure should extend approximately to the level of the ground.

As soon as the manure has been placed in the bed, the frame and sash should be put on to protect the bed from rain or snow and help retain the heat. The soil in which the plants are to be grown may be placed in the bed at this time or a few days later, but in no case should seeds be sown or plants set until after the violent heat following the moving of the manure has somewhat subsided. Sometimes this violent heating does not become evident for three, four, or even more, days after the bed is made, and a person is inclined to think the bed is not going to heat. It would be a serious mistake to plant the bed at this juncture, for if the manure is of good quality and has been properly handled, the violent heating is sure to occur, and would kill any seeds or plants in the bed. Some persons favor putting in the soil wnen the bed is first made, for the sake of killing the weed seed in the soil by this violent heating. After the bed has heated up, and then cooled down to 85° F. the tomato seeds may safely be sown.

The hotbed frame should be twelve inches high in front and sixteen or eighteen inches high at the rear. It should be six feet wide, outside measure, and long enough to accommodate the number of sash required; or if a large amount of hotbed space is required, it is a common practice to make a series of beds of four sash each. Since a "3x6" sash is a little over three feet wide, the frame will need to be over twelve feet long to accommodate four sash. It is a good plan to measure the exact width of the four sash to be used, and cut the lumber for the frame accordingly. In making the back of the frame avoid having a crack near the top of the bed. If only a small amount of hotbed room is needed, a bed may be made with only two, or even one, sash. Unless the hotbed is of the permanent type, it is advisable to have the frame put together with screws, so that it may be taken down at the close of the season without splitting the lumber. The frame can then be stored in a small space until needed the next season. The accompanying diagram shows the arrangement of the different parts of such a frame made for two sash, together with enlarged views of the corners and joints.

With a hotbed frame made as indicated there will be room for four inches of soil in which to grow the plants, and still leave eight inches of space between the soil and sash at the front of the bed. A cross-section of a hotbed of the simplest and cheapest type, showing the location of manure, soil, and sash, is shown in Fig 7.

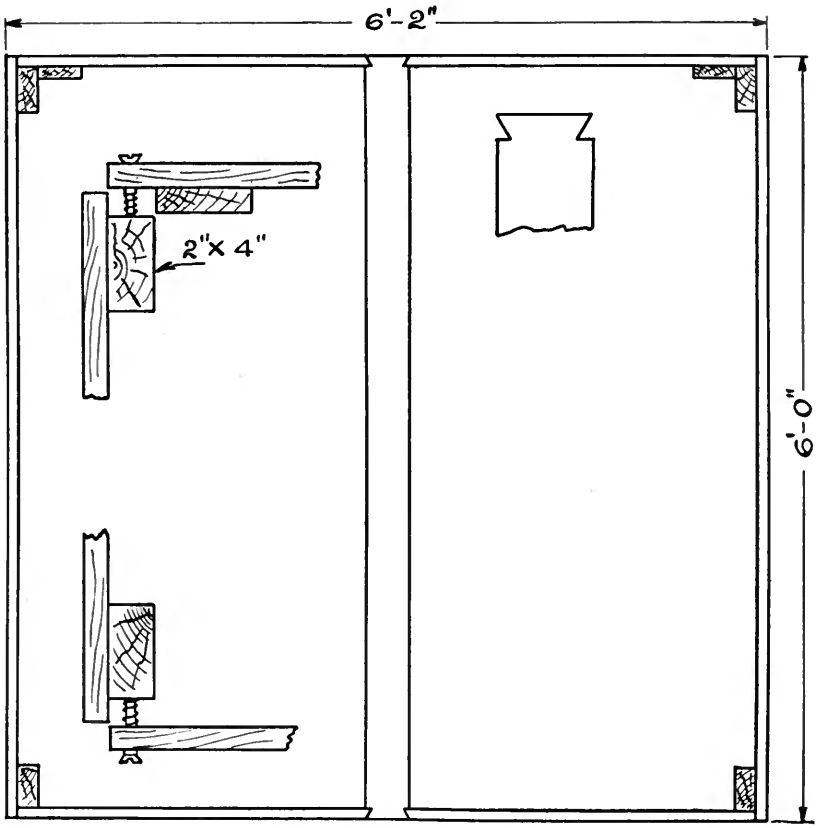

FIG. 6. DIAGRAM OF FRAME FOR MANURE HOTBED.

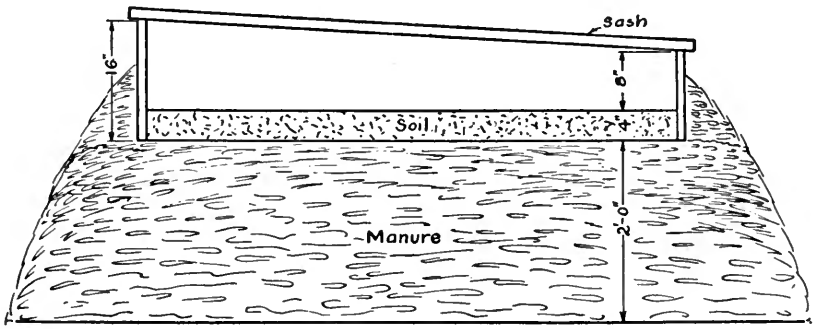

FIG. 7. CROSS-SECTION OF MANURE HOTBED.

PLANTING THE SEED

The method of preparing the soil in the bed and planting the seed is the same whether a fire hotbed or a manure hotbed is used. When the proper temperature has been secured, the soil is leveled off and worked down into a fine seed-bed. The time of planting the tomato seed will depend somewhat upon the latitude. In the extreme southern part of the state, the seed is sown from February 10 to 20. Farther north the planting is done from March 1 to 15. About four seeds to the inch are sown in rows three or four inches apart. Sown at these distances one ounce of seed will plant a little over two sash. One ounce of seed is usually planted for each acre of tomatoes to be set in the field, tho this allows for considerable loss and the rejection of all inferior plants.

CARE OF THE HOTBED

After the seeds have been planted, the hotbed should be closed, and a thermometer placed in each end. A temperature of as near 65° F. as possible should be maintained, tho no damage is done if for a short time the temperature becomes as low as 50° F. or as high as 90° F.

The plants come up about a week after the planting of the seed, and are allowed to grow in the seed-bed for two or three weeks, or until the second rough leaf appears. Usually no watering is necessary during this time, but the ground between the rows should be stirred once a week.

Fresh air must be let into the bed every day. This is done by sliding or slightly raising the sash. If the weather will permit, the bed is left slightly open for several hours in the middle of the day. When the weather is so cold and windy that the bed cannot be left open for any length of time it is opened a little for a few minutes two or three times during the day. The plants must not be chilled; still they should have all the air it is possible to give them, in order to prevent them from damping off and to make them grow stocky.

When the weather becomes unusually cold the plants must have more protection than is afforded by the glass. The moisture which collects on the under side of the glass should never be allowed to freeze. If freezing should occur the subsequent melting of the ice would cause ice-cold water to drip on the plants. Additional protection may be provided by spreading over the glass one or two thicknesses of canvass or several inches of straw. This additional covering should be removed as soon as practicable, for keeping out the light makes the plants grow long and slender.

In moderate weather sufficient heat can be kept in a fire hotbed if the firing is attended to at regular intervals three times a day. At times of severe weather, however, twice as much attention must be given to firing as when the weather is moderate. Wood is the fuel most commonly used, tho some fire-pits are equipped with a rude grate so that coal can be burned when wood is not available.

SHIFTING THE SEEDLINGS

When the plants are about three weeks old they must be shifted to give them more room. They are usually placed three inches apart each way, in another hotbed. This bed must be covered and the proper temperature secured before it is needed for the plants. In taking up the plants from the seed-bed, a flat stick or a trowel is used to lift them out, so as to avoid injury to the roots. The rows for resetting may be marked off by using a broad board an inch shorter than the bed is wide, to one side of which ¼-inch square strips have been nailed three inches apart each way. The side of the board on which the strips are nailed is placed upon the soil at the end of the bed, is pressed down firmly, then lifted back to where the next marks are to be made, and is used for the operator to stand upon while setting plants in the marks previously made.

The plants are usually set with a dibber or sharpened stick, and are placed into the ground up to the seed leaves. In shifting the small tender plants it is very important that care be taken to avoid injuring them by rough handling.

This first shifting of the plants is done early in March, so that severe weather often hinders the progress of the work, for plants must not be exposed to cold when taken from a warm hotbed. Sometimes a sort of tent is placed over the part of the bed to be set, when it is necessary to do the work in unfavorable weather.

The plants grown under one sash in the seed-bed will reset at least four sash, when only the largest, strongest plants are used.

After the plants are set, the management of the beds as to ventilation is essentially the same as for the seed-bed except that as the weather becomes warmer the plants should be exposed more and more. The heat of a manure hotbed will gradually subside and that of a fire hotbed should be gradually diminished. Toward the end of the period that the hotbed is needed, the fire is often allowed to die out entirely during the day, tho a small fire may be necessary at night. A little later the fire is discontinued entirely, so that the soil temperature will be normal before the plants are removed from the hotbed to the coldframe.

As soon as possible after the plants have been removed from the hotbed. 2″x4″ pieces should be nailed between the walls cross-

wise of the bed, at intervals of six feet, in order to prevent the walls from warping, so that the sash will fit the next season. The ends of the flues should also be stopped, to keep out rabbits and ground-hogs.

COLDFRAMES

Coldframes are frequently located permanently near the hotbeds. They are also built temporarily along the edge of the field in which the plants are to be set, or put near the middle of the field, then torn down and removed as soon as the plants have been taken out.

CONSTRUCTION OF COLDFRAMES

The construction of a coldframe is similar to that of a hotbed in some respects. The same width is desirable, but the frame may be any length. The walls are made the same except that the posts do not need to be set so deeply, and the back wall is a foot higher than the front. There is no digging to be done and no flues nor furnace to be built. In winter, stable manure is spread upon the strip where the coldframe is to be built, a load of manure to three rods. Early in spring a strip 5½ feet wide is plowed three or four times to mix the manure and earth, and is left in a ridge until needed for planting. The walls for the coldframe are put up along this ridge whenever time and weather permit. The outside of the walls are banked with earth by digging a trench around the coldframe. This also insures good drainage.

One inch below the top on the inside of the walls, blocks of wood 1″x2″x4″ are nailed at intervals of 4 feet. These are to support the ends of cross-bars of 1″x2″ stuff cut long enough to fit tightly crosswise of the bed between the walls for supporting the cover. For making the cover two widths of heavy, unbleached muslin are sewed together. One edge of this cover is nailed to the top of the upper wall, while the other edge is fastened to a roller made by nailing together two 1″x2″ strips of wood in such a way that the strips break joints and form a continuous roller as long as the bed, except in the case of unusually long beds, when the cover is made in sections for convenience in handling. The cover must be of such a width that when put over the coldframe the roller comes a little beyond the top of the lower wall. The weight of the roller then holds the cover in place.

SHIFTING PLANTS TO THE COLDFRAME

After the plants have been in the second hotbed for three or four weeks they are ready to be shifted into the coldframe. They should be shifted before they grow so large as to become crowded.

The soil of the coldframe is worked down into good condition and the plants set at distances of 6"x6". This gives sufficient room for growth until time for setting into the field. Set at these distances in the coldframe the plants for setting an acre in the field will require a coldframe about 90 feet long.

MANAGEMENT OF COLDFRAMES

By the time the plants are set in the coldframe, the season has advanced sufficiently to permit the frame to be left entirely open a large part of each day. However, there are frequently days when the plants must be kept protected from cold winds, and nights when even additional covering must be supplied. On warm windy days the cover may be kept open at the ends of the bed in order to admit air freely and still protect the plants from mechanical injury by the wind. The grower should be very cautious about leaving the cover off at night, for a sudden change in temperature, which is common at that season of the year, might do irreparable damage. When there is danger of a freeze, straw should be placed on the cover to a depth of 4 or 5 inches. Another cover is often placed on top of the straw. The plants will probably need some watering while in the coldframe, but only enough to prevent wilting and to keep them growing.

HARDENING-OFF THE PLANTS

Tomato plants that have been grown under the protection of a hotbed and coldframe are likely to suffer severely when transplanted to the field unless they have been gradually inured to outside conditions. To prepare the plants for withstanding the transfer to the field without suffering a sudden check in growth, they must be gradually accustomed to winds and night temperatures while they are still in the coldframe. Beginning about two weeks before the time for setting the plants in the field the frame is left uncovered later each evening and is adjusted so as to let in a little air even at night. Finally on pleasant nights the cover is left off entirely. The plants should be thus exposed for several nights before they are set in the field. This treatment causes them to make a slow, woody growth, so that they do not wilt badly when transplanted. It also prepares them to stand the ordinary night temperature in the field at the normal season for transplanting.

TRANSPLANTING TO THE FIELD

In Southern Illinois a few tomato plants are usually set in the field the latter part of April, but these nearly always suffer more

or less from cold weather early in May, and it is often a great deal of trouble to prevent their being killed by frost. About May 10 is the earliest date at which it is safe to set tomatoes even in Southern Illinois. The plants are at that time ten to twelve weeks old, and should be 8 to 10 inches high, with a stem somewhat larger than a lead pencil, and covered with dark green foliage. Flower buds will be numerous and some blossoms will probably be open.

The plants are usually set 4 by 5 feet apart, or 4½ by 4½ feet. At the first distance named, 2,178 plants are required to set an acre, and at the latter distance, 2,151 are required. Dwarf varieties may be set closer.

In preparing a field for tomatoes, the land is plowed early in the spring, and worked occasionally until time for planting. Im-

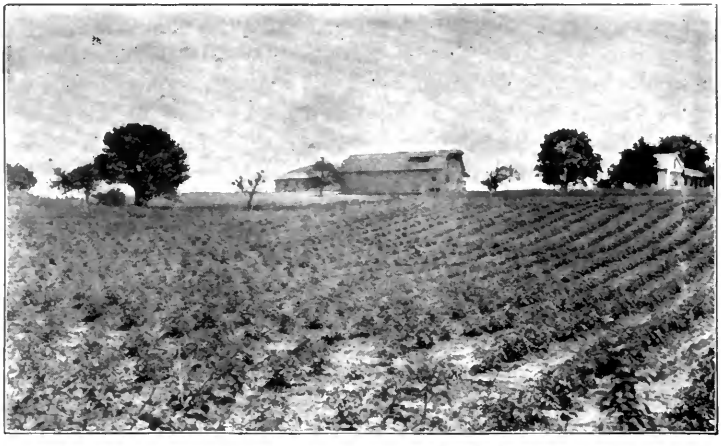

FIG. 8. FIELD OF EARLY TOMATOES, UNION COUNTY, ILLINOIS.

mediately before planting it is thoroly pulverized and furrowed out for the reception of the plants. Furrows are first made crosswise the field, with a one-horse turning plow or a single-shovel plow. Then when everything is in readiness to start the planting, the furrows are made in the other direction only as fast as needed, so that the plants may be set in freshly turned soil. If the plants are to be fertilized in the hill, the application is made at this time.

A few hours before the planting is to begin, the soil in the coldframe containing the plants should be saturated with water and should be kept wet as the planting proceeds.

The plants are removed from the coldframe by cutting around each plant with a spade, then pushing the spade under the cube of dirt containing the plant, and lifting it onto a wagon. Thus a

six-inch cube of dirt is taken up with each plant. The spade is unloaded by resting it upon the wagon and pushing the cube of dirt off with the hands. A low wagon with a long platform is very convenient for this work. Bolster springs are also of value at this time to lessen the jolting which tends to shake the dirt from the roots of the plants.

The plants are hauled to the field on the wagon and from it they are lifted by hand and placed in the furrows. Dirt is hilled up about the plants with hoes, that which is first drawn in being well firmed. The plants should be set deep enough to stand erect, and should be cultivated immediately after setting.

FERTILIZING

In addition to being large and healthy at the time of setting in the field, a tomato plant must be well supplied with plant food if it is to produce an abundant crop of early fruits. Some soils are rich enough to produce a good crop without the addition of fertilizing materials, but many soils on which tomatoes are grown commercially require the addition of plant food. Various materials are used and are applied sometimes broadcast and sometimes in the hill. For the purpose of securing information regarding the influence of different fertilizers and methods of application upon the yield of early tomatoes in Southern Illinois, experiments have been conducted in Union county the past four years.

The soil upon which the experiments were made was the typical clay soil of the region. Commercial growers in that locality do not attempt to grow tomatoes without adding fertilizer of some kind before setting the plants.

Plats consisting of 20 plants each (except in 1906, when there were 40 plants in each plat) were treated as follows:

Plat 14. Commercial fertilizer in hills
15. Manure in hills
16. Manure and steamed bone in hills
17. Manure and rock phosphate in hills
18. Check. No fertilizer or manure
19. Steamed bone in hills
20. Home-mixed fertilizer in hills
21. "Castoria" in hills
22. "Castoria" in hills, air-slaked lime broadcast
23. Home-mixed fertilizer broadcast
24. Manure broadcast
25. Manure and steamed bone broadcast
26. Manure and rock phosphate broadcast.

The commercial fertilizer applied to Plat 14, known locally as "Phosphate," was the brand of fertilizer used by most of the tomato growers of that locality. The guaranteed analysis of this

fertilizer was: Nitrogen, 1.64%; Phosphoric acid (available), 3.49%; Potassium, 5.81%. The same kind of manure was used both broadcast and in the hills, and in all cases was fairly well rotted. The "Castoria" applied to Plats 21 and 22 was castor bean pomace, a by-product of castor oil mills. The home-mixed fertilizer applied to Plats 20 and 23 consisted of 2 parts dried blood, 2 parts steamed bone meal and 1 part potassium sulfate.

With the exception of the manure, each material was used at the same rate whether applied broadcast or in the hills. In 1906, the commercial fertilizer, steamed bone, rock phosphate and home-mixed fertilizer were used at the rate of ¼ pound per plant, or 10 pounds per plat. The "Castoria" was used at double this rate, or ½ pound per plant. Fifty pounds of lime were used on Plat 22. Where manure was applied to the hills, about one-fourth scoop-shovelful was put in each hill. This amounted to a little over three tons per acre. The manure applied broadcast was used at the rate of about ten tons per acre, whether used alone or in combination with other materials.

In 1907, the various materials were applied at the same rate per plant as in 1906. In 1908, the quantities of all materials except the manure were doubled, but in 1909 they were again used at the same rate as in 1906 and 1907, with the exception of the lime which was used at the same rate as in 1908. The quantity of manure applied broadcast was reduced in 1909 to an amount equal to that applied in the hills.

The tests were made in a different field each year, on soil that had not recently been fertilized, so that there was no cumulative effect of the fertilizers as might have been the case if the tests had been made on the same plot of ground year after year. So far as these experiments are concerned, the effect of the fertilizers upon crop yields could appear only the year the applications were made, for the same land was not used twice during the experiments. This is in accordance with the usual method of fertilizing for truck crops. The fertilizer is applied for its benefit to the crop that one season, rather than for its ultimate effect upon the fertility of the land.

Each year, all plats were treated alike in reference to tillage and other care, so that any differences in yield or earliness would be attributable to differences in fertilizer treatment. The fruit was picked from three to four times per week, as is the practice in gathering the crop for shipment. Careful records were kept regarding the number and weight of fruits from each plat at each picking. The fruit was also sorted into marketable and unmarketable grades. The different fertilizer treatments did not materially influence the size or grade of the fruits. The yield and earliness, however, were influenced to considerable extent.

INFLUENCE OF FERTILIZER UPON EARLINESS OF RIPENING

The date when the first tomatoes were picked varied with the earliness or lateness of the season, from June 24 to July 10. About two weeks after picking begins there is usually a sudden drop in prices, for the price depends largely upon the supply. The yield of marketable tomatoes up to the time of this drop may be considered as the true index of the earliness of the crop. The yields during this period for each season, are given in Table 3. For the sake of uniformity, the yields are expressed in terms of pounds per plant.

TABLE 3.—YIELDS OF EARLY TOMATOES IN POUNDS OF MARKETABLE FRUIT PER PLANT

Plat	Treatment	1906	1907	1908	1909	Average
14	Commercial fertilizer in hills	.49	1.35	1.30	.33	.86
15	Manure in hills	.27	1.50	.68	.27	.68
16	Manure and bone in hills	.30	2.75	1.53	.22	1.20
17	Manure and rock phosphate in hills	.46	1.54	.73	.26	.74
18	Check. No fertilizer	.18	1.70	.34	.39	.65
19	Bone in hills	.26	2.09	1.63	.67	1.16
20	Home-mixed fertilizer in hills	.45	2.24	1.70	.66	1.26
21	"Castoria" in hills.	.18	1.78	1.36	.56	.97
22	"Castoria" in hills, lime broadcast	.36	2.14	1.10	.48	1.02
23	Home-mixed fertilizer broadcast	.95	2.20	2.25	.60	1.50
24	Manure broadcast	.12	1.93	.43	.46	.73
25	Manure and bone broadcast	.26	1.93	1.48	.43	1.02
26	Manure and rock phosphate broadcast	.15	1.75	1.35	.35	.90

These figures show that the highest average yield of this extra early fruit was produced by the home-mixed fertilizer applied broadcast, and that the second highest average yield was produced by the same material used in the hills. Manure used alone either broadcast or in the hills produced but slightly better results on the average than were secured where no treatment whatever was given. However, where steamed bone was used with the manure, the average yields were much better. Used alone in the hills, the bone gave almost as good results as the combination of bone and manure in the hills, and better results than this material applied broadcast. "Castoria" in the hills with lime applied broadcast, gave the same average yield as manure and bone broadcast. The commercial fertilizer commonly used in the locality did not produce nearly so good average yields of these extra early tomatoes as did the home-mixed fertilizer, or the bone either alone or in combination with manure.

INFLUENCE OF FERTILIZER UPON TOTAL YIELD OF MARKETABLE TOMATOES

The yields for the entire shipping season are given in Table 4. In most cases these yields do not represent the actual total yields of the plants, for under normal conditions the plants continue bearing long after the close of the shipping season. The shipping season for tomatoes in Southern Illinois is determined by market conditions rather than the condition of the plants, so that altho the figures given below do not represent the actual yields, they do represent the total yields from a commercial standpoint. Only tomatoes suitable for shipment, produced during the normal shipping season, are considered in this table. Again the yields are expressed in terms of pounds per plant.

TABLE 4.—TOTAL YIELDS OF MARKETABLE TOMATOES IN POUNDS PER PLANT

Plat	Treatment	1906	1907	1908	1909	Average
14	Commercial fertilizer in hills	2.27	4.95	3.71	2.62	3.38
15	Manure in hills	2.40	4.24	3.71	1.75	3.02
16	Manure and bone in hills	1.08	6.43	3.72	1.87	3.27
17	Manure and rock phosphate in hills	3.20	4.94	3.83	1.63	3.40
18	Check. No fertilizer	.50	5.16	3.32	1.77	2.68
19	Bone in hills	.64	5.82	3.46	2.84	3.19
20	Home-mixed fertilizer in hills	2.63	6.11	4.10	2.79	3.90
21	"Castoria" in hills	2.92	5.81	3.67	2.39	3.69
22	"Castoria" in hills and lime broadcast	1.84	6.47	4.25	2.89	3.86
23	Home-mixed fertilizer broadcast	1.86	6.55	4.24	2.67	3.83
24	Manure broadcast	1.00	6.15	3.79	1.70	3.16
25	Manure and bone broadcast	1.12	5.70	5.38	1.89	3.52
26	Manure and rock phosphate broadcast	1.10	6.49	5.68	1.63	3.72

These figures show that in average total yield of marketable tomatoes all the fertilizer treatments showed a decided increase over the yield of the check plat which received no fertilizer, even though in some years some of the treatments seemed to decrease the yield. The home-mixed fertilizer applied to the hills produced the highest average yield, and the yield from the same material applied broadcast was only slightly less. The only other treatment that gave an average yield as good as either of these was "Castoria" in the hills in conjunction with lime applied broadcast. The benefit of the lime was shown by the greater yield from this treatment than from the use of "Castoria" alone. Whether or not lime would have had a similar effect if used in connection with the other fertilizers was not determined.

It is worthy of special notice that some of the fertilizer treatments which did not produce good yields of extra early fruits gave relatively high total yields during the shipping season. This is true of the manure and rock phosphate, especially when applied broadcast, tho when used in the hills it also made a much better showing for the whole season than for the early part of the sea-

son. On the other hand, the influence of the bone, whether used alone or with manure, was much less marked on total yields than on early yields.

In regard to the influence of the method of application of the fertilizer upon the yields, there seems to be no uniformity from year to year. However, if the average yields are considered, the results seem to indicate an advantage in favor of the broadcast applications, tho it is true that in the case of manure alone or in combination, larger quantities were used broadcast than in the hills, except the last year, so that the increase may have been due to the difference in quantity rather than the difference in method of application. This interpretation of the results is supported by the fact that when equal quantities were used (in 1909) the yields were practically the same for both methods of application. With the home-mixed fertilizer, the same quantities were used in both methods of application thruout the experiment, and there was little difference in the average total yields, tho the broadcast application gave decidedly the better average early yields. This striking difference in average early yields is due quite largely to the marked difference in yields the year large quantities of the fertilizer were used.

The poorest average yield for any of the fertilizer treatments was produced by the manure applied to the hills, and the next poorest by the same material applied broadcast. Thus the manure gave the poorest results in reference to both early yields and total yields. This indicates that, under the conditions of these experiments, the application of manure alone, immediately before planting tomatoes, is not conducive to the production of early or large yields, and suggests that if manure is employed for tomatoes it might better be applied to the preceding crop. On other soils the results might be entirely different, and it is true that enormous yields of tomatoes are sometimes produced on rich garden soils that have been heavily manured every year thru a series of years.

On the whole, it may be said that, under the conditions of these experiments, the home-mixed fertilizer seems most capable of producing consistent yields of both early and late fruits, and that, so far as yields are concerned, there seems to be little choice between the two methods of applying this material, except where excessive quantities are to be used. In this case, broadcasting would be preferable to applying the fertilizer in the hills. The convenience of making the application should also be considered. If fertilizer is applied to the hills, the work must be done by hand, after the land is furrowed out and before the plants are set. The fertilizer is usually scattered over about a square foot of space in the bottom of the furrow, and the block of soil containing the plant is placed in immediate contact with the fertilizer. In making broadcast applications, the material may be applied either by hand or with a

drill, and then mixed with the soil by the disking and harrowing employed preparatory to furrowing out the land for the reception of the plants.

In the above discussion regarding the relative merits of the different fertilizer treatments, only absolute yields have been considered, and no reference has been made to the relative cost of the increased yields due to the use of the different fertilizers. For the sake of comparing the different treatments on this basis, Table 5 is introduced. In this table, all figures are given on the acre basis, and represent the averages for the four years. The average increase in yield for each plat over the yield of the check plat is given in column 1. These yields are expressed in crates per acre. Column 2 gives the average cost of each fertilizer treatment per acre. Column 3 gives the average cost per crate of increase, and is derived by dividing the cost of the fertilizer treatment per acre by the number of crates increase. The figures in column 4 represent the relative net profits per acre from the use of the fertilizer. For the sake of this comparison, an arbitrary value of 40 cents per crate for the tomatoes has been assumed. This figure was chosen because it is an approximate average price for early tomatoes from Southern Illinois, but any other price could have been used and the net profits would have stood in the same relation to each other. The figures in column 4 were derived by subtracting the cost per crate of increase from the value per crate and multiplying the remainder (which represents the profit per crate) by the number of crates increase. The figures in this last column, then, represent the profit from the use of the fertilizer—not the net profit from the entire crop, for the average yield from the check plat was 326 crates per acre, and the figures given in column 1 represent the number of crates increase over the yield of the check plat due to the fertilizer treatment.

TABLE 5.—PROFITS PER ACRE, DUE TO THE USE OF FERTILIZER

Plat	Treatment	Ave. number of crates increase over check	Average cost of fertilizer	Average cost per crate increase	Net profit
14	Commercial fertilizer in hills	74	$ 8.91	$ .120	$20.72
15	Manure in hills	30	5.51	.183	6.51
16	Manure and bone in hills	72	15.50	.215	13.32
17	Manure and rock phosphate in hills	89	8.31	.093	27.32
18	Check. No fertilizer	0	0	0	0
19	Bone in hills	48	9.98	.208	9.22
20	Home-mixed fertilizer in hills	139	15.76	.113	39.89
21	"Castoria" in hills	114	14.26	.125	31.35
22	"Castoria" in hills and lime broadcast	136	35.65	.262	18.77
23	Home-mixed fertilizer broadcast	133	15.76	.118	37.51
24	Manure broadcast	58	12.45	.214	10.79
25	Manure and bone broadcast	94	24.93	.265	12.69
26	Manure and rock phosphate broadcast	122	15.30	.125	33.55

Column 4 in the above table gives a comparison of the profits based not only on the increase in yield but also on the cost of the increase. Some treatments which gave comparatively small increase did so at such a small cost per crate that the net profits rank fairly well. Such a result is illustrated by Plat 17. Other treatments gave a large increase, but at such an expense per crate that the net profits are comparatively low. A marked example of such a treatment is shown by Plat 22. The treatments applied to Plats 21 and 26, respectively, gave large increases at a moderate cost per crate, and so gave good net returns. The treatments applied to Plats 20 and 23 gave even greater yields than Plats 21 and 26, and at a lower cost per unit of increase. Thus, the net profits as shown in column 4 are markedly above those for any other treatment. The initial cost of the fertilizer given Plats 20 and 23 as shown in column 2, was more than that for most of the other treatments. Nevertheless the net profits, which are the real basis for comparison, show clearly that the home-mixed fertilizer was the most profitable treatment used.

PRUNING AND TRAINING

Experiments in the pruning and training of tomatoes have been conducted in Union county and also at Urbana. In Union county the conditions under which these tests were made were the same as for the fertilizer experiments excepting that all the plats in the pruning and training experiment were fertilized alike. At Urbana the plants were grown without the use of fertilizer of any kind. The different methods of pruning and training employed were as follows:

Plat 7. Pruned to single stems and topped after setting three clusters of fruit
8. Pruned to single stems; not topped
9. Pruned to single stems early in the season, then allowed to branch
10. Pruned to two stems
11. Pruned to three stems
12. Tied to stakes, but not pruned
13. Neither staked nor pruned.

In the pruning, the branches to be removed were cut close to the main stem, care being taken to avoid injuring the leaf below the branch. The branches were removed while small. The training consisted in tying the plants to stakes. All plats except No. 13 were treated alike in this respect. A stake 1½ to 2 inches square and about five feet long was driven into the ground close to each plant. To this the plant was tied with soft twine. The first tying was done when the plants were about 18 inches high and before they fell over of their own weight. Three tyings in a season were

usually sufficient to keep the plants properly supported, tho sometimes four tyings were necessary.

FIG. 9. TOMATO PLANT PRUNED TO A SINGLE STEM.

FIG. 10. TOMATO PLANT SUPPORTED BY A SINGLE STAKE.

INFLUENCE OF PRUNING UPON EARLINESS OF RIPENING

The date of ripening of the first specimen of marketable fruit on each plat for each season is given in Table 6 for the Union county experiment and in Table 7 for the tests at Urbana.

TABLE 6.—DATE OF RIPENING OF FIRST MARKETABLE TOMATO FROM EACH PLAT, UNION COUNTY

Plat	Treatment	1906	1907	1908	1909
7	Pruned to single stem; topped.....	July 7	July 13	July 4	June 24
8	Pruned to single stem; not topped...	" 7	" 13	" 8	" 28
9	Pruned to single stem early; then branched	" 7	" 13	" 8	" 28
10	Pruned to two stems.....	" 7	" 20	" 4	" 26
11	Pruned to three stems.....	" 7	" 10	" 8	" 30
12	Staked but not pruned.....	" 7	" 10	" 4	" 26
13	Neither staked nor pruned.....	" 18	" 17	" 8	" 26

TABLE 7.—DATE OF RIPENING OF FIRST MARKETABLE TOMATO FROM EACH PLAT, URBANA

Plat	Treatment	1907	1908	1909
7	Pruned to single stem; topped	July 30	July 21	June 28
8	Pruned to single stem; not topped	" 30	" 11	July 2
9	Pruned to single stem early; then branched	Aug. 8	" 11	" 10
10	Pruned to two stems	" 2	" 11	" 13
11	Pruned to three stems	" 2	" 11	" 10
12	Staked but not pruned	July 30	" 15	" 15
13	Neither staked nor pruned	" 27	" 15	" 15

These tables show that the plants pruned to single stems sometimes ripened their first specimen earlier than the unpruned plants, but that in other cases the reverse was true. In general there was no uniform relation between the severity of the pruning and the date of ripening of the earliest fruit.

A truer basis of comparison between the different plats is that already used in comparing the different plats in the fertilizer experiment; namely, the amount of early fruit produced while prices were high. The yields of early tomatoes determined on this basis are given in the following tables:

TABLE 8.—YIELDS OF EARLY TOMATOES IN POUNDS MARKETABLE FRUIT PER PLANT, UNION COUNTY

Plat	Treatment	1906	1907	1908	1909	Average
7	Pruned to single stem; topped	.64	.66	.65	.41	.59
8	Pruned to single stem; not topped	.63	1.00	.70	.38	.67
9	Pruned to single stem early; then branched	.69	.99	.64	.59	.72
10	Pruned to two stems	.90	.73	1.34	.40	.84
11	Pruned to three stems	.50	1.73	1.13	.56	.98
12	Staked but not pruned	.49	1.50	1.33	.41	.94
13	Neither staked nor pruned	.07	1.31	1.29	.33	.79

TABLE 9.—YIELDS OF EARLY TOMATOES IN POUNDS MARKETABLE FRUIT PER PLANT, URBANA

Plat	Treatment	1907	1908	1909	Average
7	Pruned to single stem; topped	.93	2 20	2 53	1.88
8	Pruned to single stem; not topped	1.26	2.02	2.85	2.04
9	Pruned to single stem early; then branched	1.05	2.72	5.10	2.95
10	Pruned to two stems	1.22	3.85	5 07	3.38
11	Pruned to three stems	1.37	4.63	5.80	3.93
12	Staked but not pruned	1.19	4.75	8.51	4.81
13	Neither staked nor pruned	1.30	5.75	8.36	5.13

These tables show that in every instance the plants pruned to single stems produced low yields of early tomatoes, and that, on the average, these yields were much lower than those from plants less severely pruned or left unpruned. In Union county the plants pruned to three stems gave slightly higher yields, on the average, than those not pruned. At Urbana, however, the plants not pruned, showed a decided increase in average yield over all others. Another difference in the yields of early tomatoes, also apparently due to differences in local conditions, was that in every instance the plants which were staked but not pruned yielded in Union county more than those not staked, while at Urbana, the unstaked plants gave the higher average yields.

EFFECT OF PRUNING AND TRAINING ON TOTAL YIELD OF MARKETABLE FRUIT

When the total yields of marketable fruit are considered, the differences due to different treatment in reference to pruning and training are even more marked than when only the early fruit was considered. The yields for the Union county experiment are given in Table 10, and include only salable tomatoes which ripened before the close of the shipping season, since these represent the entire product which could be marketed.

TABLE 10.—TOTAL YIELDS OF MARKETABLE TOMATOES IN POUNDS PER PLANT, UNION COUNTY

Plat	Treatment	1906	1907	1908	1909	Average
7	Pruned to single stem; topped	1.20	1.10	1.14	.88	1.08
8	Pruned to single stem; not topped	1.95	2.49	1.78	1.08	1.82
9	Pruned to single stem early; then branched	3.20	3.84	2.87	1.50	2.85
10	Pruned to two stems	2.26	1.90	3.66	1.45	2.31
11	Pruned to three stems	1.07	3.16	3.58	2.06	2.46
12	Staked but not pruned	2.27	4.47	4.58	2.20	3.38
13	Neither staked nor pruned	.94	4.05	3.00	2.20	2.62

The total yields at Urbana are given in Table 11. These yields include all salable tomatoes which ripened before frost. The late fruit was in demand at fair prices on the local market. In addition to producing a good crop of early fruits, the plants remained healthy and continued to bear heavily during the early autumn. Thus the yields were much greater than those obtained during the shipping season in the southern part of the state.

TABLE 11.—TOTAL YIELDS OF MARKETABLE TOMATOES IN POUNDS PER PLANT, URBANA

Plat	Treatment	1907	1908	1909	Average
7	Pruned to single stem; topped	4.52	4.66	3.21	4.13
8	Pruned to single stem; not topped	7.79	5.56	6.28	6.54
9	Pruned to single stem early; then branched	11.63	13.42	15.87	13.64
10	Pruned to two stems	12.43	9.63	9.47	10.51
11	Pruned to three stems	13.60	10.32	12.51	12.14
12	Staked but not pruned	14.34	16.08	19.06	16.49
13	Neither staked nor pruned	16.12	21.57	21.32	19.67

These tables show that the plants pruned to single stems were comparatively low in total yields, as they were in early yields. In general the pruning reduced the total yields somewhat in proportion to its severity. Special attention should be called to the plants pruned early to single stems and then allowed to branch. The plants were pruned only once or twice and soon outgrew the effects of the early pruning so that at the end of the season they had practically as many branches as the unpruned plants, and ranked well in total yield.

The tables show further that the plants which were staked but not pruned gave in Union county, larger yields than those which were allowed to grow naturally upon the ground, while at Urbana the results were the reverse. These results correspond to those in reference to early yields already noted, and demand explanation. It will be remembered that the yields reported in the tables represent only the marketable fruit. In Union county the proportion of the crop which could be graded as marketable was much greater for the plants which were staked but not pruned than for those which were not staked; while at Urbana the proportion of marketable fruits was approximately the same for plants under both treatments. This is plainly shown by Table 12.

TABLE 12.—PERCENTAGE OF MARKETABLE TOMATOES

Plat	Place	Treatment	1906	1907	1908	1909	Average
12	Union Co.	Staked but not pruned	55.60	46.55	77.69	35.55	53.84
13	"	Neither staked nor pruned	39.80	30.23	61.45	35.24	41.68
12	Urbana	Staked but not pruned		71.70	73.10	69.89	71.56
13	"	Neither staked nor pruned		70.38	76.50	68.86	71.91

The cause of the greater percentage of culls on the unstaked plants in Union county was the rotting of the fruit in contact with the ground in wet weather, and the injury by sunburning of the fruits unprotected by the foliage in hot weather. An untrained plant affords much less protection to its fruits from the sun than

does a trained plant. At Urbana, there was much less injury from both these causes than in Union county, owing to the differences in rainfall and intensity of heat. This at least partially accounts for the differences in results of these treatments at the two places.

EFFECT OF PRUNING ON SIZE OF TOMATOES

Pruning is often recommended as a means of increasing the size of tomatoes, and single stem pruning urged especially for the production of large fruits early in the season. For the purpose of securing data regarding the effect of pruning upon the size of the fruits the tomatoes from the plants in the pruning experiment in 1907, 1908 and 1909, were counted as well as weighed, so that the average weight of the specimens from each plat could be determined. The average weights of the fruits classed as early tomatoes from the various plats, are given in Tables 13 and 14. In calculating these averages, all fruits, both marketable fruits and culls, have been included. The weights are expressed in pounds.

TABLE 13.—AVERAGE WEIGHT OF EARLY TOMATOES PER FRUIT, UNION COUNTY

Plat	Treatment	1907	1908	1909	Average
7	Pruned to single stem; topped	.235	.291	.273	.266
8	Pruned to single stem; not topped	.270	.306	.284	.286
9	Pruned to single stem early; then branched	.265	.332	.303	.300
10	Pruned to two stems	.281	.335	.288	.301
11	Pruned to three stems	.281	.329	.269	.293
12	Staked but not pruned	.226	.337	.255	.272
13	Neither staked nor pruned	.195	.303	.279	.259

TABLE 14.—AVERAGE WEIGHT OF EARLY TOMATOES PER FRUIT, URBANA

Plat	Treatment	1907	1908	1909	Average
7	Pruned to single stem; topped	.451	.410	.382	.414
8	Pruned to single stem; not topped	.438	.418	.363	.406
9	Pruned to single stem early; then branched	.414	.434	.376	.408
10	Pruned to two stems	.444	.372	.382	.402
11	Pruned to three stems	.380	.418	.435	.411
12	Staked but not pruned	.359	.432	.348	.379
13	Neither staked nor pruned	.394	.410	.399	.401

The average weights of the early fruits are used for this comparison rather than the average weights for the total crop, because the most severely pruned plants produced only lightly after the ripening of the early fruits, and it seemed advisable to compare the size of fruits produced at the same time.

In both localities the pruning had but slight effect upon the size of the fruit and in only one case did the plants pruned to single stems produce the largest fruits. Pruning to single stems not only failed to increase the size of the early fruits, but also reduced the foliage to such an extent that the fruit was badly exposed. Sunburning and cracking of the fruit followed. The excessive cracking of fruits on single stem plants, especially those which were topped, was one of the most striking features of the experiment.

Since pruning to single stems reduces the yield of both early and late fruit, exposes the fruits to sunscald and cracking, and does not materially increase their size, it is not to be recommended. Less severe pruning, tho less detrimental to the plants, and in some cases apparently increasing the yield over that of unpruned plants, does not give results warranting its practice. The pruning of tomatoes adds considerably to the expense of their culture, and under the conditions of the experiments reported, such expense is unwarranted.

Whether or not tomatoes should be staked and tied, or allowed to lie naturally upon the ground, seems to depend upon local conditions. In localities where tomatoes are subject to rot and sun-

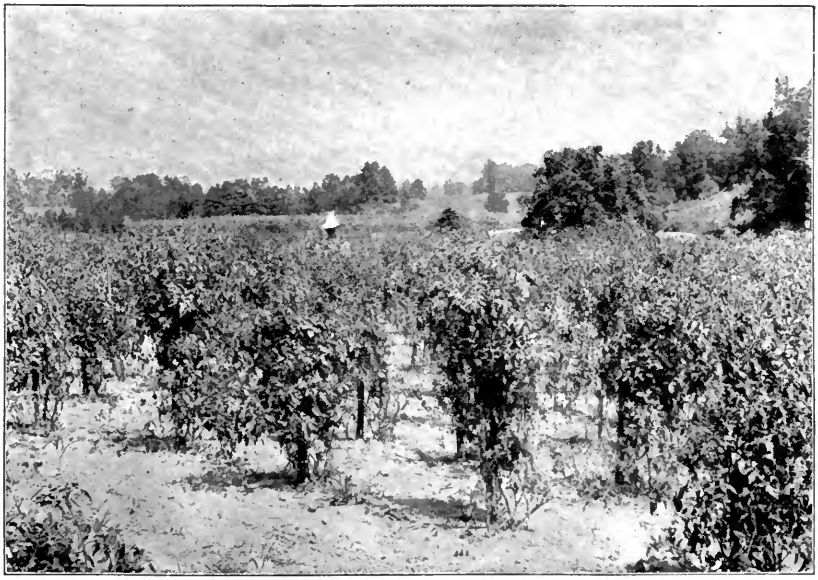

FIG. 11. FIELD OF TOMATOES TRAINED ON STAKES.

scald it is a decided advantage to have them upon stakes. Also where the season is likely to be dry, the tomato crop is under better control if trained on stakes, for cultivation can then be continued as late as desired. This would be impossible with untrained plants, for they fall to the ground from the weight of their fruit. The fruit from trained plants is also held up from the ground so that it is not spattered with mud in times of rain, and therefore requires less wiping in preparation for market. Under the conditions existing in Union county, it would seem advisable to practice staking and tying, while at Urbana the crop seems to succeed fully as well without training. However, in exceptionally wet seasons, staking might be an advantage even in localities where conditions are similar to those at Urbana.

Another factor which should be considered is the difference in cost of training tomatoes in different localities. The cost is considerably greater in a prairie region like that in the vicinity of Urbana, where the stakes must be purchased at the lumber yard, than in regions where native timber is abundant.

SPRAYING FOR THE CONTROL OF LEAF SPOT

While the tomato is subject to attack by several fungous diseases, the one most prevalent and widely distributed in this state is the leaf spot (*Septoria lycopersici*) often called the "rust." This disease is especially destructive in the southern part of the state. Its presence may be recognized by the appearance of small, circular, brown spots upon the lower leaves. The infection gradually progresses upward on the plant, the leaves dying in the order of their infection, as the season advances. In cases of severe attack, the leaves die more rapidly than new foliage is formed, and the plants become so weakened that they cease to produce marketable fruit. On untrained plants bereft of their lower leaves the fruit is very likely to sunburn.

On account of the prevalence of this disease and its economic importance to commercial growers in Southern Illinois, experiments were undertaken in Union county to determine the value of spraying as a means of control. These experiments have been continued for five successive seasons. In all the spraying the standard 4-4-50 Bordeaux mixture was the material used. When tomato worms appeared, Paris green was added to the mixture. Each year, the various plats in the experiment were sprayed as follows:

Plat 1. Sprayed at intervals of two weeks thruout the season, beginning after the plants were set and continuing until the shipping season was over

2. Sprayed every two weeks until the shipping season began

3. Sprayed every four weeks thruout the season
4. Sprayed every two weeks until the plants were staked
5. Sprayed every two weeks, beginning after the plants became badly infected with leaf spot, and continuing until the close of the shipping season
6. Check. Not sprayed.

METHOD OF SPRAYING

The spraying was done with a barrel hand pump and double vermorel nozzle. Some seasons the plats were arranged in a long narrow strip so that a wagon could be driven along each side and the spraying done with the aid of a long hose and bamboo pole. To do spraying in this way on a commercial scale it would be necessary to leave driveways thru the field every sixty or seventy feet. To spray without having these driveways, the spray barrel may be mounted on a low, one-horse cart with an axle short enough to go between two adjoining rows of tomatoes. Such a cart was used for the experimental work in 1905 and 1906. With this arrangement ten or fifteen feet of hose are sufficient and a short spray pole is more convenient than a long one. This method of spraying is adapted only to staked tomatoes, while the other may be employed for tomatoes either staked or unstaked. In both methods two men are required to do the work, one to drive and pump and the other to hold the nozzle.

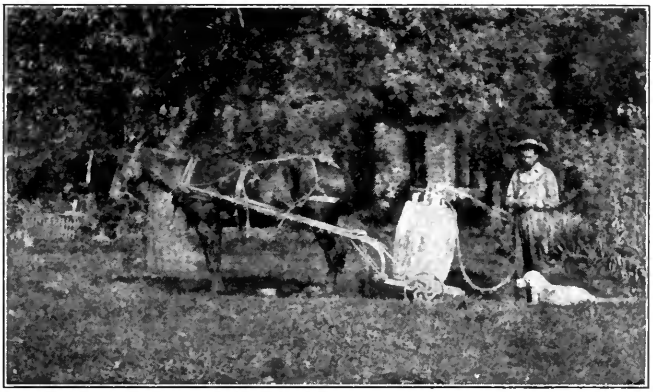

FIG. 12. SPRAY CART USED IN SPRAYING TOMATOES.

The date of the first application varied in the different seasons from May 16 to June 12. Usually the disease had appeared in the plantation before the first application was made, and in 1908 the infection was so bad that treatment to Plat 5 was begun at the time of the second application to Plat 1. In other years the infec-

tion did not become bad until somewhat later. The number of applications given each plat each year is shown in Table 15.

TABLE 15.—NUMBER OF APPLICATIONS OF SPRAYING MATERIAL

Plat	Treatment	1905	1906	1907	1908	1909
1	Sprayed every two weeks.	6	5	6	6	6
2	Sprayed every two weeks until shipping began	3	3	3	3	3
3	Sprayed every four weeks.	4	3	3	3	3
4	Sprayed every two weeks until staked.	1	1	1	2	2
5	Sprayed every two weeks after badly infected	4	3	1	5	3
6	Check. Not sprayed	0	0	0	0	0

Thus the plants sprayed every two weeks thruout the season usually received six applications; those sprayed until the be-

FIG. 13. SPRAYED TOMATO PLANT, FROM PLAT 1, AUGUST 9, 1909.

FIG. 14. UNSPRAYED TOMATO PLANT, FROM PLAT 6, AUGUST 9, 1909.

ginning of the shipping season, and also those sprayed every four weeks thruout the season, three applications; and the plants sprayed until staked, either one or two applications. The number of applications made to Plat 5 after the plants became badly infected, varied from 1 to 5, depending upon the relative time of severe infection.

The effect of the spraying was very marked. The progress of the disease was checked in proportion to the amount of spraying. Unsprayed plants lost much of their foliage early and were bare almost to their tips at the close of the shipping season, while the sprayed plants retained their foliage in varying amounts. Altho all plants lost some foliage at the base, those sprayed regularly and often retained sufficient foliage to properly mature their fruit, and were still producing blossoms and green fruit at the close of the shipping season. Specimens of sprayed and unsprayed plants (from Plats 1 and 6, respectively) were photographed August 9, 1909, and are shown in Figures 13 and 14.

EFFECT OF SPRAYING ON YIELD OF FRUIT

The effect of the spraying was further shown by the yield of fruit. Early in the season the unsprayed plants often produced more fruit than those which had been sprayed, but the sprayed plants produced much higher total yields for the entire season.

The fruits classed as early were gathered during the same period as designated in the fertilizer experiments previously reported. The average yields of early tomatoes in pounds per plant are given in Table 16.

TABLE 16.—YIELDS OF EARLY TOMATOES, IN POUNDS OF MARKETABLE FRUIT PER PLANT

Plat	Treatment	1906	1907	1908	1909	Average
1	Sprayed every two weeks	.25	1.65	1.02	.32	1.08
2	Sprayed every two weeks until shipping season	.42	1.95	.40	.31	1.02
3	Sprayed every four weeks	.37	1.71	.52	.45	1.01
4	Sprayed every two weeks until tomatoes were staked	.23	1.77	.80	.45	1.08
5	Sprayed every two weeks after badly infected	.34	1.97	.90	.55	1.25
6	Check. Not sprayed	.65	1.78	.74	.65	1.27

These figures show that so far as extra early tomatoes are concerned, there is, on the average, no benefit to be derived from the spraying, for the plats which were not sprayed in the early part of the season produced the highest average yields of early fruit. The

fungicide seems to conserve the energy of the plants and cause them to continue growth rather than ripen early fruit.

However, this extra early fruit constitutes only a small part of the entire crop from the sprayed plants. When total yields are considered, the sprayed plants so far outstrip the unsprayed as to completely overcome the slight advantage of the unsprayed plants in reference to early fruit. The total yields from the various plats in terms of pounds per plant are given in Table 17. These yields include only the marketable tomatoes which ripened before the close of the shipping season.

TABLE 17.—TOTAL YIELDS OF MARKETABLE TOMATOES, IN POUNDS PER PLANT

Plat	Treatment	1905	1906	1907	1908	1909	Average
1	Sprayed every two weeks	8.32	1.09	5.93	5.63	2.72	4.73
2	Sprayed every two weeks until shipping began	8.80	1.85	6.05	1.93	2.29	4.18
3	Sprayed every four weeks....	7.55	1.27	6.02	2.87	2.66	4.07
4	Sprayed every two weeks until staked	5.48	.72	5.52	2.46	1.99	3.23
5	Sprayed every two weeks after badly infected.....	4.19	.91	5.73	4.14	1.78	3.35
6	Check. Not sprayed....	3.61	2.30	4.36	2.27	1 82	2.87

The above table shows that regular, frequent applications of Bordeaux mixture are very effective in securing large total yields of marketable tomatoes, and also that early spraying, as on Plat 2, gives much better results than late spraying, as on Plat 5. The exceptional yield from Plat 5 in 1908 was due to the fact that the spraying of this plat was commenced relatively early that year and more applications than usual were made. The conflicting results obtained in 1906 are due to the effects of the wilt which attacked the field in spots. The check plat was in one of the spots not affected early in the season, while the other plats were severely attacked.

These experiments indicate that it is possible to control the leaf spot by spraying. The control of this disease does not usually increase the yield of extra early fruit, but very materially increases the total yield during the normal shipping season. For the most certain results five or six applications should be made at intervals of two weeks, beginning within two weeks after the plants are set in the field.

TOMATO WILT

Reference has already been made to the wilt which appeared in the experimental tomato plantation in 1906. This disease, known

as fusarium wilt, is not in the least affected by the application of spraying materials to the plants, and should not be confused with the leaf spot, which, as indicated above, can be effectively controlled by the judicious use of Bordeaux mixture. The wilt has been observed in Union county for a number of years, and has caused the loss of many a promising crop. Affected plants are characterized by a sudden wilting of entire branches, or even the entire plant. Within a few days the wilted portions become brown and dead. Examination of the wilted stems reveals a discolored, brownish appearance of the woody portion. The plants may die before any fruit has matured or after any part of the crop has been gathered.

FIG. 15. TOMATO PLANT KILLED BY WILT.

The first season that the wilt appears in a given field, usually only a few plants are infected, but if the same field is used for tomatoes the next year, the attack is likely to be very severe, for the disease is carried over in the soil. The length of time the disease will remain in badly infected soil is not known. It is, therefore, important to practice rotation of crops so that the soil will not become badly infected. Care should also be taken in securing soil for the beds in which the plants are grown. Fresh soil should be put in the beds each year, and it should be secured from a part of the farm which has never grown tomatoes nor received the wash from tomato fields. It is also important to avoid inoculating a new field by means of soil carried from an infected field on tools or the feet of men or farm animals.

HARVESTING AND MARKETING

After a crop of tomatoes has been successfully grown the profits to be realized depend, in a large measure, upon the methods employed in harvesting and marketing.

PICKING

Tomatoes must be picked carefully, and the stems broken off in order to avoid bruising and puncturing the fruits when they are

placed in the picking basket. As a further precaution against bruising, some growers line the picking baskets with burlap. The tomatoes are carried or hauled to the packing shed* in these baskets or placed in boxes and hauled in.

If the tomatoes are to be shipped to a distant market, they should be picked when about one-third of each fruit is well colored. At this stage of ripeness the fruits are still firm and will carry in excellent condition. By the time they reach the market, two or three days later, they will be nicely colored. If a local market is to be supplied, the fruits should be riper when they are picked. By picking ever two days, practically all of the fruits can be secured at the proper stage of maturity. However, in hot weather when the tomatoes are ripening rapidly, it is sometimes necessary to pick every day in order to avoid over-ripeness.

Tomato picking is very dirty work. The dirty green stain from the vines which collects on the picker's hands and clothes is difficult to remove. If the hands are rubbed thoroly with a green tomato or a crushed stalk of rhubarb immediately after the picking is completed, the greater part of the stain can be removed. Old garments should be worn while picking tomatoes, and should be reserved for that particular purpose, for it is impossible to keep them clean. Another disagreeable feature about tomato picking is that the tomato vines, as well as the stain from them, have a peculiar odor, which is nauseating to some persons until they have become accustomed to it.

WIPING

Tomatoes which have been sprayed late in the season show the stain of the Bordeaux mixture when they are picked. Those from vines which lie upon the ground are more or less soiled with dirt. In either case the tomatoes should be carefully wiped with a damp cloth before they are packed. This can be done most conveniently as they are being removed from the picking baskets to the packing table.

GRADING

Tomatoes should be graded before they are sent to market. Much of the dissatisfaction with tomatoes on the market, and much loss in the hands of retailers is due to the fact that many tomatoes are sent to market which should never have left the premises of the grower. This applies particularly to specimens which are so badly cracked that the juice oozes from them before they reach the market. One leaking tomato in a crate is likely to ruin the sale of the entire package, for if it leaks enough to be detected, the crate

*The construction of packing sheds is fully described in Bulletin No. 124.

is designated as a "leaker" and is sold at a decided discount. Rough or over-ripe specimens or those of very small size are almost as objectionable, for they spoil the sale of good specimens if placed in the same package, and if packed alone they often fail to bring enough on the market to pay for the expenses of marketing.

In grading tomatoes, then, all badly cracked, rough, over-ripe, or under-sized specimens should be discarded as culls. The salable tomatoes are usually put in one grade, but for discriminating markets, better results would be secured if two grades were made. There is a distinct demand for sound, smooth tomatoes, regular in shape, free from cracks, and of such a size that twelve specimens fill a basket. Tomatoes of this character should be marketed in a grade by themselves, and may be designated No. 1. Sound specimens, slightly inferior to the above in size or smoothness, or with slight cracks about the stem, which have healed over so that there is no danger of their leaking, may be graded as No. 2. Over-grown specimens should also be graded as No. 2. Tomatoes which are so small that over twenty specimens would be required to pack a basket, are not in demand on the market.

If the tomatoes are not uniform in ripeness, each grade should be further sorted, on the basis of color, and only tomatoes uniform in maturity packed in the same crate.

The grading of tomatoes, as well as the wiping (when necessary), is usually done as the fruits are being transferred from the picking baskets or field boxes to the packing table.

PACKING

For local market, no special kind of package for tomatoes is demanded. They are often hauled to market in half-bushel or bushel baskets or in boxes. Usually no special arrangement of the specimens in the package is attempted, tho sometimes the fruits are placed in more or less regular order. For shipment to distant markets, however, special kinds of packages are demanded, and careful placing of the specimens in the package is imperative in order that the tomatoes may reach the market in presentable condition.

PACKING IN CRATES

The standard package for tomatoes produced in Southern Illinois is the four-basket crate. The dimensions of this crate are 22″x13″x4⅜″. The baskets are 10″x6¼″ at the top and 8½″x 4¾″ at the bottom, and 4″ deep. Twelve tomatoes of the best grade are packed in each basket. Six specimens are placed, stem side down, in the bottom of the basket, and six more, of a some-

what larger size, are similarly placed on the top. The specimens should fit so tightly that they completely fill the basket, but are not squeezed so much as to be injured. The top layer should extend

FIG. 16. CRATE OF NO. 1 TOMATOES SHOWING STYLE OF PACK.

to the top of the crate, so that when the cover is put on, it will press upon the tomatoes sufficiently to hold them in place. The cover of the crate consists of two slats which are nailed on after the baskets have been filled. These slats are of such a width that the edges of the tomatoes are exposed to view along each side of the basket. This makes an exceedingly attractive package.

FIG. 17. STYLE OF PACK FOR SMALL TOMATOES.

For smaller sized fruits, the style of pack is varied. Usually it is necessary to place the fruits of the top layer on edge in order to bring them up to the proper height. Care is taken to arrange these fruits so that the blossom ends are exposed to view after the top slats are nailed on the crate.

PACKING IN BASKETS

In some sections of Illinois, especially in localities where the shipping of tomatoes is of minor importance as compared with the shipping of melons, the one-third bushel climax basket commonly used for melons is also used for the tomatoes. In this package the tomatoes are placed in three layers. The arrangement of the specimens in each layer depends upon the size of the fruit. Unless the fruits are exceedingly large it is necessary to pack at least one layer on edge, and in the case of small specimens it may be found necessary to pack two layers in this manner. The packing thruout should be so tight that each specimen will remain exactly where it has been placed. Special care should be taken in the arrangement of the tomatoes in the top layer, so that the package will present a neat appearance. This layer should extend high enough to touch the cover so that the specimens will be held in place, and yet not crushed by the pressure. When used for packing tomatoes the climax basket should be provided with a single-slat, rather than a two-slat, cover, since this type of cover gives the package a more finished appearance.

TYPES OF TOMATOES DEMANDED BY THE MARKET

Formerly only two brands of tomatoes were recognized on the Chicago market—the market which determines the classification of most Illinois tomatoes in so far as they are classified at all. These were known as "Acme" and "Trophy." All large, smooth, purple or pink tomatoes were classed as Acme, while all the bright red or scarlet sorts were classed as Trophy. Most of the bright red tomatoes were more or less rough and wrinkled, so that the bright red color and the roughness of fruit were always associated in the mind of the produce buyer. Thus a strong prejudice against bright red tomatoes was early developed on the Chicago market, and still persists, theoretically at least, in spite of the fact that many extremely smooth varieties of bright red color have been developed. Likewise purple color and smoothness of fruit have long been associated in the mind of the Chicago marketman, since the original Acme tomato was of that color and character. However, the recent introduction of certain extra early, rough-fruited varieties of purple color has somewhat confused the original classi-

fication, for some shippers are inclined to brand these rough tomatoes as "Acme" on account of their color. The produce dealers, however, do not recognize this classification, and are beginning to quote these rough, purple sorts by their variety names. In like manner, the shipment of large, smooth, bright red tomatoes is becoming of sufficient extent to warrant a separation of these tomatoes from the old Trophy class in the market quotations and certain leading varities of this character are now sometimes quoted under their variety names. Large, rough-fruited tomatoes of the Ponderosa type are not recognized on the general market, though they may be salable in some local markets.

The Chicago market declares decidedly in favor of tomatoes of the Acme type. The same is true of Peoria, Bloomington and Galesburg. Quincy, Springfield and Decatur do not seem to be so particular as to the color of the tomato so long as the fruit is smooth.

Some of the varieties of tomatoes extensively grown in Southern Illinois which are everywhere recognized as belonging to the Acme type are the Imperial, Livingston's Beauty, Trucker's Favorite, Dwarf Champion and Magnus. The leading variety of the Trophy type is the Earliana, and this has become so predominating a variety of that type that it is often quoted under its own name. The leading rough-fruited varieties with the Acme color are the Earliest Pink and June Pink. Some of the best varieties of smooth, bright red tomatoes are Chalk's Early Jewel, Stone and Matchless.

Tomatoes of the Trophy type, especially the Earliana, are grown quite extensively on account of their extreme earliness. Earliest Pink and June Pink are being grown to some extent, for the same reason. These varieties usually bring good prices if there are no other tomatoes on the market, but as soon as the market is supplied with smooth varieties, there is little demand for these rough sorts. Even at their best, these varieties produce a high percentage of culls, and should, in most cases, be discarded by all growers who desire to produce tomatoes acceptable to the trade. With well-grown plants of a slightly later variety, but one which produces large, smooth fruits, the careful grower can practically control the early tomato market of his locality. For shipment to the city markets also, it is unwise to depend upon rough-fruited sorts, for even if early, they usually must compete against smooth later sorts from more southern localities.