

# HOW SOME CURRENT PRUNING PRACTICES DEFEAT REAL OBJECT TOLD BY AGRICULTURAL COLLEGE EXPERT WHO HAS HAD MUCH EXPERIENCE IN WORK

Trees Often Overpruned and There Is Much Danger of Doing Work So That Bearing Capabilities Will Be Seriously Endangered—Training Tree to Look Well Not Real Object—Questions Which Must Be Left to Judgment of Person Doing Pruning—An Article Which Every Fruitgrower Should Read.

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Ask the average fruitgrower why he is in the orchard business and he will give you any one of a number of answers, depending upon how he interprets your question. He may tell you he is growing fruit as a side line, as an avocation; it may be that his health demands that he do outdoor work; possibly he was bought up on a fruit farm and thus came more or less naturally into the business. However, regardless of how they got started, most fruit-growers are in the business primarily what it will yield in the way of financial returns. The orchard may be a means of affording him a living. We maintain the orchard not primarily for its looks for the addition it makes to the landscape, but for what it can do. Our primary object is to take from it year after year the largest possible quantities of fruit of the best possible grades and at the lowest practicable cost. It is because of this that we cultivate, fertilize, thin, spray, prune and otherwise care for the trees. This being true, the value of any particular orchard operation of practice can be—and should be—measured by the way in which it influences yield, grades and cost of production.

If then, we ask the question "why do we prune?" our answer is that fundamentally we prune to get more fruit and better fruit, to increase quantity and quality or to lower its cost per box. At this point it may be objected by some that we also prune to secure a certain shaped tree. That, however, is a matter of training, and pruning should not be confused with training. Training has to do with the shaping of trees, with making them assume one form or another. We trim trees with open or close centers; with round spreading or flat tops; with many or few scaffold limbs; with high or low heads. Here it should be emphasized that training does not have to do directly with the functioning, with the behavior of the tree. This is, of course, far from saying that training is not important. A tree trained with an open center may be much better adapted to a certain soil, a certain slope and a certain amount of humidity than a close-centered tree of the same variety. The reverse may be true of the same variety under an entirely different set of conditions. But whether in training we secure a good shape or a poor one for a certain variety under our conditions, training has to do primarily with form. On the other hand we prune trees to so modify, to so control their fruit habits that larger and more regular crops of better fruit will be borne. In other words, we prune to modify function.

Broadly speaking, we can control the fruiting habit of fruit trees only in so far as we can control their machinery

for fruit production. The flower is usually regarded as the mechanism that the plant constructs for the ultimate purpose of fruit and seed formation, but flower formation depends to a very large extent upon the number of flower spurs or, as we call them, fruit spurs, present and upon their behavior. This is practically the equivalent of saying that the fruit spur is the real machine that the tree builds and through the operation of which its fruit is manufactured. Possibly exception may be taken to this in the case of bearing on one-year-old wood, but this rather extraordinary habit of some varieties (it is understood this discussion pertains only to apples and pears) is not general enough to seriously conflict with the statements made. At any rate the fruit spur is the mechanism that the tree usually employs in its work of fruit bearing. Without doubt many factors influence the initial development and the later health and vigor and regularity of functioning of fruit spurs. Indeed there are good reasons to believe that most of our orchard practices, such as cultivation, fertilization, spraying, the use of cover crops, etc., influence them either directly or indirectly—perhaps mainly indirectly.

Pruning, however, has generally been looked upon as a practice, almost as the practice, through which we directly influence fruit spurs. All fruitgrowers know that they can prune them out and thus reduce their number. Many believe that by this or that pruning practice they can stimulate their formation, or possibly increase their vigor or lengthen or shorten their life, etc.; and these beliefs are founded upon careful observation and experience. To just what extent the existence, the vigor, the health, the length of life and the regularity of bearing of individual fruit spurs are influenced by definite pruning practices, such as heading in, thinning out, summer pinching, etc., is far from being generally understood. In other words, we realize that pruning influences the fruit spur system of the tree, but we don't realize how it influences it nor to what degree.

At this point it will be well to consider what we really desire in the way of fruit spurs on our trees. Looking at the question from the viewpoint of their fruit spurs, when are our trees in the best condition? Do we want the spurs to be many or few in number? Large or small? Long lived or short lived? Should we aim to have each bear a fruit every year or every two years, or every four, eight or ten years? These may seem superfluous questions, but investigation will show that they are not. The trees in some orchards are full of fruit spurs, those of other orchards are relatively much fewer in number. The individual fruit spur in some orchards average an apple or a

pear once every two or three years; those in other orchards average a fruit only once in four or five or six or eight or even ten years. The average length of life of the fruit spur in some trees may be three or four years, in others thirty or forty years. These are extremes, of course, but they represent facts regarding the fruit manufacturing machinery in our orchards. Surely all of these conditions cannot be equally satisfactory. There must be some of these extremes that are distinctly undesirable. Possibly no extreme is desirable. What are the correct answers to the questions that have been asked? If the fruit-spur system of the tree is its mechanism for fruit production then it is reasonable that we should prune (1) to obtain as large a number of fruit spurs as possible, for within certain limits to be mentioned later, the larger the number of fruit manufacturing machines the larger will be their total output. And it is not also reasonable that we should prune (2) to keep the fruit spurs that we once secure in as thrifty, vigorous and healthy condition as possible, for the better condition a machine is in the better is the product that it will turn out.

**Pruning Practices That Encourage.**

Now let us ask what are the pruning practices that stimulate and encourage the formation of the largest possible number of fruit spurs and what are the pruning methods and practices that either directly or indirectly limit fruit spur formation. First, it may be mentioned that not a few fruitgrowers deliberately remove fruit spurs from the scaffold limbs of their trees. Of course many orchardists would never permit such pruning in their orchards, but it is far from uncommon. The writer well remembers visiting one orchard of over 5,000 large bearing trees where the new manager was having this done. The idea evidently was that the trees "look better" when they have perfectly smooth limbs, their surface unbroken and unmarred by irregular jagged spurs. Little thought was given to the fact that immediate and future yields were being reduced, that indeed the part of the tree best able to bear heavily was probably being rendered permanently barren. How many people pruning trees between the ages of two and five years prune with their future bearing habit and bearing surfaces in mind? Probably very few. Too many are inclined to think that at that age they are pruning simply to secure vigorous wood growth and proper shape. At that stage of tree growth these questions should be dominant, but that does not mean that future bearing habit should be entirely lost sight of. Especially is this true when pruning trees four, five and six years old. If the branches of young trees are pruned too heavily practically all the buds left are forced into growth. This necessitates severe thinning and severe heading back the following year; and these two processes kept up year after year for three or four seasons mean that but very few buds that can develop into fruit spurs will be left in the lower and central part of the tree. It is probably good practice to prune heavily trees that have been set one, two, three, four and occasionally five years. By this heavy pruning wood growth is greatly stimulated and a large, vigorous tree with good strong framework can be quickly grown. But when the time comes for the tree to begin to bear the kind of pruning employed should be entirely changed, for an entirely different type of growth is wanted. The energies of the tree are to be turned into another direction, or at least they are to be divided and part of them expended for fruit spur and fruit production. In terms of pruning practice this object is accomplished mainly by comparatively light pruning for at least a couple of years. Yet many orchards that are or have recently reached bearing age show that the one directing their pruning has figured (if indeed, he has thought about this particular question at all) that the same type of pruning that has been giving him excellent vegetative growth will in some way also give him fruit spurs, though other conditions have in no way materially changed. In hardly any other way can the frequent heavy pruning of trees between four and eight or ten years of age be explained. It sometimes seems as though we have a kind of blind faith that our trees will somehow come into bearing without much effort on our part and in spite of almost anything we can do to prevent it. Consequently we give little thought to pruning as it really influences bearing habit.

**Limits Fruit-Bearing.**

What has just been said regarding the limitation of the number of fruit spurs by severely pruning young trees applies with equal force to the severe pruning of bearing trees. In general heavy pruning greatly reduces the number of buds that can develop into fruit spurs, if it does not actually remove many, and also forces a large percentage of the buds left into vegetative growth. In extreme cases it forces well formed and properly functioning fruit spurs into leafy, non-fruiting shoots. It thus limits the fruit-bearing surface in four distinct ways. This is far from stating that heavy pruning is never desirable; but the fact should be emphasized that heavy pruning greatly reduces the amount of the tree's machinery for fruit production. The question is here raised, are not many orchards forced into wood growth year after year by the heavy pruning that they receive, when a lighter pruning,

or in extreme cases no pruning at all, would permit the development of much-needed fruit spurs? It should be stated here that by "heavy pruning" is meant just what the term implies, whether the removal of top growth consists in the taking out of a few large limbs or of many smaller ones, whether it consists in the thinning out or the heading back of branches or of both, whether the interior or the exterior of the tree is sacrificed. It may be that few growers prune heavily as a matter of choice. They possibly think they have to to keep their trees in "good shape," regardless of what this kind of pruning does to the fruit spurs. At any rate the fact remains that heavy pruning is an exceedingly common orchard practice.

From what has been said it might be inferred that no pruning at all will give us the largest possible number of fruit spurs, as the largest possible number of buds are left to grow into spurs and so many start that few can develop into purely vegetative shoots. Theoretically at least this is probably more or less true. Practically, however, it is undesirable to stimulate, or more accurately permit fruit-spur formation to proceed to that extent. This is because we desire not so much the greatest possible number of fruit spurs in the trees as fruit spurs that healthy, vigorous and in good condition in every way so that they will flower and fruit regularly for many years. The health, vigor and longevity of the fruit spur depend upon its food and moisture supply and upon the amount of sunlight it receives. It is possible for a tree to be so situated that there is not enough moisture and food present to supply properly all the spurs and their developing fruits. It is also possible for the upper and outer limbs to be so numerous and the growth they make so dense that many of the inner and lower branches, with their fruit spurs, receive insufficient light to keep them thrifty. Later these shaded spurs die off and the fruiting area of the tree is thereby reduced. Under these circumstances judicious pruning would so limit the number of spurs that there would be food and moisture for all, and the branches would be so thinned that enough sunlight would filter through the outer and upper part of the tree to keep the remaining parts growing vigorously. Just as too severe pruning reduces the number of fruit spurs, too little pruning weakens them, reduces their vitality, shortens their life and makes them function irregularly. The problem of the fruitgrower then is to maintain the proper balance between the number of fruit spurs and their health and vigor. He does not desire so many that some of them die out; he does not wish for so many that even though all live most of them bear irregularly. On the other hand, he does want as many as the size of the tree and its food and moisture supply can keep alive and healthy and bearing regularly.

**Some Questions.**

The question that we may now raise is, how do current pruning practices maintain life and strength and vigor of fruit spurs? How do they influence their longevity and the regularity with which they bear fruits? How do they maintain the proper balance between number and strength of fruit spurs? Do they allow too many fruit spurs or do they go too far in reducing their numbers? Do they keep the spurs strong or do they allow many to die? A partial answer has already been given to this question in discussing the subject of heavy pruning. Though possibly a smaller percentage of fruit-growers under-prune than over-prune, too little pruning is without question the direct cause of small crops and inferior fruit in many orchards. It is not necessary to visit a large number of orchards in order to find evidence of too light pruning. Dead and dying fruit spurs are very common, especially on older trees. There may be loss of fruit spurs from dense shading in over-pruned trees and there will, of course, be a certain loss from other perfectly legitimate causes (a. g. occasional injuries incident to picking) in very well-cared-for trees, but in general the dying out of many fruit spurs indicates too little pruning. The fact is that an exact balance between number and vigor of fruit spurs, between fruit and wood production in the trees, cannot be maintained. The best we can do is to maintain an approximate balance. The grower often falls far short of maintaining this approximate balance because he does not realize that there is a balance to maintain or does not appreciate its real nature. This is not because he does not spend enough time pruning. He realizes that it is one of the most important of his orchard operations. He perhaps studies the problem more assiduously than he does any other orchard practice. However, he does not approach the problem from the right angle, view it in the right light. He looks upon pruning as a means of obtaining a tree of a certain form, of a certain type, and bends the best of his energies toward that end. He uses pruning as a means of modifying form when it should really be a means of modifying function. Consequently he trains his trees instead of pruning them. In training them he may incidentally, or accidentally, prune them, and in the best possible manner, but if so it is more or less a matter of coincidence.

**Objects of True Pruning.**

Thus far an attempt has been made only to point out the fundamental ob-



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jects of all true pruning and to present one or two of the principles underlying pruning operations. Incidentally the inevitable results of too much and of too little pruning have been mentioned. It hardly need be added that the unpruned tree is not necessarily the best pruned tree; the much-pruned tree is not necessarily the best-pruned tree; neither extreme is apt to give the best results. In fact the contrary is most apt to be the case. The practical question at once arises, "how much are we to prune?" From the very nature of the question, or rather of the subject with which it deals, no answer can be given which can be taken as a rule to be always followed. It is the principles that have been discussed which underlie tree growth and fruit production that determine amount of pruning. Only as these principles are applied to each individual problem as it arises—in other words, to each individual tree—can the right amount of pruning be done. From what has been said it is evident that proper pruning consists in the removal of just enough wood to afford the largest possible number of fruit spurs, a good supply of light and food, and consequently keep them growing vigorously and pruning regularly. A tendency on the part of the tree to produce watersprouts and other wood growth at the expense of fruit spurs indicates that too heavy pruning has already been done. Irregular bearing and dying out of fruit spurs indicates that too little pruning or pruning in the wrong part of the tree, or both, have been faults of recent years. Lighter pruning in the first instance and heavier pruning in the second instance are the correctives. The person who prunes should glance quickly over the tree, judge quickly and accurately of the balance (or lack of it) that exists between vegetative growth and fruit bearing surface, and then proceed to restore or maintain this balance. In its last analysis the question of amount of pruning becomes a question of judgment. Rules cannot be given, or if given they are almost worse than useless. They mislead as often, or more often, than they lead aright. Principles governing amount can be more or less thoroughly understood and then applied to individual cases. Principles are always the same.

**Question of Kind.**

Pruning is not only a problem of degree, of amount, it is a question of kind as well. That is to say, the fruitgrower not only needs to know the principles underlying the amount of pruning to do, but of equal importance is the question of how that amount shall be done. Having determined upon the right amount of pruning, shall the grower thin out or head back? If he heads back, shall he head many branches a little or shall he head back a few severely? If he thins out, shall he take out a few large limbs or many smaller ones? These questions cannot be considered entirely apart from the question of the number of fruit spurs that we desire, or their relative strength, apart from the question of training. Manifestly the thickness and density of growth which is modified by thinning of one kind or another, bears an important relation to the health and vigor of the fruit spurs, especially those in the lower and central parts of the tree. In general it may be stated that heading in tends to thicken the top, while thinning out, as the term indicates, thins it. Thinning, of course, in addition to reducing the number of actual or potential fruit spurs, lets in sunlight and thus tends further to keep the remaining ones healthy and vigorous. Heading in, on the other hand, while reducing the number of actual and potential fruit spurs much like thinning out, really tends to afford less light to the spurs on the inner and lower limbs, and thus is apt to reduce rather than to increase their vigor and longevity. Though heading in acts as a stimulus to the development of buds that are left; and thus

in one way forces lateral growth thinning also encourages lateral growth through the removal of branches that would otherwise check it. In other words both practices are a stimulus to fruit spur formation, heading in being the greater of the two. Of the two, thinning is probably the greater aid in increasing the vigor, longevity and regularity of bearing of individual fruit spurs. Consequently if it is a greater number of fruit spurs that we need, thinning and heading in should be combined. If we have enough or too many fruit spurs and wish mainly to increase their vigor, longevity, and regularity of bearing, thinning is the practice that we should mainly employ. This is again the equivalent of saying that principles, and not rules, should determine the kind of pruning that we should do. Good judgment is as necessary in deciding between heading in and thinning out as in deciding upon amount of pruning to do.

**Methods of Training.**

Though this article does not deal with training, a word is in place regarding the relation of pruning to methods of training. The two subjects are quite independent and this fact should be emphasized. The one has to do with form, the other with function. The grower should not confuse the two. He should realize that there may be much pruning and very little training; and conversely much training and very little pruning. A tree may be well pruned almost regardless of the way in

which it is trained. To be more specific, the open or the close-centered, the high or the low headed, the round or the flat-topped, the spreading or the pyramidal tree may be well pruned or it may be poorly pruned. It is not the object of this article to minimize the importance of training or to encourage one type of training over another. Good training is desirable; it means much to the fruitgrower. At the start he should study carefully the advantages and disadvantages of the different systems of training and use his best judgment in deciding upon which one is the best adapted to his variety or varieties as they grow naturally under his conditions. When the system of training is once settled let it remain settled, for if the right system has been selected for a certain set of conditions there will be no reason for changing it. The attention of the grower can then be turned to a study of the few simple principles underlying all pruning and to an application of these principles to the problems that his individual trees present.

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