

in the milk duct will effect a cure in a few days. Neglected, the disease will creep into the udder and permanently destroy the quarter affected.

M. B. A.

GARDEN & ORCHARD

Opportunity for Ontario Fruit-growers.

The success met by the Short Course in fruit-growing, instituted a year ago at the O. A. C., has led to renewed efforts in 1909, with the result that a splendid practical programme is now being carried out. The course commenced on January 26th, and is to run until Feb. 5th. The features yet to come are, briefly, as follows:

On Friday, Jan. 29th, "Pruning," by W. T. Macoun; "Commercial Pear Culture," by J. E. Orr; "Top-working," by W. T. Macoun; "Fertilizers," by R. Harcourt.

Saturday, 30th (forenoon only), "Management of Bearing Orchards," by H. S. Peart; and Question Box.

Monday, Feb. 1st—"Insects Injurious to Fruits," by T. D. Jarvis, and "Orchard Diseases," by L. Caesar, O. A. C.

Tuesday, Feb. 2nd.—A general conference on the preparation and application of spraying mixtures, with demonstrations on a commercial scale.

Wednesday, Feb. 3rd.—A conference on "Varieties Worth Knowing"; "Thinning Fruit," by J. Gilbertson and Wm. H. French; conference on box and barrel packing; demonstrations conducted by A. McNeill.

Thursday, Feb. 4th.—"The Fruit Crop of 1908 and Its Disposition"; "Experiments with Long-distance Shipments," by J. B. Reynolds; "Cold Storage for the Fruit-grower," by J. A. Ruddick.

Friday, Feb. 5th.—Conference on co-operation; a thorough discussion by managers of co-operative associations and other experts.

The evenings will be devoted to special discussions, and to addresses by prominent speakers, including Prof. John Craig, A. McNeill, Prof. H. L. Hutt, T. D. Jarvis, and R. M. Winslow.

This is a meaty programme which no one interested in fruit-growing should miss if he can help it. The only necessary expense is for board, which can be obtained in the city near-by, and railroad fare—single-fare tickets on standard-certificate plan.

Fertilizers in German Orchards.

Address by Prof. R. Harcourt, before the Ontario Fruit-growers' convention, 1908.

Statistics show that, while one-sixth of the cultivated land in Germany is devoted to the growing of potatoes, sugar beets, turnips, cabbage, etc., only one-fiftieth is in orchards and gardens. This statement gives some indication of the relative importance of fruit-culture in Germany.

Fruit-growing is most successful in the middle and southern part of the Empire, especially in Saxony, Franconia, and the Rhine Valley. But I did not see whole districts devoted to fruit-raising, as may be seen in some parts of Ontario. An exception must be made in the case of the grape, which is the most important of the fruits grown in Germany. It is found most extensively cultivated in the Rhine Valley, the valleys of the Moselle and the Neckar, where all the lower slopes of the hills are literally covered with vines. Grapes of somewhat inferior quality are also grown in the valleys of the Saale and Elbe, near Dresden. A comparatively small amount of these grapes are used for general household purposes; they are almost entirely converted into wine. To show the extent of this industry, it is only necessary to state that recent records prove that the annual production of wine in Germany is about one thousand million gallons.

My observations of actual orchard conditions in Germany were almost entirely confined to the neighborhood of Dresden, Leipzig, and Halle, or what might be called Central Germany. The roads in this part of the country, like those in almost all parts of the old land, are narrow and winding, a noticeable feature being the absence of fences along the lines of travel. But in many districts, a row of fruit trees, principally apples, plums and cherries, flourish on either side of the driveway, and when in bloom they make an exceptionally fine appearance, and take the place of unproductive ornamental trees, such as are seen in many parts of the Old Land. These fruit trees are the property of the municipality, corporation, or person who owns the road.

The common practice of the country is to sell the crop of fruit early in the summer, just after the fruit is set. The ordinary price is about twenty-five or fifty cents per tree, the purchaser taking all risks of the fruit being stolen, and to do all work in connection with spraying, picking,

PLANTING ON HILLSIDES.

The same evidence of thrift is manifested in planting the sides of gullies or ravines with

fruit trees. On one farm visited there were 16,000 trees planted on the steep sides of a ravine. The place where the tree was planted was terraced, and kept free from grass. The fruit from these trees was sold in the same way as that along the roadsides, and the otherwise waste land—for no stock is pastured—was made to do its share in increasing the profits of the farm.

One feature of the cultivation of the soil, everywhere in evidence, was the thoroughness with which it was done. The German farmer has not as many labor-saving implements as we have, but labor is cheap, and they do not hesitate to make use of it. As an instance of this, I may cite the case of one 2,000-acre farm visited. On this farm there were several hundred acres of potatoes and sugar beets, nearly 100 acres of peas and beans for canning, 90 acres of asparagus, besides rye, wheat, barley, and oats. All the crops, with the exception of rye, were hand-hoed, and the ground was as clean and as free from weeds as a well-kept garden. On this farm there was no orchard, but the sides of the lanes and rough places were planted with fruit trees, which were both ornamental and profitable.

Another point that is particularly striking to a stranger is the amount of trellis work in orchards and on their fruit experimental grounds. On either side of the main drive at the Diemitz Fruit Experiment Station there are rows of trellised apples and pears. These may or may not be profitable, but they show the methods of doing this work, and certainly add variety and beauty to the orchards. The trellising of fruits, as, for instance, pears, on the sides and ends of old buildings, is very common, thus serving the double purpose of covering up the wall and improving its appearance, and of increasing the total revenue of the farm.

EXTENSIVE USE OF FERTILIZERS.

By way of further increasing the returns from the land, it may be interesting to know that fertilizers are quite extensively used on all farm crops. But the Germans admit that they have not studied the characteristic food requirements of the fruit crops so fully as those of the cereal and root crops. The subject, however, is receiving a great deal of attention, and, as a result, many valuable conclusions have been reached. It was my good fortune to visit several farms where fertilizer experiments on fruit crops had been carried on for several years. Among the most interesting of these was a series of experiments that had been carried on for sixteen years on an orchard at the Diemitz Fruit Experiment Station. The object of the experiment was to ascertain the effect of each of the important fertilizer ingredients on the growth of wood, and the color, size, flavor and yield of fruit. In other places there were special experiments with the various kinds of small fruits.

It is impossible to deal with the results obtained in each individual experiment, but I shall endeavor to give, in a general way, some of the impressions gained as a result of my observation and through conversation with those in charge of the experiments.

In the first place, it would seem to be fairly established that the manurial constituents required per acre for the full development of fruit trees does not materially differ from that required for root and vegetable crops. But extensive experiments have repeatedly indicated that hoed crops, such as potatoes and sugar beets, make a better use of farmyard manure than fruits. It is further agreed that commercial fertilizers cannot take the place of stable manure, but that the best results are obtained when both are used, the one supplying humus and some plant food, and the other supplementing the deficiencies of the mineral constituents in the stable manure.

RESULTS FROM MIXED FERTILIZERS.

At Diemitz and Stassfurt, I had a good opportunity of observing the results of the application of fertilizers on the apple orchard, which, after grapes, is the most important fruit of Germany. In both places, experiments have demonstrated that mixed fertilizers, containing the three essential manurial constituents—potash, phosphoric acid, and nitrogen—can be used with profit, but that the lack of potash affects the results more than any other one constituent. Where potash was not supplied, even though light dressings of stable manure were made every three or four years, the trees have assumed the appearance of those grown under adverse conditions on poor soil; i. e., the growth of wood is arrested, the leaves are small, and have an unhealthy color, and are covered with yellow spots. After the fruit is matured, there is some growth of wood, and the next spring there is put forth an abundance of blossoms, of which, however, few develop, owing to the lack of proper nourishment. In spite of the fact that there is an abundance of phosphoric acid and nitrogen in the soil, most of the fruit falls off during the summer; and, in consequence, the yield obtained when potash is not supplied is very little greater than when no fertilizers are used. I may say, however, that

these conditions are not general, certain varieties showing a marked ability to thrive under unfavorable conditions. In fact, a number of these varieties, which were pointed out to me, form strong wood and large leaves, and apparently possess the ability to throw off the superfluous fruit which the tree is not capable of fully maturing. Lack of nitrogen in the soil has been shown to have a somewhat similar effect upon the development of the fruit, although not so pronounced, while the absence of phosphoric acid is even less noticeable.

Experiments have fully demonstrated that the use of a complete fertilizer will more than double the yield of plums. Where nitrogen was omitted, the yield was much lower; and where phosphoric acid was lacking, it was still lower. In fact, the results of German investigations appear to indicate that the yield of stone fruits is more influenced by phosphatic and nitrogenous manures than core fruits. It is quite possible that this is due to the fact that stone fruits have a large kernel, which is rich in phosphoric acid, and, as the proportion of the kernel to fruit is much larger in stone fruits than in core fruits, the former have a greater need for phosphoric acid.

The results of fertilizer experiments with gooseberries indicate that potash is the most important constituent in influencing yield. With some varieties phosphoric acid stood second and nitrogen third, and with others the nitrogen ranked second, and the phosphoric acid third. It would, therefore, appear that, while different kinds of fruits make use of the various manurial constituents in different proportions, the different varieties of one kind of fruit also have their own peculiarities, which have to be studied.

RESPONSE FROM STRAWBERRY PATCH.

Strawberries have been found to respond readily to the application of commercial fertilizers. The study of their requirements is not so difficult as are those of other fruits. This is partly because they come into bearing quickly, and partly due to the fact that they are generally grown in rotation with vegetables. Experiments have demonstrated that the complete mixture of fertilizers give the largest yields, and that, on ground in good condition, the plot that received no nitrogen gave nearly as good results; while, if either potash or phosphoric acid are omitted, the yield is seriously diminished.

From these observations, it is not surprising to find that the general opinion among many German fruit-growers is that potash and phosphoric acid are of the utmost importance in the development of fruit-bearing trees and bushes. Even if these constituents are applied in excess, no harm will be done, whereas an excess of nitrogen may injure the trees, and, besides, exert an unfavorable influence on the composition of the fruit. Large applications of nitrogen to strawberries, especially if the season happens to be a wet one, causes the berries to begin to decay early. Apples are said to be similarly affected, while gooseberries, raspberries and currants are affected to a lesser extent.

Regarding the quality and flavor of fruit, the results of German investigators show that the presence in the soil of an abundance of phosphoric acid and potash is extremely important. On the other hand, where nitrogen is somewhat deficient, the effect on the quality was scarcely perceptible.

INFLUENCE ON SIZE OF FRUIT.

Considerable work has been done on determining the influence of the several ingredients on the size of individual fruits. With core and stone fruits, the experiments are not far enough advanced to warrant definite conclusions, but with berries a greater number of results have been obtained, and these appear to indicate that the lack of phosphoric acid did not materially decrease the size of the berries, as compared with those grown where a complete mixture of fertilizers was used; but when potash was not applied, the berries were smaller; and where the nitrogen was left out, they were still smaller.

Another question which is receiving a great deal of attention is whether a different action is detectable when nitrogen is applied as nitrate of soda, or sulphate of ammonia, or horn meal, the phosphoric acid as ground bone or superphosphate, or the potash as the chloride or sulphate of potash. So far as I was able to learn, no definite results have been obtained.

The problem of what quantities of fertilizers must be used to force maximum crops, and whether these large quantities will sufficiently increase the yield to pay for the extra cost of the fertilizers, is also being studied.

Laboratory investigations are being made to ascertain the amount of the fertilizing constituents in the various fruits, and the distribution of these in the plant.

In conclusion, I may say that the Germans appear to have proved to their own satisfaction that the use of commercial fertilizers on general farm crops is profitable, and they are now making a serious effort to gather sufficient data to enable the fruit-grower to use these substances intelligently.