THE PENNSYLVAN TREE IMPROVEMENT PROGRAM

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The Christmas tree industry for many years has been trying to meet the demand by consumers for higher-quality trees. For growers to stay in business, it is mandatory that they provide for the gradual and consistent improvement in their product. This problem is a basic one to most manufacturers who are competing for the consumer's dollar with other manufacturers of the same product or a substitute. The Christmas tree industry is no exception. Its "substitute" is the artificial tree which in some areas has made some significant economic inroads. The problem can be simply stated another way -- there is a growing demand for better quality and more efficient production of natural Christmas trees. It was this basic need that led to the creation of PENNSYLVAN.

The PENNSYLVAN Program is a down-to-earth tree improvement venture organized through the Pennsylvania Christmas Tree Growers Association (PCTGA). It was conceived through an interchange of ideas among the authors and the officers of the PCTGA. In 1969, a constitution was adopted, which in effect created the program. It is under joint sponsorship by the PCTGA and the School of Forest Resources of the Pennsylvania State University. The School provides such assistance as is consistent with its mission in research, instruction, and continuing education and as is possible within the limits of its resources. Activities are organized as projects with particular goals, time schedules, and budgets. In appropriate cases, agreements may be negotiated with research institutions or government agencies for conducting specialized projects.

Who is involved in this venture? Membership is open to any member of the PCTGA who is willing to participate constructively in the program. He may be elected by the PENNSYLVAN Board of Trustees to one or more of the following categories:

A. A nurseryman member is one who will be a propagator of the approved PENNSYLVAN varieties or clones.

B. A grower member is a cooperator in selecting superior trees and/or conducting varietal or progeny tests.

C. A geneticist member is a person trained in genetics and breeding who contributes his knowledge or plant materials.

D. An affiliate member would be a person who contributes to PENNSYLVAN goals in any other way.

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Members will be given special privileges relating to the dissemination of information and plant materials. The program will be financed through a fee system associated with seedling sales. In addition, under special conditions special fees may be assessed that would take into account the cost and benefit of the service and materials provided to members.

The officers of the program are a Program Director, an Assistant Program Director, and others that may be established by the Board of Trustees. These first two officers are appointed by the Directors of the PCTGA. The program is governed by a Board of Trustees comprised of the Program Director, the Assistant Program Director, and five members appointed by the PCTGA Directors. Of these seven, two are appointed to represent the interests of the growers, two to represent the interests of the nurserymen members, one to represent the interests of Directors of PCTGA, and two to be qualified geneticists and tree breeders. These latter two are certified by the Director of the School of Forest Resources. All of these participants are appointed for staggered three-year terms, which may be renewable. The Trustees are responsible for electing the PENNSYLVAN members; setting dues; nominating candidates for appointment to the Board of Trustees; approving policies, projects, budgets; and approving the use of the registered name PENNSYLVAN.

At present, the program includes three projects. One project is the selection of superior trees from well-established plantations of Scotch pine and Douglas-fir to preserve valuable phenotypes. The second is the testing of commercial varieties. The third, a project that we hope will have considerable merit for the growers, is the genetic evaluation of seedlings offered for sale by commercial nurserymen, with the PENNSYLVAN trademark and number to be given to approved varieties.

How does the program actually work?

Project 1. Selection and Propagation of Outstanding Trees. The objective is to find and preserve greatly superior Douglas-firs and Scotch pines, so they will be available for breeding, seed orchards, and possibly for direct use through commercial vegetative propagation. The grower makes initial selections. He hangs a bright "Do Not Shear or Cut" tag on trees that he considers to be of outstanding quality. We then come in and rate the trees on a series of nine point scales, considering amount of shearing required, color of needles, growth rate, and other economically significant traits. By grafting, potentially valuable genotypes are preserved for breeding and progeny testing. Cuttings are also immediately tested after collection for their ability to be reproduced asexually by rooting. Cuttings that root are out-planted to determine to what degree they will retain growth habits of the parent tree. Growth habit of cuttings is influenced by collection position on the crown, and by the degree of genetic control over each of the numerous traits that make up the general appearance.

Project 2. Variety Tests. The objective is to compare qualities of trees grown from seed of commercial varieties and of natural populations from different geographic origins, by means of small prepackaged experiments especially prepared for planting by tree growers or nurserymen.

A number of improved Scotch pine and Douglas-fir varieties and recommended provenances are available throughout the country. This project will make it possible for growers and interested cooperators to compare the desirability of

these commercially available varieties by growing simplified experiments prepared for them in a package form. Thus, the trees are tested in a broad spectrum of environments and also under various representative conditions of planting and cultural treatments. The result is that growers not only have some data that apply to their own conditions, but also the pooled information will be translatable into broader applications.

The price charged for packaged experiments includes the cost of procuring seedlings and the time required to package the experiment in a statistical design that lends itself easily to planting procedure normally used by growers. The design also lends itself to ease in final analysis and publication of results.

Project 3. Recommended PENNSYLVAN Varieties. The objectives are to recommend to growers those varieties of Scotch pine and Douglas-fir, available from nurseries, that have promise of genetic superiority, and to generate income for PENNSYLVAN.

A Planting Stock Buyers' Guide will be published to assist Christmas tree growers in purchasing the Scotch pine and Douglas-fir varieties that best suit their needs. It will help them to match seedling size and genetic qualities to the requirements for their own particular planting sites.

The service will operate in this manner: Nurserymen cooperators will send in an application form which will include all details known about the seed origin and supporting documents. When an application is received, Buyers' Guide reference numbers for each variety will be sent to the grower so that he may use them in his advertising. He may also use the PENNSYLVAN membership insignia to remind his customers of his contribution toward the improvement of planting stock. We will schedule a visit during October or earlier to inspect and measure the varieties, and to verify their genetic identities. Varieties will be examined in nursery beds, and evidence acquired will be compared with known characteristics of the improved variety that the producer states he is growing. If one or more of his varieties meets PENNSYLVAN standards of excellence, each will receive special recognition in a separate listing of "Recommended Varieties," with its unique PENNSYLVAN number. Advance copies of the Buyers' Guide will be sent to all PENNSYLVAN members in December, and in January or February it will appear in various trade journals. Immediately after sales have been completed, the number sold of each listed variety is to be reported to us, together with payment of a premium fee per thousand trees sold.

Christmas tree growers have stated emphatically and often that they would gladly pay more, if they could be sure of getting better planting stock. It is obvious that any modest fee that the buyer pays can be recovered from the first few trees that he will harvest of varieties that are even slightly superior. The system of premium charges is designed to be an equitable way of paying for services in direct proportion to the benefits that a grower may expect to derive from them.

Each individual plant or variety selected, tested, improved, or mass-produced by the program will be available for release on terms that are equitable to all members. In each case, the terms pertaining to the release of material would be approved by the Board of Trustees. This Board is empowered to enter into contractual relations with plant propagators and nurserymen to provide for

mass production of improved varieties. The registered name PENNSYLVAN in combinations with a unique number would be given to a variety that has been tested thoroughly and found to be genetically superior in at least one characteristic to other varieties of the same species. It can also be used in combinations with a number prefixed by 'X' given to a variety the Trustees believe to be genetically superior according to experience or to experimental information that is incomplete in some respect.

What accomplishments have we made thus far?

A system for intensive selection in plantations over three feet in height has been developed. Final selections are based on quantitative ratings of growth rate, crown density and shape, and needle color, taking into account the economic value of each trait. It will take about three years to complete selection work in the above-average plantations that have been reported to us. So far, systematic inspections have been made of 60,000 Douglas-firs and 1,000 Scotch pines. The 29 trees (21 Douglas-firs and 8 Scotch pines) selected are magnificent specimens that would require little or no shearing. Some of the Douglas-firs appear to be highly resistant to aphids. Eighteen (18) were successfully propagated by grafts and rooted cuttings. All the Scotch pine grafts were failures, quite unexpectedly, perhaps due to winter drought. Arrangements have been made for planting and maintenance on a university golf course.

A Scotch pine seedling experiment was announced in PCTGA Bulletin 103. A complete set consisting of 12 varieties (48o trees with labels and instructions) was offered for $60.00. The seedlings were obtained from six nurseries, and experiments were shipped to three cooperators. A similar Douglas-fir experiment will be offered for planting in spring, 1970. A Douglas-fir seed experiment may be offered to nurserymen this year or next if there is sufficient interest in planting small seedlots in rows.

In conclusion, our basic goal is aimed at improved sources of seed and live materials which will produce higher-quality Christmas and amenity trees. This will be accomplished by selection of superior natural populations, through intensive selection of outstanding phenotypes in Pennsylvania environments, and finally, the selection of clones that will respond to large-scale vegetative propagation and will grow to consistently top-quality products.

What are the prospects for success in this type of program? We believe they are good. Other such associations have been successful in the past. They can be found especially in the livestock industry, but also in forestry in the Pacific Northwest, the Southeast, and elsewhere. Such programs examine the weakness in an industry's materials, stimulate new ideas, and generate a healthy competitive spirit. Of prime importance is the resulting improved genetic quality of their breeding stock. The benefits are expected to include better quality of the product, lower costs of production, and greater profit.

DISCUSSION

McCORMACK - From the pictures you showed us, all the trees are approaching at least what appears to be a similar set of standards. I think we all recognize the problem with Christmas trees is the consumer preferences change as to taper, density, branching perhaps. Are you considering this as you make your selections?

PALPANT - Very much so. I happened to be selecting in one age group with Jerry. In this case, he was meeting the standards of the consumer for the next few years, but we certainly are considering the possible standards needed 10 to 20 or more years hence.

McCORMACK - Are you also selecting narrow taper and less dense trees as well?

PALPANT - Yes, we are very sensitive to these features; however, it is hard to sell this when the immediate demand is for the high density, moderate taper type of tree. I think Jerry is very aware of this.

ABRACZINSKAS - Ed, will you answer the question that was put to me earlier in the program as far as a testing program? I believe that you are planning to set out some of these younger trees in different areas of the state to see how they do.

PALPANT - You mean the provenance study?

ABRACZINSKAS - Yes. Would you explain this?

PALPANT - Yes, we do have a provenance study at Penn. Nursery, and we intend to again start, if time permits, another study this year. These will be outplanted at key locations in the state.

GABRIEL - I made reference to location because of the limited information that comes from only one planting. The provenance study would be of benefit to a greater number of Christmas tree growers over the state if you put your provenance planting in as many locations as possible.

PALPANT - Even though Jerry may live right here, we have to consider the four corners of the state, too.

GABRIEL - That is what I was getting at earlier when I asked the question.

PALPANT - You may be interested, we also have some Douglas-fir material in Europe. Some of the people that were here yesterday are our European cooperators. One lady in Italy has some of our material. Anyway, we do consider the matter of area that the field data is applicable to, and I'm glad you brought it up. May I say just a few words in conclusion. Our goal is to provide information on improved sources of seeds which will consistently produce a high percentage of saleable Christmas trees, or amenity trees -- as Ernie suggests. In addition, through the resources of native provenances and other basic studies and also thro h the resources of very high quality breeding materials that is already established in this exotic environment; we are, and will be, selecting Scotch pine and Douglas-fir clones that will respond to large-scale vegetation propagation and will grow to consistent top quality products. Thank you.