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ORCHARD COVER CROPS

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Orchard Cover Crops

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The wide adoption in Michigan of orchard fertilization with nitrogen-carriers is tending toward neglect of cover crops. A few years ago so much was said about the nitrogen-gathering powers of leguminous crops that the notion has become fixed in many minds that this is the chief or only function of orchard cover crops and with the nitrogen requirements filled by chemical fertilizers many growers apparently think the need of a cover crop has passed. Possibly the dislike for wet feet on dewy mornings at picking time has had some influence, though this objection has not more force now than it had years ago. Whatever the reason, year after year many orchards go into the winter with only such soil covering as a chance crop of weeds may give. Horticultural history in this state shows that some of these orchards will go this way into one winter too many. Furthermore, chemical fertilization alone will not sustain soils in a productive state indefinitely. It is to set forth some valuable qualities of cover crops which are no less important now than they ever were and to point out the change in cover crop standards resulting from the adoption of chemical fertilization that this paper is published.

Fruitfulness in trees depends on reasonably vigorous growth. However, late growth is likely to lead to the death or serious injury of the trees from the ensuing winter, particularly if this winter happens to be as severe as several of those which have taken their toll in Michigan orchards. The fruit grower, then, is confronted with two problems, securing vigorous growth and preventing late growth. These requirements are, in a sense, antagonistic, for the cultivation and fertilization used to induce growth are likely to give it such an impetus that in some seasons it is unduly prolonged. Fortunately, the fruit grower can in some degree "eat his cake and have it, too." This he can do in part through the proper use of cover crops, in combination with cultural manipulations.

The tree makes its greatest growth shortly after blossoming. At this time, its requirements for moisture and nitrogen are great; consequently, competition with the tree should be slight. This is illustrated by the vigorous growth of trees in cultivated orchards, where competition from other crops is eliminated entirely. In most orchards, fertilizers evoke the greatest response when they are applied so that nitrogen is available in early spring, when, not only is the need great but the natural supply of soil nitrates is generally lower than at any other time during the growing season. A crop of small grains, starting at this time, competes with the trees for moisture and nitrogen; growth is checked prematurely to the detriment of tree and its crop.

Later in the season checking of tree growth is the very thing the grower wishes to accomplish. Consequently, the same crop that would have been injurious to the trees in the spring becomes a benefactor and an ally later in the season. As soon as it begins to grow, the crop starts the depletion of the available moisture and nutrients and as it grows larger the depletion increases; its competition with the trees increases and the growth of the trees is checked, so that they are enabled to enter the winter properly prepared to withstand cold weather.

The benign influence of the cover crop does not stop here. The mulch of vegetable matter insulates bare ground against freezing and thus protects the roots of the trees, which are more tender than the tops. It does still more. It holds the leaves as they fall from the trees, increasing the mulch, and it holds snow which would be blown away from bare ground. Thus it may provide a double insulation of the soil against excessive freezing. This effect has had extreme importance on more than one occasion in the history of Michigan fruit-growing and is likely to become just as important in some future winters.

When, with the coming of spring, the cover crop is turned under, it performs one more service for the trees. Decaying, it turns nutrients back to the soil from which it took them, and—what is much more important—it forms humus, which mellows the soil, whether it be light or heavy. This last effect is of great importance in many orchards on sandy land. Cultivation burns out humus rapidly and a few years of it may change a sandy loam to a sand, with unfortunate effects on the trees. Continued cultivation is not a safe practice unless it is accompanied by addition of humus-forming material, which in most orchards is accomplished most economically by turning under a cover crop. Experience has shown that soil may receive abundant fertilization and still fail to support an orchard because the humus has been exhausted by clean cultivation.

The gathering of nitrogen from the air by leguminous plants, some of which are used as orchard cover crops, is a fascinating subject. In extensive farming, where profits per acre are so low that fertilization with chemicals becomes disproportionately expensive, the use of these crops for fertilization is an old practice. Orchards, however, should have high enough returns per acre to justify the use of chemical fertilizer and the value of cover crops for this purpose is really small. One of the leguminous plants, crimson clover, has been shown to be wholly a consumer of soil nitrogen up to four weeks previous to its blossoming, which is nearly the time when it should be turned under if used as a cover crop in the orchard. Furthermore, it should be borne in mind that the tree's requirements are probably greatest at and just after it blossoms and any supply gathered by a cover crop would not become available at this time in great quantity. For this reason if nitrogen is needed it should be supplied in chemical fertilizer and the value of cover crops in this respect becomes a minor consideration and may safely be disregarded.

Many times a certain crop is stressed as valuable because it lives over winter and makes a quick lush growth early in the spring so that it apparently provides a great bulk of material to be turned under. When it is recalled that this lush spring growth is made at the expense of nitrogen and moisture taken from the soil in competition with trees when the trees' requirements are great and the supply of soil nitrogen low, the superiority of winter-surviving crops seems doubtful. The apparent bulk of the spring-

growing crop is deceptive; the actual dry matter in it is far less than it appears to be. Until evidence to the contrary becomes available, winter survival may be dismissed from consideration among the characteristics of a good cover crop.

Any crop, leguminous or not, that germinates well and makes heavy growth in fall, covers the ground thoroughly and stands up sufficiently to hold leaves and snow, makes a good cover crop for a cultivated orchard. If it stands a light frost, so much the better; if it kills out in the winter, better still. As a snow arrester, corn is excellent, but it does not protect the soil sufficiently against freezes when the ground is bare. As an insulator buckwheat is good, but it is likely to kill with a light frost early in the fall and thus lose its value as a growth arrester, and it mats down too readily to hold snow well. Millet is a good soil insulator and snow arrester, but it kills rather easily and in a cool summer, particularly in orchards where much of the ground is shaded, it does not grow well. Cowpeas mat down rather too readily. At present, oats sown about August 1 seem to meet the requirements as well or better than any of the common crops.