side of silo, say 10 or 12 feet from top, to save blowing all the corn over the top, and the same hole will be very handy to dump the spoiled corn out when once you open the silo to feed from. After the silo has been filled, it should be kept well tramped every few days for about two weeks. It will become very hot and soft on top. This should be tramped until it is hard; then, about two or three inches will be all the waste. If not tramped, there will be about 18 inches spoil.

Perth Co., Ont. A. STEVENSON.

## Size of Tile in Relation to Grade and Kind of Soil.

"Would it pay to put underdrains as close together as two rods?" Let us see. In 1897, James Marshall, of Hamilton, drained a twelve-acre field of heavy clay. To quote his own words: "The drains were 25 to 30 feet apart, and 3 feet deep. The labor cost $240, and the tile $220, making $460 for twelve acres." This we see, was almost $40 an acre. Continuing, he says: "In 1898 this field yielded 80 bushels of oats per acre, while the next one, of similar soil, yielded only 45 bushels, and not as good oats." Thus, the gain by drainage was 35 bushels per acre. At, say, 40 cents a bushel, this would mean $14.00 per acre, at which rate the drainage would pay for itself in three years, and our introductory question is answered. This is experience, and "money talks" in underdrainage as in most things. Examples of this kind are to be found in every county of Ontario, possibly in every township, and a few townships are well drained, yet, on the whole, underdrainage has spread but slowly. I estimate that at least 20 per cent. of the land under cultivation needs drainage. Is that too high? Look at your own township, your own county, and see how much seeding is a month late because of lack of drainage. Why has underdrainage spread so slowly? Because its results have not been given due publicity, because laborers have been scarce and methods of digging slow; because beginners have not felt sure enough of their methods, their outlets, their plans, etc., to warrant them in doing more than a small area, "just to try it," and, lastly, in many cases, because the ready cash has not been available. The present growing interest in drainage is doing much to make its results known; the ditching machine will solve the labor problem; drainage demonstrations will disseminate knowledge of simple methods whereby every farmer may be able to solve his own particular drainage problem; and the financial impediment should gradually disappear as people learn to take advantage of the Government aid offered in the "Tile, Stone and Timber Drainage Act."

Once a man decides to underdrain, a multiplicity of questions confront him, chief among which is the size of tile to use. The proper selection depends upon three factors: The slope of the drain, the friction in the tile, and the volume of water to be carried, and the last, in turn, depends upon the number of acres to be drained, and the greatest rainfall that is likely to occur in twenty-four hours. Treating these factors separately, we may observe, first, that if the grade is increased, the same size of tile will carry more water on the steep than on the slow grade; for instance, if the grade be doubled, the same tile will carry 1 1-3 times as much water as before; if it be trebled, the tile will carry about 1 7-10 times as much, and so on. Again, the friction varies with the size; a small tile will have more friction for the volume of water going through it than a large one. This makes the water run more slowly in the small tile, hence a small one should have a steeper grade than a large one. A 12-inch tile is just 16 times as big as a 3-inch tile, but, on the same grade, the water will run twice as fast in a 12 as in a 3, and hence the former will carry 32 times as much as the latter, although only 16 times as big. Now, the grade of a drain should be steep enough to give the water a velocity sufficient to flush all soil particles out of the tile. It takes a 2-inch grade in 100 feet to flush sand from a 3-inch tile, but a 1-inch grade will flush sand from a 12-inch tile. Hence, if there is any possibility of sand entering (and there are few cases where there is not), 2 inches in 100 feet is the slowest grade that should be used for the former, and 1 inch in 100 feet for the latter. It takes only one-quarter as great a velocity to flush clay as to flush sand, and hence, in clay land, tile might be laid on slower grades than indicated above, and the drains be comparatively just as safe from blocking by sediment as the steeper ones exposed to sand; but at the same time the efficiency of the drains would suffer, they would carry less water, because of slower grade. And so I think it false economy to choose a slow grade all over the system, just to avoid a little digging at the outlet or along the main. Lastly, the greatest rainfall in a day is approximately two inches, of which not more than one-half, or possibly one-third, has to be carried by the tile; and, to be safe, this should be removed in about 36 hours, for crops submerged longer than this begin to suffer, especially in warm weather. Thus we see that the problem of what size of tile is suitable, under certain conditions, is a complex one. There are two ways of solving it, by experience, and by mathematics, and they must agree when correctly worked out. After a good deal of experimenting, scientists have found a rule, or formula, which makes proper allowance for grade, friction, and quantity of water; and using this formula, they have been able to work out by mathematics what size of tile should be used to carry the water from a certain area on a given grade. The following table embodies the results:

TABLE OF SIZE OF TILE PIPE OF MAIN DRAIN (McConnell).

| Fall | Acres Drained. 3-inch tile. | 4-inch tile. | 6-inch tile. | 8-inch tile. | 10-inch tile. | 12-inch tile. |
|---|---|---|---|---|---|---|
| 1 foot in 20 | 18.6 | 26.8 | 74.4 | 150.0 | 270.0 | 426.0 |
| 1 " 30 | 15.1 | 21.8 | 60.4 | 128.0 | 220.8 | 346.0 |
| 1 " 40 | 12.9 | 18.6 | 51.6 | 108.8 | 189.6 | 298.4 |
| 1 " 50 | 11.9 | 17.0 | 47.7 | 98.0 | 170.1 | 269.0 |
| 1 " 60 | 10.9 | 15.6 | 43.4 | 90.0 | 156.0 | 246.0 |
| 1 " 70 | 10.0 | 14.5 | 39.9 | 83.0 | 144.4 | 228.1 |
| 1 " 80 | 9.3 | 13.4 | 37.2 | 77.0 | 135.0 | 213.0 |
| 1 " 90 | 8.1 | 12.6 | 35.0 | 72.5 | 127.0 | 200.5 |
| 1 " 100 | 7.3 | 11.9 | 33.1 | 69.2 | 120.6 | 190.5 |
| 1 " 150 | 6.7 | 9.5 | 26.6 | 56.0 | 97.3 | 154.1 |
| 1 " 200 | 5.7 | 8.2 | 22.8 | 48.0 | 83.9 | 132.5 |
| 1 " 250 | 8.1 | 7.5 | 20.4 | 42.4 | 74.4 | 117.0 |
| 1 " 300 | 4.6 | 6.9 | 18.4 | 38.2 | 65.5 | 107.0 |
| 1 " 400 | 4.1 | 5.9 | 16.5 | 32.6 | 60.3 | 90.7 |
| 1 " 500 | 3.7 | 5.2 | 14.8 | 30.1 | 54.0 | 81.6 |
| 1 " 600 | 3.3 | 4.7 | 13.3 | 28.0 | 48.6 | 74.0 |
| 1 " 800 | 2.9 | 4.1 | 11.4 | 24.0 | 41.4 | 65.0 |
| 1 " 1,000 | 2.6 | 3.7 | 10.2 | 21.2 | 37.2 | 56.0 |
| 1 " 1,500 | 2.1 | 3.0 | 8.5 | 16.8 | 30.8 | 47.0 |
| 1 " 2,000 | 1.9 | 2.8 | 7.4 | 15.0 | 25.0 | 40.8 |

Suppose the reader wants to drain 40 acres, and the slope of the main at the outlet is 4 inches in 100 feet—i. e., 1 foot in 300 feet—what size of tile should he use at the outlet? Look down the "fall" column till we find 1 foot in 300. Following this line to the right, we find the number of acres nearest to 40, viz., 38.2, which is pretty close to 40, and looking at the top of that column we see the size of tile to use, which in this case would be 8-inch. Half way up the main, if 20 acres were being drained through it, and the grade were 2 inches in 100 feet, or 1 foot in 600, the size is determined in the same way, and found to be 7-inch. Where the slope of surrounding land is steep, more than about 3 feet in 100, the rule is to add to the area of the flat one-third of the area of the steep shed. The sum gives the area for which drainage should be provided. Where the slope is less than about 3 feet in 100, little, if any, allowance is made for water from the surrounding slopes. The reason for this is that the natural gradient of the water table in soil back from drains is about 3 feet in 100, within, say, 36 to 48 hours after saturation. In our work at the College, we use this table exclusively, and we find it tallying with experience pretty uniformly. It is calculated on the basis of flushing sand from the tile, and when the circumstances of the case are such that we have to choose slower grades than 2 inches in 100 feet, we advise putting in catch-basins at intervals along the drain to catch the sediment and prevent blocking of tile.

In working out our drainage plans, the size of tile is the last point settled, the plan, the acreage, the grades, the kind of soil, being all determined in advance. WM. H. DAY.

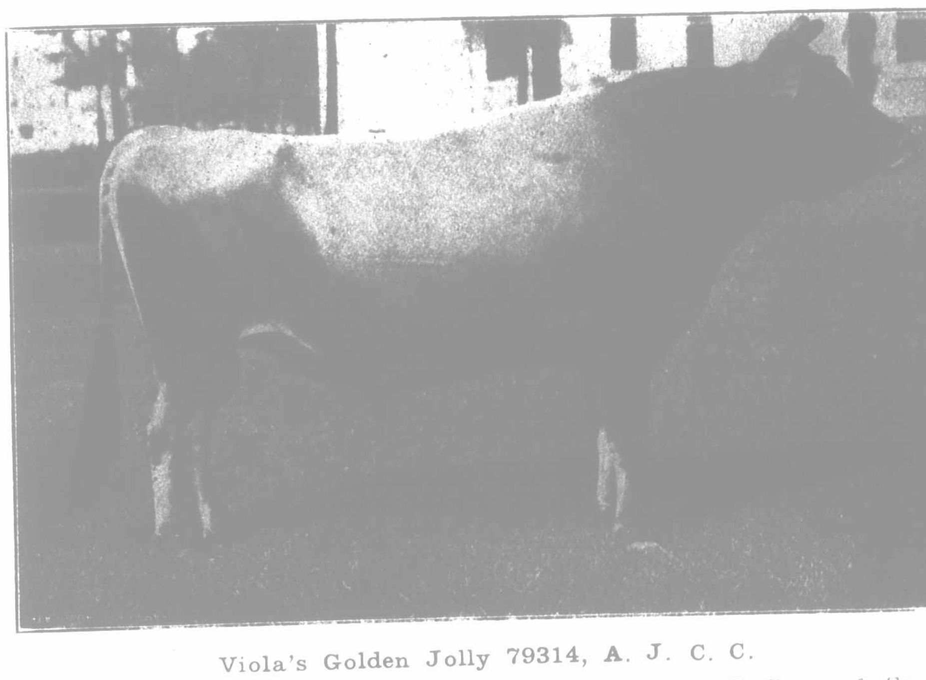
# THE DAIRY.

## Quality of Milk, Butter and Cheese.

Editor "The Farmer's Advocate":

There is a cause for the increasing amount of poor-quality creamery butter and cheese. It may be in part carelessness of farmers with their separators and other milking utensils, or partly with the creamery officials, or partly from the cream and milk not being properly cooled by an abundance of ice. But, to my mind, we have to go farther to find the real cause. I believe it is being brought about by our farmers substituting low-testing cows into their herds, because they give a larger amount of milk, for cows they had that gave less milk, but testing higher, hence of a better quality and flavor.

W. G. Medd and others are writing in "The Farmer's Advocate" that they think the cause of our butter and cheese makers not keeping up to their usual standard of quality, particularly of butter, is because of the carelessness of our farmers and their wives in not keeping the separator and other utensils clean. I must say I take only little stock in this uncleanly idea, for I believe our Canadian women are as carefully clean as any women under the sun. And I think the same thing can be said of our creameries, but there may be fault in their system of payment for milk, paying by quantity of milk, not by quality. I rather think, mostly, this is the case, or our farmers would be looking more for quality. My opinion is that this low-testing, thin milk is having the same effect on both cheese and butter, producing low-grade stuff. I have formed this opinion after many years of experience in the cream and butter production business on a dairy farm of about 40 milk cows of high-testing power. I have come to the conclusion, where the mistake lies is that our dairy farmers, to get the quantity, are putting in the Holstein and displacing the old Canadian-bred stock, many of which are high-testing cows. No doubt, the old blood is fast dying out, by the introduction of the beef breeds, which may not interfere with their richness of milk, but undoubtedly is destroying their continuance in the flow of milk.



Viola's Golden Jolly 79314, A. J. C. C.

Jersey bull. Bred on the Island. Imported in 1907, by T. S. Cooper & Sons, Coopersburg, Pa., and sold at their annual auction sale, May 31, for $12,000.

My contention is that, the higher-testing the milk is, the more cream it makes, the firmer cream it makes, hence the better texture, quality and flavor, on the same feed, for, no doubt, feed has something to do with quality, as well as quantity. The cow that gives a 6-per-cent. milk will make a much firmer cream, hence a better quality and flavor, than the cow that gives a 3-per-cent. milk.

I am pleased to read, in Mr. Medd's closing words, that he thinks the cow has something to do with the quality of our butter. I have thought this idea of high-testing milk making high-quality cheese and butter, higher than low-testing milk, should be thoroughly demonstrated and worked out at our experimental farms, and thus place our country where she should stand, ahead of Denmark or any other European country, in the production of cheese and butter of the very highest order. T. PORTER.

York Co., Ont.