The Establishment and Management of Seed Production Areas

Donald E. Cole 1/

This discussion will concentrate on current methods in the establishment and management of seed production areas and will be confined to slash and loblolly pine.

A seed production area is defined as "a natural or planted stand or group of stands, set aside, periodically rogued, and treated to stimulate seed production. The genetic quality of the seed is not known (11)". The purpose of a seed production area is to provide, in quantity, seed of known origin from the best phenotypes available. The establishment of seed production areas is a stop-gap measure, designed to provide seed of the best possible quality until our seed orchards begin to bear.

While opinions differ as to the degree of improvement to be expected from seed from such areas it is of considerable benefit just to have seed of known origin and to have seed collection concentrated on specific areas. Perry and Wang present calculations to show that seed that is only one-half of one percent superior to the average would, under the conditions they have assumed, be worth an extra $4.52 per pound. They also say, in speaking of seed production areas, that "when racial variation is taken into consideration, it is highly conservative to assume genetic improvement of at least two percent over the use of wild type seed of unknown geographic origin and unknown parentage. A two percent genetic improvement, by the calculations of this example, permits an expenditure of $18.93 extra per pound of seed... (9)" This would seem to be ample justification for the trouble and expense involved in establishing these areas.

In Georgia the most important change in the establishment of seed production areas is in the greatly increased emphasis on the quality of the trees left for seed production. The purpose is to secure, through the selection of good seed trees, all the improvement in genetic quality that is consistent with quality seed production. Only the best trees are left, their quality being judged by their bole form and crown characteristics, freedom from disease, and vigor. The change has been caused by the adoption by the Georgia Crop Improvement Association of standards for the certification of forest tree seed; this has focused our attention on seed quality and has provided a set of standards for choosing the seed trees.

This emphasis on quality is important since the selection of the original stand and of the trees to be left on the area and its isolation zone determine

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1/ Gair Woodlands Corporation, Savannah, Georgia

the degree of improvement in genetic quality that will be obtained. We can't be positive that any improvement in genetic quality has been effected until these areas have been progeny-tested; but surely this will counter the dysgenic effect of using seed collected without regard to its parentage or origin. We are confident enough of the benefits that we plan to continue until we are securing all of our seed from certified seed production areas.

What sort of stand, then, makes a good seed production area and how is it established? In selecting a stand for this purpose, the most important requirements are that it be a well-stocked stand of good quality that has not suffered any sort of highgrading and that it be so located that an isolation zone of the proper width can be established on all sides (Georgia Crop Improvement Association Standards specify a 400 foot isolation zone). In addition, the trees should be large enough to produce fair cone crops (12" dbh, or more), the stand should be on a soil type and topography that is fairly typical of the area to be served, it should be as accessible as possible, and finally, it shouldn't be too small. a stand as this would tie up a disproportionate area in the isolation zone.

The next stop is to mark the area and its isolation zone; the same criteria are used on the isolation zone as on the seed production area. This is a very important step, of course; our practice is to follow the Georgia Crop Improvement Association standards rigidly in selecting seed trees and then to leave every tree that meets the standards, regardless of spacing. This has given us about fifteen trees per acre in twenty-five to thirty year old slash stands; older stands would probably have fewer trees. The distribution is somewhat patchy but not excessively so if the original stand is well stocked and of good quality. It has been suggested that preparation and management would be simplified if the isolation zone was clearcut and planted with a species that won't cross readily with the species on the area but we feel it is important to leave as many trees as possible there to improve the pollination of the trees on the edges of the area. The first crop pollinated by the marked tree is ready two years after release and the crop should increase to a maximum about the fifth year after release; it may level off or decline after that (13).

Once a seed production area has been established, a number of practices can be used to increase seed yields and facilitate operations. Probably the most promising is the application of fertilizers. A number of reports show that fertilizer applications will increase seed yields (1, 6, and 12).

Considerable research is underway on the techniques of fertilizing seed production areas (and seed orchards) but little of it has been reported yet. The best procedure is to have a soil analysis made, submit the results to a qualified soils specialist, and follow his recommendations.

It is also known that girdling, root pruning, strangulation, etc. may be effective in stimulating seed yields (6, 8, and 12). However, there are also

reports that these treatments may reduce the vitality of the trees and even result in the production of fewer cones, in the long run, than no treatments (2 and 7). The loss in vitality is probably the result of too severe root pruning and girdling and it is likely that methods of light root pruning and partial girdling can be worked out that will stimulate seed production without much loss in vitality. But until we have a better idea of the long term effect of these practices we shouldn't apply them on a large scale.

Cone losses to various insects (and in some parts of the South, to disease) are serious but other papers are being given on these subjects. However, I will say that we badly need an effective chemical with greater residual effect); perhaps one of the systemics now being tested will prove to be satisfactory.

Understory vegetation will have to be controlled on these areas in order to reduce competition and facilitate operations; pine reproduction, hardwoods and shrubs should all be treated. The methods adopted to do this will vary with conditions but will probably involve regular prescribed burning and/or cleaning with a rotary mower.

Finally, we come to the most difficult problem involved - harvesting the cones. Some of the harvesting from seed production areas, especially loblolly areas, has been done by cutting the trees and collecting the cones from the felled trees (3). However, the difficulty of finding a succession of stands good enough to make seed production areas is forcing many companies to collect from the standing trees so that the same areas can be kept in production for several years. L. T. Easley, of the West Virginia Pulp and Paper Company, reports a cost of $3.16 per pound (or about $3.35 per bushel) when his crews collected from standing slash pines four years after release; the average yield per tree was about 0.9 bushels. 2/ Our company had had no experience with collecting cones this way so we had it done by the Davey Tree Expert Company; results were satisfactory and costs, the final week of operations, were $4.50 per bushel on a slash seed production area three years after release; the average yield per tree was 1.1 bushels. Goddard reports a collection cost of $4.77 per bushel on a loblolly seed production area three years after release; the average yield per tree was about 1.5 bushels (4). In all three cases, the climbing was by means of ladders and ropes and a considerable amount of time was spent in climbing and moving ladders. Climbing with spurs and ropes has been reported as the most efficient means of cone collection (7); this would eliminate the need for labor to move the ladders, speed the actual climbing and since the climbers would decend from the trees on their ropes, the spurs probably wouldn't damage the trees too much. This method shows enough promise in reducing costs to be worth investigation. Cones have also been collected from the bucket of a dragline and it has been

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2/ Personal communication.

suggested that cones might be collected by an operator suspended from one or more balloons tied to a vehicle that could move the balloons about as needed; other methods have been suggested and will undoubtedly be tried in an effort to reduce cone collection costs.

Yields from seed production areas vary in bushels per tree and seed per bushel and also from year to year on the same tree or area. Such factors as spacing, diameter, crown length, period of time since release, inherent fruitfulness, insects, and disease and climatic conditions all have significant effects. The number of cones that is set as the minimum that will be climbed for also has a marked effect on costs and yields; 300-400 cones per tree has been suggested as the minimum for loblolly (4); probably 300 cones per tree would be a good minimum for slash. Since a minimum has to be set, it is apparent that some trees are not producing very heavily, at least in the first years after release. The general opinion seems to be that most of these trees will improve as producers as release and fertilization continue to have their effect. The reported yields per individual tree range up to 3 bushels (4) (commercial collectors have stated that they have collected as much as fifteen bushels of cones from a single open grown slash pine); it would appear that we should be able to average two bushels or more of cones per tree if the trees are large enough, if the proper fertilizers are applied, if steps are taken to control cone insects and diseases, and if enough time has passed for release and fertilization to have full effect.

In summary, then we can say that seed production areas can provide us with seed of the best quality that will be available until our seed orchards begin to bear, although we don't know the degree of genetic improvement to be expected from such seed, the evidence available indicates that the results will justify the costs involved. Collecting cones from the standing trees, although more expensive than collecting from felled trees, is not too expensive considering seed quality, particularly if climbing is restricted to trees with a bushel or more of cones, and it permits collection from the same area for a number of years. Fertilization and the control of cone insects are two promising methods of increasing seed production but more research is needed on both methods. Finally , we need to test the progeny from these areas so that we will have an indication of their genetic worth.

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