BETTER SEED FOR FOREST PLANTING IN THE SOUTH FROM NATURAL STANDS

(Floyd M. Cossitt)

I want to talk about obtaining seed from natural stands and superior individuals among them, which, after all, must be relied upon as the basis for the planting programs for a long, long time. No one has any expectation that hybrids will replace natural seed; rather, these should be considered as an addition. This in no way minimizes the importance of securing the best possible seed from such genetically superior plant material which may be found among the now existant trees.

Phil Wakeley has already given you a clear, concise picture of the importance of the geographic strains which have been found. Obviously, everyone should be governed by these findings in the selection of seed for the huge planting program now under way. No one realizes more keenly than I of the need for more data.

From a practical standpoint, it is not always possible to obtain seed from the desired geographic strains. Seed crops are extremely variable, ranging from complete failures to bumper crops. A long-range seed procurement with proper cold storage facilities go a long way in maintaining adequate seed supplies. Unforeseen contingencies such as changes in field planting programs, extraordinarily long periods between seed crops, nursery catastrophes requiring re-sowing a crop, frequently create seed shortages, which, in turn, result in an unbalanced nursery sowing schedule. With our limited knowledge of the outer limits to which seedlings can be moved from their natural locale, it is inevitable that some will be moved too far for best results. Those responsible for planting programs are always under pressure to supply seedlings for all and unless due consideration is given to seed provinces there iS grave danger of making serious errors. The ideal would be to have a never failing supply of seed wherever and whenever we want it. Such, of course, is only wishful thinking.

There is, however, increasing evidence that we can, through proper management and possibly fertilization, increase the seed yield in a managed stand. Given ample room, trees will produce larger quantities of seed three years after release regardless of the general level of seed production for surrounding stands. Heavy crops have been observed in the fourth and fifth year after release. Just how long the seed crops will remain at a high level remains to be determined. A series of planned released cuttings would be of material benefit to those responsible for seed procurement.

Let us review briefly the standards which may be observed in releasing a stand for seed production. These are:

1. Leave the best well formed trees with ample space around each seed tree.

2. Remove all trees which are not good seed producers.

3. Remove all associated species which would interfere with economical collection.

A vigorous young stand, well located on level or gently rolling topography, is preferred to older stands on rough terrain. I feel that cone collection costs can be reduced by the use of mobile extension ladders where the topography is favorable and the quantity of cones great enough.

Experiments are now under way using fertilizer to stimulate seed production. There is some evidence that trees will produce more seed, particularly in "off years" - that is, in years of generally limited seed crops. Furthermore, the quality is better; seed is larger and the yield per bushel of cones is greater. The direct ratio of large plump seed to the vigor and rate of growth of the resulting seedling is a well known fact. I would like to see the results on seed production of a released and fertilized stand.

It is not expected that released trees or fertilized stands (if this proves to be an effective measure) can furnish all of the seed needed for a large sowing schedule. The bulk of the seed must come from other areas in years of bumper seed crop. Their greatest service would be in "off years" when seed may be badly needed for a given locality. In fact, the cost of treatment and maintenance would be returned in a very short time by reduced collection costs, particularly when nurserymen must pay from $4 to $10 per pound for seed from any source.

We have been considering the collection of open pollinated seed from trees of good form. In other words, a "run-of-the-woods" source. Now let us turn our attention to laying the groundwork for improving the quality of such seed.

In natural stands we find at rare intervals a beautiful specimen with outstanding form, a fast rate of growth, free of disease and insects- altogether an ideal tree. The question now arises - Is this tree superior because of environment or is it truly genetically better than its neighbors? Is it superior enough to justify being considered as a distinct improvement over its associates? If it is strictly environmental, then there would not be any advantage to using it as the basis for superior progeny.

In testing a tree for superiority a number of measurements are made on which to judge its worth. I shall not recite all of them here but essentially it is to determine if it is actually a better tree. Such measurements include age over height compared to at least four dominates in the same stand. The rate of growth must be superior to all of its associates, its form and height well above that of the dominates. If the candidate passes, then we must know: Is its superiority due to environment? If it is due to this, then we have no further use for it.

Obviously, we cannot pick up the tree and move it to prove the point, but we can test it genetically in a new location by grafting and growing an offshoot in a designated seed orchard. Grafting and rooted cuttings are proven methods of perpetuating selected plant material and permits the testing of identical material in several localities. By a series of tests a tree can be established as an elite specimen suitable as a base for both open and controlled pollination within the species, hybridization as desired, and the source of pollen for crosses in other locations.

I would like to say a word about the lay-out of the seed orchard. Incidentally, a plantation composed of candidates for the elite classification is, to me, truly a seed orchard. The lay-out of the seed orchard should be such as to permit the rogueing of trees which do not pass the environmental test in its new location. There are going to be a number of these regardless of how ruthless the candidates are culled in their original location.

Another method of securing superior progeny would be through controlled pollination. When two superior trees have been elected to the elite classification through the seed orchard method, it is entirely practical to control the parentage for a limited amount of seed.

Plantations from such seed could then be established for further testing and if they proved to be superior, they could be used as a source of open pollinated seed. Again, rogueing of poor and fair trees would be an essential step as soon as they can be determined. Here, at least, one of the parents would be of proven origin. There is some evidence that progeny from one superior parent yield a higher percentage of good trees than those from unknown parentage. This may not apply to all southern pines, but apparently slash pine can be improved in this manner.

It is natural to ask - why not extend this practice to all southern pine species? If it is true for slash pine, wouldn't it hold good for other pine in this section? In this way, progeny would be assured of at least one good parent.

The theory must be tested before it can be accepted and, at the present time, there is no agreement among geneticists on this point. It is argued, and rightly so, that genetic superiority must be proved before it can be assigned. Form, good growth rate, and other desirable attributes, due to environment, are not transmitted to their progeny. Testing of all superior individuals is an important point in the study of genetics. In the meantime, we can and should include the poorer trees, since there is a wide variation in plant material. We will, in this way, be assured of better-than-average seed.

In summary, I would like to point out that natural regeneration obtained from open pollinated seed is going to be a potent factor in forestry for a long time to come. It is reasonable to think that if superior strains are developed these could be planted even in well stocked areas and reserved as seed trees for several rotations.

I want to emphasize that the development of better strains of trees for seed production is an important phase of the tree improvement program. It should be parallel to the development of suitable hybrids. Relatively small gains made by judicious manipulation of genetically superior individuals has the potentiality of increasing timber growth over a large acreage. Returns may be as great or greater than increasing the yield through the use of hybrids on a more restricted acreage. Both phases have their place in our consideration of the problem.