

of, evaporation becomes one of the farmer's worst enemies. The sun, in April or May, will evaporate from one-fifth to one-quarter inch of water per day. For thirty days this amounts to over six inches. The average monthly rainfall at Guelph for April is two and one-half inches, for May and June, three inches each. Evaporation will, then, exhaust in one month all the rain that will fall in two months.

In spring, the soil is naturally compacted on the surface, and this is an ideal condition for a time. When the excess of moisture is got rid of, evaporation should be checked at once. The best way to do this is to stir the surface and loosen up the soil, breaking the particles into coarser, looser pieces, which, acting as a mulch, checks the upward movement of the water from the lower layers of earth. Soil is made up of very many particles of earth, with pore spaces between. An ordinary loam soil is from one-third to one-half of its bulk pore-space. This has been ascertained by actual measurement. Each pore-space serves as a storehouse for water. If the soil pores are too coarse, as in a gravel or coarse-sand soil, the water is not held, but goes right down and out as drainage water. In clays, the pore space is too small, and there is not sufficient room to store enough water for plants.

Underdrainage aids greatly in improving the capacity of a clay soil to hold water. It is a remarkable fact that a clay soil becomes more porous by the creation of little runlets through the soil leading to the drains. Deep plowing also aids in making soils porous and increasing their water-holding capacity. When a soil in good tilth is full of water, but not water-logged, the first foot will contain four or five inches of water. That is, if all the water in a cubic foot of soil were extracted, it would fill a cubic-foot vessel from four to five inches deep. This amount decreases as we go deeper into the soil, so that the first four feet of soil will hold about twelve to thirteen inches of water.

If the water required to grow an average crop of grain, three feet high, were all placed on the surface of the soil at once, it would cover the ground to a depth of from eighteen to twenty-four inches. To produce a crop of fruit requires much more water. The rainfall for the four growing months amounts to about ten or twelve inches. There is, then, from eight to twelve inches of water to be secured by the plants from some other source. If evaporation has not been allowed to go on too long in the spring, this extra water will be stored in the soil. Thus, there is always sufficient water to mature a crop each year, if properly conserved. Cultivation as early as possible in the spring, and after each rain in summer, will conserve and insure a continuous and usually abundant supply of moisture.

### A Definite Size in Grading Apples.

Editor "The Farmer's Advocate":

Some years ago, the writer, in an article to the Halifax Chronicle, advocated the necessity of incorporating in the Fruit Marks Act some definite sizes of the principal commercial varieties of apples, as a key to and explanation of the present indefinite term "medium," to designate the minimum size of No. 1 in each variety.

Knowing well that one definite size would not do for all varieties, it was suggested that a list of the principal commercial varieties be printed in the Fruit Marks Act, giving the minimum size in inches and fractions thereof.

The advantages of such an addition to the Act would be obvious. First, the work of the inspectors would be more uniform, and, consequently, easier, since there need be no hesitation resulting from difference of opinion, or the errors of judgment resulting from changes to lots of apples of different size. It is wonderful how individuality operates in judgment.

Even where the parties are disinterested, it is scarcely possible to get any number of men to agree to exactly what size of a certain variety would rank as medium, even where they may be judging the same lot of apples, and at the same time, especially if they have no chance of measuring. The error increases if the apples are in different places, and of a different average size in each place, and the difference of opinion probably reaches its maximum when the apples in one case may be those of a friend, and in another those of an enemy.

I will go further, and say that a packer may throw upon the table a number of barrels of large, average size, and directly afterward a number of smaller, average size, and his judgment of "medium" will differ in the one case from the other. Unless constant recourse is had to some form of measurement, a small, average run of apples will pack out much smaller than a large run.

Second.—It would be better for the packer. He would know just how small to run his No. 1's and 2's, and would put up a more uniform package, even if his apples were of widely different sizes in different lots. This would apply not only to the individual, but to the whole Dominion.

Co-operative associations are being formed in the hope that packing might be more uniform, but it seems to me that uniformity would be more quickly accomplished by the above means. The Inspection and Sales Act defines clearly enough the quality of apple that must go into a No. 1 or No. 2. In regard to spot, roughness, ill-shape, bruises, etc., the directions or provisions laid down in the Act are sufficiently plain to give little excuse for want of uniformity in the above respects. The Act is plain in demanding clean, hand-picked, sound fruit, carefully packed; it is the indefinite terms used to designate size that preclude possible uniformity.

Third.—It would be better for all classes of buyers, from the wholesaler to the consumer. With the better enforcement of the Act, the buyer is becoming yearly more reasonably sure of getting clean, sound apples when he buys a barrel of apples, but, until we get the minimum size stated definitely in the Act, he cannot be sure what size he is buying. One man's "medium" apples may be half an inch larger in diameter than his neighbor's; and two barrels of apples may reach the buyer, both put up in good faith, but differing in size by this much. These surely must be discriminated against by the buyer.

At the present time, the buyer does not know whether a No. 1 barrel of apples will contain apples running down to 2½ inches or 2 inches as a minimum.

One objection made to a definite size being given is that in different seasons, owing to climatic causes, apples grow of a different average size, so that one season there would be a greater number of No. 2's than another season. In such cases, for the sake of uniformity, it would be better to pack the greater number of smaller grade, and put the loss down to the misfortune of having such a season.

Again, it is objected, here in Nova Scotia, that the same variety of apple grows larger in Ontario and British Columbia than in our own Province, and if we took as the minimum No. 1 for the Dominion an apple which might be considered as medium in Ontario and British Columbia, it would be discriminating unfairly against the Nova Scotia apple, compelling, again, the packing of a large proportion of No. 2's. This objection may be answered in two ways. The setting of a standard to the medium of these other Provinces may put us upon our mettle, and lead to the more improved methods of pruning, fertilizing and thinning, and also the questionable sacrifice of the present average proportion of No. 1's and 2's. It is well known in all the markets of the world that Nova Scotia apples, though perhaps somewhat smaller than the same varieties in the other mentioned Provinces, are of such superior quality that, if the size were raised to a good standard, they would easily lead the market.

Or, the size "medium" could be interpreted for the whole Dominion to suit Nova Scotia, and packers in the other Provinces could pack as much larger and better as their enterprise and circumstances would warrant. Other things being equal, where the quality of our apples is known, we are not afraid to compete with any other country on earth, even where our superior judgment and common sense lead us to use the sensible 96-quart barrel.

So much for advantages and objections. The history of the attempts to get a definite size, as far as Nova Scotia is concerned, has been that, at the annual meeting of the Nova Scotia Farmers, in 1909, a resolution was passed to let the law remain, as at present, indefinite. A paper was read at the N. S. Fruit-growers' Association in December, 1909, advocating the idea, and the discussion following did not lead to any conclusion. In Ontario, some of the co-operative associations have adopted sizes for themselves, but this is not universal. A step in advance this winter has been the distribution among the principal fruit-growers of a list of some twenty-five of the principal commercial varieties, asking them to give in inches for each variety the size corresponding to very large, large, medium, small, and very small. In this way, Chief McNeill hopes to get at an average on which to base a definite size for each variety. It is to be hoped that the move may be successful.

Annapolis Co., N. S. R. J. MESSENGER

### Cultivation, Cover Crops and Fertilizing.

The emphasis laid on spraying in connection with the report of our work in "The Farmer's Advocate" demonstration orchard last season, must not, as we reminded the Fruit Institute at Lambeth, be taken to imply that all the credit for the results was due to this factor. No small part should be credited to the cultivation given. Up-to-date fruit-growers cultivate their orchards as a matter of course. The proper treatment of apple orchards is to plow them early in the spring, harrow frequently, and disk two or three times, keeping a mulch of loose earth until, say, the middle of July; then sow a cover crop of

clover, vetches, alfalfa, rye, oats, or almost any kind of crop, to be plowed under the following spring. In northerly latitudes the cover crop should be sown earlier, say, the latter part of June, in order to check the growth of wood and hasten maturity of the wood, so that it may be saved from winter-killing.

The common practice is to leave the orchard in sod, generally pasture. This is bad for the orchard, as it is bad for a wood-lot. Grass and trees do not well agree; the grass nearly always gets the better of the trees, unless these are thick enough to prevent the grass from growing. Alfalfa is worse, even, than the grass, and should never be sown in an orchard, except as a cover crop, unless it is desired to kill the trees.

Why should we cultivate the orchard? There are three main objects: First, to conserve moisture; secondly, to promote aeration of the soil; and, thirdly, as a result of these, to liberate plant food. We might say that a fourth object is to keep down weeds which rob the soil of moisture and plant food, but this should rather be regarded as an incidental result. There are two ways in which moisture is passed off from the soil: First, by evaporation from the surface of the ground; secondly, by transpiration from the stomata or breathing pores of the leaves. Every tree in the orchard, every plant in the field, is a pump, sucking up moisture during the growing season, to be transpired through the leaves, after having carried up plant food in the form of a dilute solution. When moisture is lacking in the soil, the tree is, therefore, both starved and parched. In order that we may prevent waste of moisture from the soil by evaporation, it is important to have a loose mulch two or three inches deep spread over the surface of the ground to intercept the upward capillary movement of soil moisture, and protect it from the evaporating influences of sun and wind above. The second purpose that is served by moisture in the soil is the liberation of plant food by conversion into soluble forms. The soil is a laboratory where important chemical and bacterial processes are going on. These cannot proceed, however, in the absence of a reasonable supply of moisture. We must conserve moisture, therefore, first, that plant food may be liberated; secondly, that it may be carried up in the form of sap to the leaves of the plant.

Aeration is soil ventilation. Oxygen is distributed through the soil as it is through the atmosphere, only not so abundantly, and is necessary for the chemical changes by which plant food is made available. A crusted, hard, dry soil is not likely to be well aerated. Cultivation, by preserving a loose mulch of surface soil, not only conserves moisture, but favors the freer liberation of plant food, especially in the early part of the season, when the tree requires both plant food and moisture in abundance to produce growth of wood.

### SEVEN DIFFERENT METHODS OF HANDLING ORCHARDS.

A bulletin from the Vermont Experiment Station has suggested seven different methods of handling orchards. First, clean tillage throughout the season; second, tillage with cover crops; third, tillage with intercropping; fourth, grass mulch; fifth, sod mulch; sixth, grass removal; seventh, sod pasture.

Clean cultivation throughout the season has the disadvantage of finally exhausting the humus and nitrogen from the soil.

Tillage with cover crops is an ideal method for general use.

Intercropping between the rows of trees is all right with a young orchard, but a gradually-widening strip should be left for the use of the trees. Hoed crops are perhaps the best for intercropping.

By a grass mulch is understood the practice of mowing the grass which grows in the orchard, and spreading it around under the trees, extending somewhat beyond the tops. When not enough grass is produced to form a thick mulch, other mulch material is to be brought in. This finally becomes rather expensive. Good results have been produced by the mulch system, but it has the disadvantage of drawing the roots of the trees close to the surface, where they are liable to suffer from drouth and from freezing, unless the mulch is kept quite thick.

Sod mulch is described as the system where only that mulch material is used that is produced in the orchard.

Grass removal consists in the cutting of hay, and is rarely or never to be recommended.

### CULTIVATION BEST IN MOST ORCHARDS.

Experiments of the N. Y. Experiment Station showed, in five years' comparison of tilled orchards with sod mulch, 36.3 barrels per acre more fruit from the former, or a gain of 50 per cent., and the apples were better. It cost, on the average, for five years, to handle the two plots, \$17.92 per acre for the sod mulch, and \$24.47 for the tillage and cover crops. The \$6.55 extra cost, however, was small, compared to the difference in yield and quality. The cost of orchard