Objectives of the Research Program at The University of Florida

By

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As this meeting is being held concerted efforts are being made by all the forestry agencies, public and private, to expand the current forest tree planting program in the South. In 1951, 300,000,000 trees were planted on 350,000 acres, and a comparable number of trees has been planted in 1952. It is safe to say that in this planting program little or no effort has been made to take advantage of the genetic situation as it exists in nature. There has been progress in some southern states toward the recognition of geographic strains in the planting program, but in most states this factor is still largely ignored. Even in the few places where geographic racial variation is recognized practically no attempt is made to control the quality of the trees from which the seed for planting, is collected. Instead cones are purchased blindly by the bushel from any source.

This first slide shows a typical tree from which I. observed cones being collected this fall. The negro cone collectors stake claims on such trees as this months in advance of the time of cone ripening. Why wouldn't they? The more bushels of cones they collect the more money they make. As a result of current seed purchasing practice there is an effective premium placed on poor form, climbability and heavy cone production. Seed collections from such trees as this can only result in the production of plantations poor in form and low in economic value.

Here is a photograph of a crooked tree in a plantation near Lake Butler, Florida. Over 30% of the trees in this plantation show crooks of varying degrees which would prevent their ever developing into salable saw timber, and at least 5% of the trees are so crooked as to make it impossible to obtain a pulpwood stick from them.

This next photograph shows a tree with five forks and seven leaders in it. The plantation in which this photograph was taken has 7.6% of its trees forked. Another plantation investigated by the Southeastern Forest Experiment Station contains 10% forked trees.

If there is any doubt in your minds as to whether or not characters like these are inherited I recommend that you read Keith-Dorman's publication "Hereditary Variation as the Basis for Selection of Superior Trees". Pages 22 through 27 of this publication contain an excellent review of the more striking results obtained from progeny tests with aberrant trees.

The early Egyptian farmers who never heard of genetics knew the desirability of selecting their best animals and plants for producing their future crops. Yet, the modern forester, who has available a vast literature of information concerning inheritance, still continues

to ignore the basic principle of using the best natural trees to reproduce his stands.

Another criticism of the current planting program in the South is the persistent practice of planting slash pine on all sites and ignoring the obvious fact that the other southern pine species would make better growth on many of these sites.

The work of Coile and his colleagues at Duke and of Ralston and Barnes at the University of Florida have produced methods of site indexing through soil analysis. By taking a few borings with a soil auger one can accurately determine what southern pine species will do best on a given site. For example, if borings of an imperfectly drained site show a depth of 24" to a sandy clay subsoil, Coile's data reveal that its site index is 100 for loblolly pine and 85 for slash pine. U. S. Forest Service Miscellaneous Publication 50 shows that this site will produce 40,000 board feet of lumber at fifty year if planted with loblolly pine, but only 27,000 board feet if planted with slash pine; A difference of 13 ,000 board feet!!! Slash pine may run gum but I have no knowledge of slash pine that will run enough gum per acre to snake up for a difference in growth of 13,000 board feet.

This next photograph shows the result of planting slash pine on a longleaf-oak ridge. Not only has survival in this seven year old plantation been so poor as to make the rows almost undiscernable, but longleaf has seeded in and is overtaking slash pine in growth. This is a common observation in most of the deep sand-oak ridge sites in Florida I realize that the poor survival of longleaf plantations is a major reason for planting slash pine on longleaf sites and will discuss this later it my talk.

Each tree species has a limited set of environmental requirements which must be met before optimum growth can ensue. These requirements are different for each species. The rule of planting the best possible species on a given site may not seem to be a profound genetic principle, but if this rule were followed our planting program would be much more productive.

The practice of leaving only the unmerchantable trees as seed sources in our current logging operations has produced one of the most discouraging sights that professional geneticists have to look upon. Foresters have finally been convinced of the necessity of leaving a few trees as seed sources for future forest stand, but clear cutting and planting would seem to be a preferable alternative to leaving the ill formed runts and wolf trees that one usually remaining after after a logging operation. I am sorry I do not have a slide to illustrate this, however I am sure all of you can reca11 having seen the type of seed trees now being left in our cut over stands.

The point I am attempting to make in this introd- uctory tirade, gentlemen, is that we are faling to take advantage of the hereditary variaton that exists naturally in our forest trees. In my opinion the biggest contribution geneticists can make to our forest economy in the

next fifty years is to point out this serious failure to the forestry profession, and to correct it by persuading foresters to follow these four simple rules:

1. To plant only seed of local origin.

2. To leave only the best trees as seed sources in our current logging operations.

3. To plant wild seed of the best source that can be obtained.

4. To plant only the tree species that are best suited to the site they are planting.

The establishment of expensive and complex breeding programs for the development of superior trees is only one way in which genetic principles can be applied to forestry practice. Species improvement through the selection of phenotypically elite trees, progeny testing, and controlled pollination may possibly produce the most sensational genetic improvements in forest productivity, but I feel safe in saying that it will be a long time before significant acreages of forest land will be planted with hybrid tree seed, The forester cannot stop his current planting program to wait until hybrid tree seed is developed in commercial quantitates; he must make the best possible use of what he now has available.

For this reason the forest genetics research program of the University of Florida will concentrate largely on demonstrating and developing techniques for taking the best possible advantage of the genetic situation as it now exists in our forest tree species.

One of our first tasks is to illustrate for foresters the genetic aspects of the management problems with which they are confronted. To do so, plantations are needed which are designed to show the significance of racial variation, and to show the role of inheritance in controlling vigor, forking crown and stem form and other tree characteristics with which the forester is concerned.

We are attempting to propagate crooked and forked trees by rooting and grafting. The plants thus-produced will be set out in demonstration plantations on the University's experimental forest and will show that these characteristics are inherited.

Several trees of high and low vigor have been located on the University forest and I will start making controlled pollinations among them next week. The seed produced from these pollinations will be planted in a design suited to demonstrating the inheritance of vigor.

Slash and longleaf pine are the most important tree species in Florida's forest economy and the University's forest genetics research program will be concentrated largely on these two species. However, our research will take in the entire ranges of these two species and their varieties. The genetic studies with slash pine will include its close relatives in Hohdouras and the Caribbean regions.

Two major studies of racial variation will be established at the University of Florida, One with slash pine and one with longleaf pine. These investigations will use more than 200 origins for each species and its varieties.

Wakeley's southwide study of racial variation is designed to block out in a general way what seed origins will do best in a given area and to find which environmental and geological factors have been of the greatest significance in the evolution of racial variation.

We hope, that by using only a few seedlings from a given origin and by using many more origins than are included in Wakeley's study, to obtain quantitative information on how far seed may be planted from its point of origin and the degree of corelation between racial variation and the different factors of the environment.

This information will not only be of value to the current planting program, but it will be useful in estimating the limits of dispersion of the superior strains that future breeding programs may develop.

Controlled pollinations in these ecotype collections will. produce both a knowledge of the genetic basis for racial variation and an estimation of the possible economic value of inter-racial hybridization in producing superior tree strains. For example .during this past fall I observed scattered trees of slash pine growing well in the deep sands of the citrus belt of central Florida. The other species growing on these sites were sand pine and scrub oak. Controlled pollinations with trees from this extremely dry site and local strains may produce a new strain of slash pine that would grow well on our oak ridge sites in N. E. Florida.

Crosses between extreme southern and northern races of slash pine will yield information concerning the genetic basis for the varietal distinction made between south and north Florida slash pine.

Much of the work in making controlled pollination s among the races of slash and longleaf pine will be facilitated by having cooperators ship pollen to me by air mail.

The grass stage and root habit of longleaf pine are probably important factors in its low survival when transplanted. A study of the genetics of the grass stage and root habit of longleaf pine will be established this year at the University with the objective of developing plantable strains of this species. All reports of races of longleaf pin that do not go through a grass stage will be traced and we will attempt to include such races in our ecotype collections. Seedlings will be raised from large numbers of trees to find evidence of individual variation in the time required to pass through the grass stage. Records will be kept of the trees from which the seedlings were produced and it may eventually be possible to analyze the type of genetic control involved in this characteristic, and produce strains of longleaf that do not have a grass stage.

The research program at the University of Florida will include other possible ways in which genetic principles can be used to increase forest

production. Experiments to develop quicker and more economical methods of hybrid seed production will be established. This winter I am attempting to make grafts of cone bearing branches from selected trees so that seed orchards of small trees may be developed. In such seed orchards controlled pollinations may be made with much less expense than in the original forest trees. Early selection in the nursery bed and other techniques for shortening the time requirements for progeny tests will be tried.

There seems to be an endless list of important studies that we should establish, but with the resources that are now available our work in the next few years will be largely taken up with the important task of discovering the degree of natural variation that occurs in slash and longleaf pine. With this information we will be able to prescribe ways of taking the best possible advantage of the genetic variation that exists naturally in our forest tree species. As I have stated earlier, it is my belief that this is the biggest contribution that forest geneticists can make in the near future.