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THE FARMER'S ADVOCATE.

best interests of the tree, and, therefore, judgment must be used in practicing them

Pear trees in the past have been more susceptible to injury than have apple trees, but there are many apple orchards in which there is a large amount of this disease, and, as it spreads rapidly and is very destructive, it cannot be handled too quickly. In most cases it is advisable to keep the pear orchard and the apple orchard separated from each other.

Cover Crops in the Orchard.

Text of an address by Prof. W. S. Blair, Macdonald College, Que.

Cover crops, and their value in orchard practice, has been discussed many times at your annual meetings. The only apology I have to offer for addressing you on this subject is that I consider it one of the many important operations in orchard management, which should receive more attention if we hope to produce fruit most economically.

The three methods of culture usually recommended in orchard practice are : First, the covercrop method ; second, the clean culture method ; third, the sod mulch method.

There are some who advocate growing trees in sod, but this is undoubtedly an unwise method; is adaptable to very exceptional conditions, and should not be recommended.

The cover-crop method, briefly, is to cultivate the ground from early spring until the first of July, sufficient to keep a fine-earth mulch on the surface, and at the time of the last cultivation seed to a cover crop which will produce a good math of vegetation to work under either in the late fall or the following spring. The clean-culture method is similar to the above, except that no cover-crop is grown and the ground is left bare, or to be occupied by an occasional weed after the last cultivation, early in July.

The soci-mulch method is to mulch, usually with manure, the area occupied by the tree sufficient to prevent great evaporation from the soil, and to keep all grass or weeds cut, not allowing them to grow taller than six inches, and letting this material also remain as a mulch. This practice is advisable if conscientiously followed, especially on hilly, rocky. or very open, gravelly soil; but what some growers practice and call the sod mulch method, I would call the large-hay-crop method. It is not the purpose of this address to discuss any of these methods, except to place clearly before you the cover-crop method of orchard tillage.

If the clean-culture method is followed, some means must be adopted to get humus into the soil. Without humus, our spils become unpro-Humus not only aids in conserving ductive. moisture, but gives, as well, a better mechanical texture to the soil. It lightens up heavy soils, and makes an open soil more compact. in the soil assures an ever-present supply of nitrogen, and prevents the leaching from soils of potash and phosphoric acid. Bacterial life in the soil is largely dependent upon humus, and we must not forget that these lowly forms of life are very large factors in rendering a soil productive

Commercial fertilizers do not add humus to the soil. They can only be used most economicaloil not deficient in humus, for otherwise, a continuous supply of available food materia not within reach of the plant. I do not mean to say anything against commercial fertilizers, for they can be used to advantage by the or-But what I want to impress upon you is that humus in some form is essential, and if the clean-culture method is followed, stable manure or litter of some sort must be used to fur-Manure is not available for many growers and besides, if cover crops can be grown in nish it. the orchard to supply the humus, and not be a detriment, but rather an advantage, to the growing tree or ripening fruit, why not make use of Many orchards are located on hillsides, and, if cultivated, a serious washing may occur during the fall or early spring rains, if not prevented by means of a cover crop of some sort.

the plant are supplied only after this want has our trees food as required, I think we would hear less about the winter killing of our bearing trees. The improper ripening of the tissues of a tree may be due to an excessive food supply, or excessive moisture conditions in the soil, or to a The temperature continued high temperature. and food supply are largely influenced by the moisture conditions, although a combination of these factors is responsible for late growth. The moisture conditions are, in a measure, within our control by the use of cover crops. In irrigated districts the grower has absolute control of this factor, and can ripen off his trees when he wishes by the withholding of water. We have no such absolute control in the use of cover crops, for excessive rains at a certain period may largely counteract any drying effect we wished to produce through the use of a cover crop that tends to dry out the soil.

The following table will give some idea of the relative drying effect of various cover crops. These experiments were conducted in our young orchard, and show the percentage of moisture in the soil in the middle of September : Millet, 7.24; oats, 10; rape, 10.1; winter rye, 11.6; crimson clover, 11.8; buckwheat, 11.8; red clover, 12.3; vetch, 12.8; no cover crop, 14.9.

It will be noticed that the strong-growing cereal crops and rape will run down the moisture content of the soil very rapidly, and for this reason they may be advisable in some cases. The out plot had 4 per cent. less moisture than the check plot growing no cover crop. Crops that form a dense math prevent evaporation from the soil, and this is one reason, probably, why the clovers and yetch do not so materially reduce the moisture content. It was found, also, that the thick-growing cereal crops reduced the moisture of the soil earlier in the season than the clovers, especially when the red clover, which requires a longer period to form much leaf area.

The following experiment, however, proves quite conclusively that the soil moisture conditions can be controlled more effectively by the date of seeding than by any particular cover crop. Crimson clover was sown on June 15th and on July 15th. The soil samples taken on the first of September showed 6.1 per cent. of moisture for the early seeding, as against 12.03 These results per cent. for the later seed plot. are what one would expect, and the date of seeding advisable for different sections and different types of soils can only be determined by conducting similar experiments in your section. After conducting various tests, we have settled on the last of June or early in July as the most suitable in our section for ripening young trees

If trees are carrying a good crop of fruit, there is little likelihood of the wood not ripening well, and it would certainly be unwise to dry out the soil too much by early seeding of the cover crop. For this reason, I advise later seeding in the bearing orchard-say, the middle of July. It is well, also, to keep in mind that cover crops make a much more rapid growth in a young bearing or chard where there is little shade, than in an old one heavily shaded, and the transpiration in protected areas is not nearly so great as in the unprotected.

I would say, also, that, whereas a cover crop may dry out the soil early in the season, that does not imply that the soil will continue dry until late fall and injuries from dry winter-freezing result, for our experiments go to show that, when a dense covering is formed, it so protects the soil that little evaporation takes place in the late fall, and the ground by fall will actually contain more moisture than the areas not so covered. Winter-killing of the root is more liable to occur in a dry soil. This is not of special consideration in northern sections only, for winter-killing is often caused by alternate freezing and thawing, which has greater range in a somewhat dry soil than in a moist soil, for the more water a soil contains, the less liable is it to frequent alternate freezing and thawing. Cover crops were first used for the purpose of keeping frost from penetrating the ground, and at the same time prevent alternate freezing and thawing. It will prevent the latter, as we all know from experience, and experiments go to show that a moderate mulch on the surface will keep the frost from penetrating less than half the depth that it will on unprotected area. frost renetrating the soil may not prove injuriouts, but alternate freezing and thawing must be guarded against.

long before plowing under, and rob the ground of been met. Were we to place within the reach of much moisture that might have been conserved, spring breakiast.

The following experiments, which 1 versionally conducted, show the effect of winter rye and red clover in reducing the moisture contents of the soil, as compared with the early-cultivated crimson clover plot. A plot of oats sown on an ad-joining plot on June 20th was also compared as to the percentage of moisture at different dates. These plots show how quickly the moisture contents of the soil can be reduced by crops in the orchard in the spring and early summer months.

| Sept. 20 14.91 10.01 Oct 31 21.33 19.77 26.02 19.71 | May 12 June 3 July 21 July 21 Aug. 4 Sept. 6 | 8.41 17.21 12.52 10.46 9.06 7.46 8.23 9.80 17.79 | und 200 10.000 10.000 10.000 10.000 100 1 | cloud | рэмоја тоца 18.93 18.93 14.04 11.65 11.22 12.06 10.36 13.66 20.22 19.87 |
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| | Sept. 6 Sept. 20 | $17.79 \\ 14.91 \\ 21.33$ | $16.99 \\ 16.31 \\ 19.77$ | 18.09 26.02 | 19.87 19.71 |

The clover plot was given clean culture, and no cover crop was used on any of these plots. The fall was a moderately wet one, and these plots each contained approximately 20 per cent. of moisture, which amount our experiments indicate is about right for the most successful wintering One of the bad effects of drying out the soil early in the spring is that the subsoil water is lost, whereas it would be retained for the crop later on, as it is this water on which the crop depends later in the season. The tabulated data show only the condition of the soil to one foot in depth, but soil to a greater depth would

show as great a variation. It is advisable, except in cases where the ground has an excess of nitrogen, to use leguminous cover crops. The crimson clover and com-Both of these make an mon vetch we prefer. ideal cover. The math is not objectionable at picking time, and it forms a good protective cov-We find that the clover can be worked under with greater ease, and for that reason we use it principally. The two mixed together are

Red clover does not make sufficiently rapid good. growth, in my opinion, and we do not use it, ex-We get a much cept in our comparative tests. better protective covering with the crimson clover, and a very much greater bulk of material to turn

A mistake is often made in using too little under Never use less than 25 pounds of crimson clover seed and 75 pounds of vetch seed per acre. In seeding to clover, we run over the ground

with a tilting-spike tooth harrow, sow the seed and harrow with this tool again, having the teeth upright, and again harrow with the teeth tilted, to leave a perfectly smooth surface. The seed can be safely worked in to a greater depth than is the case with the smaller red clover seed. In seeding vetch, I prefer to use the spring-tooth harrow, which leaves the soil more in ridges, and after

Nitrogen, one of our most costly elements of fertility, may be largely supplied through a leguminous cover crop, and the purchase of fertilizers confined to the potash and phosphate manures. If clean cultivation is followed, this free nitrogen cannot be secured. The above reasons ere. I think, sufficient to warrant one in advocating the cover-crop method of orchard cuitiva-

Let us now look at another phase of the subject, namely, the proper ripening of the wood for winter. Winter injuries may result from imexproper nourishment. Instances of the latter the best protective covers we have. are found in cases where there has been heavy cuitage, which drains the tree of its vitality, unss there is sufficient wood available to supply the growing tissue, as well as the fruit. Nature Greets all her effort first to the development of where all ner enort list to the development of ground early the following spring. The danger, and to perpetuate the species, and the tissues of however, is that we may allow them to grow too

It is usually not advisable to plow under a cover crop in the fall. There is much less liability to washing of the surface soil, and the mulching effect is better if it is on the surface. It also serves to hold the snow, which is one of

Personally, I think it does not matter whether the cover crop stands the winters or not. In fact, the only advantage that I can see in having one that will stand the winter is to dry out the ground early the following spring. The danger,

seeding this is again used, followed by the level-

I have never yet had any difficulty in getting a ling harrow. good catch from seeding on a properly cultivated area. If the ground is thoroughly dried out on the surface, there may be trouble, but in such cases I would advise working in the seed more

There are other points we could profitably disdeeply. cuss, but I feel that I have already taken up too much of your time.



Ringing a Bull-Two-furrow Plow. Editor "The Farmer's Advocate":

Have just received the June 15th issue of "The Farmer's Advocate," and, as it seems to be a thing of the home, or for the home, we are always anxious to see what the next paper has My wife always goes to her part of the paper first, and, to sum it all, I don't see how we could do without it, and only hope you may be spared long to keep it going.

Having seen in some of your columns about ringing a bull, I will give you my experience in that line. I am only a young farmer, but was born and brought up on the farm. In these days help is none too plentiful, and sometimes we are short of proper tools to do that kind of jobs It makes us lift our thinking-cap and scratch our head to find some way to get such things accomplished, and I think my plan appeals