APPRAISAL OF FOREST TREE IMPROVEMENT ACTIVITIES

FROM THE VIEWPOINT OF FOREST INDUSTRY

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I have been a consulting forester for 18 years in the South, but most of my acquaintance with tree improvement has been from the outside looking in. It is from that position that I would like to talk to you this morning and give you some viewpoints on the tree improvement pro gram as it has developed in the South.

What has brought about the acceleration of interest in tree improvement in the South? If we go back to the mid-1930's, forestry as we know it today was being practiced in very few places and on a very small scale. Land was cheap. Large tracts, well-stocked with young timber, were sold to the National Forests for $1.00 or $1.50 per acre - lands which are today worth $50 to $200 per acre Lumber companies tried to avoid acquiring land when they bought timber deeds. Paper companies leased land for 99 years for 10 cents per acre per year. Foresters were paid as little as $80 per month.

But there was a gradual awakening to the potential of small pine trees and the future value of well-stocked lands. The Civilian Conservation Corps was a strong influence in the spread of interest in forestry, and in about the same period were begun the first major efforts to reduce forest fires. Lumber companies which thought they had only 4, or 5, or 6 more years of cutting found that by careful planning they could operate on a sustained yield basis. Land and young timber growth became marketable commodities, and the thousands of acres which had gone to the states for delinquent taxes, were redeemed or purchased in tax sales. Southern pine timberlands sold for $1 to $5 in the late '30's, $5 to $25 during the war, $25 to $50 in the years right after the war and now competition is such that prices have gone out of sight. Bare land sells for a minimum of $20 and in some areas as high as $50, and land with a fair stand of timber starts at $100 per acre and goes up from there.

Tree improvement became important when land became high-priced and in short supply. Forest industries could sit tight on quite a few acres of nonproductive land when it was worth (if anything) only a few dollars on the open market and when they did not need it for their own supply of wood because they could purchase farmers' wood at a low price and in sufficient quantities. Then, as more and more pulp mills moved into the South it became obvious that these bald or understocked lands must be put into production to offset the cost of holding the land, to obtain a suitable return on the market value of the land, and to provide the wood which this blossoming pulp industry was going to need. Consumption of pine pulpwood increased from 3.7 million cords in 1937, to 7.6 million cords in 1946, to 15.5 million cords in 1968. The price of pine pulpwood f.o.b. rail car climbed from $3.15 in 1937 to $10.91 in 1947, to $15.39 in 1956. The price of bare land of average site climbed from tax delinquent in 1937 to about $10 in 1947 to $25 today. The program of tree planting followed much this same pattern. By 1931 in the whole U. S. there had been established only one and one-quarter million acres of acceptable plantations of all ages. In 1958-59, the South alone planted over 1,000,000 acres—the State of Georgia produced nearly 250,000,000 seedlings.

However, in the rush to make forest lands productive by artificial planting and seeding some bad mistakes have been made. The major emphasis has been on quantities, and quality has suffered. The various species of Southern pine have been planted on each others sites. Loblolly has been planted on large areas which have a history of destructive tip moth infestation. Species have been planted out of their ranges, with planting stock from other regions, with seed from other localities, and with seed from inferior trees.

Then our research began to catch up to our practices and tree improvement men, among others, impressed on us the eventual high cost of these unwise practices. Tree improvement programs, conferences, papers, publicity have made all foresters more quality-conscious and more and more attention is being given to seed source and seed quality, and to 'plus' trees and cutting methods. The major landowners and forestry schools are cooperating in research and action programs, seed orchards have been established and it is possible that within a few years most nursery stock will be raised with seed from carefully selected trees. As an example of the work being done by the large companies, St. Regis Paper Company and 9 other companies are in the Cooperative Forest Genetics Research Program at the School of Forestry, University of Florida. The St. Regis forester says, quote "Through support of this program, the Company indirectly participates in and receives benefit from the investigative work being done by forest geneticists at the School in several phases of tree improvement. In addition to sharing in the results of basic research work, the Company's program receives guidance from the applied research in the fields of tree selection, grafting, seed orchard management, soils management, handling of seed production areas, and so forth.

"The most tangible, immediate and direct benefit of the Cooperative Program has been, of course, the production of grafted stock by the University from scion material furnished by the Company, for outplanting in the Company's seed orchards."

This company has at the present time selected 145 slash pine trees as plus trees, and cuttings from these trees have been grafted to provide 1,200 plants for their three seed orchards at Pensacola, Florida.

In addition, 17 natural seed production areas have been chosen which total 240 acres. Seed from these two sources will be used in the Company nurseries which last year had a capacity of over 30,000,000 seedlings.

The status of tree improvement in the South is best presented in the foresters' own words. I questioned a large number of Southern forest managers recently and the following quotes are from their letters of reply:

" We are engaged in supplementary research projects with the University of Florida, North Carolina State College, and the U.S. Forest Service on fertilization and liming seed orchards, effect of fertilizing and girdling on seed production, correlation of Juvenile characteristics with mature characteristics, etc. In addition we are doing research on fertilization of seed production areas aerial spraying for control of cone insects, use of systemic insecticides, a company geographic seed-source study, etc."

"In the paper industry, we are looking for trees that show superior traits, primarily rapid growth and high density or specific gravity. At this time, we have located upwards of 100 trees that we feel are the best that our stands have to offer. At least, that we can recognize. These trees are selected probably from one in a million trees."

"All of our seed comes from known sources even though we could purchase seed slightly cheaper."

"Some 1,100 grafted scions ha been planted at 30' x 30' spacing in our seed orchard. Although some sporadic flowering has occurred and specific crosses started, sufficient flowering for significant crossing and progeny testing is not expected for 4 or 5 years. Full production of seed from open pollinating (within the orchard) is hoped for in about 12 years."

"Seed eventually produced from our orchard should, we believe, average of superior quality to run-of-the-woods seed. Even with no genetic improvement, we will at least have a concentrated, easily harvested, annual crop of good full cones-sufficient for our planting needs.

" Currently seedlings for our planting program are being "custom-grown" by state nurseries from our seed. This year, for the first time, seeds were entirely from south Alabama and south Mississippi seed sources. We hope to improve on this by collecting increasing proportions of our own cones from the better trees being cut in the course of routine timber sales."

"This orchard had approximately 700 grafted trees, which were accepted under a very rigid grading system. We propose to have six different geographical strains and species located in this orchard, totalling 76 acres in all. We plan to use 16 clones and will have a total of almost 4,000 individual trees when the orchard is fully stocked."

"We recognize the fact that the tree improvement program in slash pine will not pay off for some years to come. In fact, most of our plantations will be established before sufficient seed is obtained from tested. trees to give us much benefit. We look forward, therefore, to worthwhile returns from a succeeding rotation and on into the future."

"We have spent considerable time and money on a tree improvement program. We have no assurance that this will pay off; however, we be lieve in it firmly enough to continue every effort in this direction."

"Industry personnel should keep abreast of the major work being done on forest tree improvement and industry should contribute money to these programs that show the most promise of producing trees of better quality and with improved growth characteristics. Industry should fully cooperate in these selected programs to carry on 'pilot plant' studies and make growth and quality data available to the program directors."

"One of the greatest shortcomings of the program is the general lack of knowledge about pine trees or techniques. No one seems to know if or how much to fertilize, whether or not cover crops should be planted, whether or not bud pruning should be done, intervals of spraying and spray techniques for insects and diseases, the advisability of irrigating, and several others. Much basic material is still needed concerning the physiology of the pine tree and the application of practical orchard techniques for superior trees."

"Many companies have invested considerable sums of money in their individual tree improvement programs with the establishment of seed orchards[3] subsequent to the rather costly selection of plus trees in the woods. With this in mind, and speaking as a forester, I trust that no basic principles have been overlooked sufficiently enough to endanger the success of these programs. Foresters, and forestry generally, apparently enjoy a high degree of confidence on the part of top-management at the present time. Should top-management be disappointed in the outcome of certain high-cost programs, it would probably throw the entire profession into a bad light."

From these very revealing statements, it is obvious that Southern foresters put much faith in tree improvement and are working on expensive, long-range programs. At the same time a few doubts creep into their statements and it is on these doubts that I want to base the rest of my paper. I would like to offer a few suggestions to forest geneticists which, if followed, may make their progress with forest industry even more favorable.

First, taking a clue from my last quote[9] be careful not to oversell. The geneticist must be sure that the possibilities and limitations of his work are thoroughly understood by those who would put it to use in their forest management. Tree improvement has great attraction for the owners and general managers of industry. In their hands are the major policy decisions and the purse strings for capital investment and we must not lead top-management into high-cost tree improvement programs without careful explanation of possible results and the chances for success or failure.

This leads to a second point--the difficulty and time involved in developing proven qenetic superior trees is not clearly stated in enough of the literature, and certainly is not carefully explained to the average woods forester. Most foresters, including myself, and therefore I am sure most non-foresters in our industry, have been led to believe that the selection of plus trees, and the establishment of carefully designed seed orchards with grafted stock from these trees will result in a supply of genetically superior seed. This is not necessarily so. One loose statement, such as the following, can go a long way toward misleading the non-experts. It is a quote from a forester who is explaining the tree improvement activities which he conducts for his company. "Genetic control is exercised through seed selection and grading of nursery stock."

We need to know more about the relative improvement in our trees which can be expected from each practice. For instance, what measure can the geneticist now give us for tree improvement results from each of these practices: selection of seed trees and seed; selection of nursery stock; seed from controlled parentage in seed orchards; seed from carefully controlled hybrids?

Third, there needs to be much more light shed on the relationship of tree improvement to forest improvement by all other means. The forest geneticist is the relatively new member of a team which includes among others ecologist, soil scientist., entomologist, pathologist and silviculturist0 This team must constantly review our forest practices and planting practices and assess for us forest managers the long-term results of our actions--the losses which may be expected from our mistakes. For tree improvement to produce the greatest benefits it must he dovetailed in with improved practices in all realms of forestry.

Actually, one of the greatest contributions of forest genetics and tree improvement programs to date has been to make us foresters keenly aware of our shortcomings and casual ways and to inject more precision and scientific method into all of our operations. But we need to know what portion tree improvement should take of our annual budgets, our manpower, and our land area assigned to research.

Finally, we are interested in total results. What and when will tree improvement contribute to the health and welfare of the forest economy. Although there are many excellent programs now under way to provide a source of improved planting stock, it will be several years before this stock becomes any significant part of the more than one billion seedlings planted out annually in the South. There has been no estimate of the time needed to provide proven genetically superior seed for the planting requirements of even one species. And what of the forests which are seeded naturally? Lest I give the impression that the quality of Southern forests will be controlled by the billion planted seedlings, it should be realized that hundreds of thousands of times as many are seeded naturally. Artificial regeneration will eventually be done with seeds and seedlings which should have a better chance for survival, more possibility of rapid growth and acceptable wood qualities, and perhaps more pest resistance. These planted areas will therefore be more productive than if made with haphazard and uncontrolled seed and planting stock. They will be our bank of future superior trees and of parents with genetic history and in ages to come we may have the entire forest under control.

We need to know when the tree improvement programs will produce results and we need a measure of what these results will be.

John Duffield says that forest genetics offers foresters a chance for survival. Forestry and forest products are running a race with economics, with competitive products, and with clouds of insects and new diseases. Forest genetics offers us some possible solutions to these very serious problems. Not only in the South, but in the West, in the Lake States and in New England, genetics is being recognized as a vital segment of forestry and forest management and will increase in importance as forest management is intensified. It is obvious that the long-range future of the forest industries depends on tree improvement. Let us so manage our plans, programs and reports that we will continuously merit industrys support and appreciation.