EARLY DISTRIBUTION OF THE NORTHEASTERN HYBRID POPLARS, 1930-1954

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Before I discuss the early distribution of the Stout-Schreiner hybrid poplars, I wish to call your attention to a short article in the June 1974 issue of the Journal of Forestry titled "Forest Tree Improvement; Mississippi Certifies Nation's First 'Blue Tag."' This certification covered a mixture of cuttings from five select cottonwood clones (Populus deltoides Bartr.) from Issaquena and Bolivar Counties, Mississippi.

In the year 1939 the late Dr. Carl Hartley, research pathologist with the USDA, had an article in Phytopathology and in the Arborist News on the hazards of monoclonal cultures, and I had a paper in the Journal of Forestry in which I also stressed the danger of monoclonal plantings. Although we were acquainted, through our mutual friend, Dr. A. B. Stout, we had both written our papers without knowledge of the other's intent.

Since 1939 I have continued, at every opportunity, to call attention to the potential susceptibility to diseases, insects, and inimical environmental conditions of extensive monoclonal cultures. And I have done this with first-hand knowledge of the outstanding Italian poplar clone I-214, which has been holding its own in monoclonal cultures on a practically world-wide basis for many years. But I am sure that we will not get such excellent clones very often; and we must face the fact that in recent years even I-214 has shown some inroads by disease. On the basis of my recommendations Tom DeLong, Pennsylvania Department of Environmental Resources, has been distributing clonal mixtures of the Northeastern hybrid

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poplars to the public in Pennsylvania since 1963. Production between 1963 and 1972 has been more than 2 million cuttings.

I am certain that Carl Hartley would be as pleased as I am that certification has been granted to a synthetic multiclonal variety of forest trees.

And now, to return to my report on the "Early Distribution of the Stout-Schreiner Hybrid Poplars," I will start with a brief history of their origin, for the information of the young forest geneticists (those under 50).

The Oxford Paper Co., in cooperation with The New York Botanical Garden, started large-scale breeding with poplars under the supervision of Dr. A. B. Stout, Plant Breeder and Director of Laboratories at The Botanical Garden, in the spring of 1924. Between 13,000 and 14,000 hybrid seedlings, representing 99 cross combinations between 34 different kinds of poplars, were produced in 1925 and 1926. These hybrids were started in the greenhouse and then grown in a nursery in White Plains, New York.

In 1927 and 1928 all of the hybrids were moved to the new Oxford Nursery located in Frye, Maine. Six hundred hybrid seedlings were selected for pedigree and nursery clonal tests; the remaining hybrid seedlings were set out in 6- x 6-foot forest plantations on clear-cut upland sites on the Oxford nursery. In 1929 and 1930, 58 of the 600 pedigreed clones in the nursery were selected on the basis of their nursery performance in Maine for increased propagation and plantation tests. These 58 selected clones were being propagated for field trials in 1931 when the Company changed to the use of northern hardwoods and continued the poplar research on a maintenance basis. Ten hybrids were named and described by Schreiner and Stout in 1934 (Torrey Bot. Club Bul. 61:449-460).

Between 1931 and 1936 the Oxford Paper Company distributed cuttings of the 58 selected hybrids to many American and foreign organizations and individuals. A complete list of these distributions is not available; distributions within the United States during these early years that are on record in the research or correspondence files are listed in table 1.

Distributions to foreign countries from 1931 to 1974 are listed in table 2 to indicate the dissemination of these hybrids on a world-wide basis (a minimum of 40 countries). This list is also incomplete, primarily because of exchange of plant materials between countries; and in recent years distribution by commercial nurseries.

For example, the Kornik Arboretum in Poland received their cuttings in 1934 from the Morton Arboretum, Lisle, Illinois. In 1955 I saw a poplar clone in the nursery of the Forest Experiment Station in Madrid, Spain, labeled "Oxford Poplar - Origin, France." Recently, I was advised that cuttings would be sent to central China from Poland, and to Mongolia from Hungary. The Miles W. Frye Nursery in Pennsylvania reported in their 1973 catalog that they had sent unrooted cuttings of the hybrid poplars to Jordan, Iran, Thailand, Israel, India, Greece, Spain, and Canada.

DISTRIBUTION FOR UNIFORM COOPERATIVE CLONAL TESTS

In 1936 the Oxford Paper Company transferred all of the poplar hybrids that had been produced by the hybridization project of the Company and The New York Botanical Garden to the Northeastern Forest Experiment Station of the U. S. Forest Service. The poplar stools in the Oxford Nursery, Frye, Maine, were cut back in the spring of 1937 to provide cuttings of the 58 selected clones for uniform cooperative tests by agencies engaged in reforestation in the United States. These cooperative tests were established in 1938 and 1939. Instructions for uniform field design, site selection, site preparation, planting and culture, particularly the need for first-year clean cultivation, and data sheets to provide uniform information were sent to each of the 35 cooperators indicated by underline in Table 1.

These cooperative tests provided more confusion than sound information, primarily because cooperators failed to follow directions for site preparation and culture. Contradictory results were reported from the same regions. For example, about 1941 the Pacific Northwest Forest Experiment Station considered the hybrid poplars to be unsuited to the region. In 1946, the Soil Conservation Service, Region 7 (Pacific Northwest) in their Technical Supplement No. 20, recommended two of the Oxford Hybrids for planting and reported that: "Hybrid poplars are a promising substitute for native poplars. The hybrids have a higher survival, grow more rapidly, and are more resistant to disease than the native poplars." In 1947, the Crown Zellerbach Corporation of Portland, Oregon, reported excellent, but spotty, growth in their earlier mishandled tests and requested more planting stock.

CLONAL TESTS IN THE NORTHEASTERN REGION

As early as 1941 it was becoming clear that the poplar hybrids would have to be properly tested by the Northeastern Station within the limits of this region. It was decided that when their growth and development had been tested in 5- to 10-year-old plantations, selections could be sent out to cooperators throughout the country with a record of their performance. With this background, cooperators would be more likely to use suitable sites and proper cultural methods to evaluate the hybrids.

A stool planting of the 58 selected clones was started in 1941 at the Hopkins Memorial Experimental Forest, Williamstown, Massachusetts, for the production of cuttings for clonal tests within the Northeastern Region. The Experimental Forest had been assigned to the Genetics Project for nursery production, establishment of an extensive breeding arboretum of native and exotic species, and field trials of control-pollinated progenies. This stool planting would have produced sufficient cuttings to start plantation tests in the spring of 1943, but the stool planting had to be abandoned when the Hopkins Experimental Forest was closed-out in 1942.

In July 1942 the Northeastern Station was merged with the Allegheny Station. The Northeastern Station headquarters were moved to central Philadelphia and the Genetics Project was headquartered at the Morris Arboretum of the University of Pennsylvania. The Arboretum, under the

supervision of Dr. J. R Schramm, provided office, laboratory, greenhouse and nursery space at no charge.

From 1942 to 1945 the genetics research was limited primarily to maintenance of the 58 hybrid poplar selections in a new stool planting established at the Morris Arboretum in the spring of 1943, and transfer to the Arboretum nursery of as much as possible of the seed-bed and nursery stock from the abandoned Hopkins Experimental Forest. With the help of only three very efficient and hard-working conscientious objectors, it was possible to save a major part of the control-pollinated stock. A limited amount of nursery stock of species for the breeding arboretum was heeled-in at Hopkins for possible out-planting that never materialized.

Expansion of the hybrid poplar research became possible in 1945, when I was moved to Beltsville, Maryland, to take charge of that Research Center, which was to be concerned primarily with forest genetics and physiology. The C. O. camp at Beltsville provided ample labor from 1945 to 1947 for nursery and field plantings,

SELECTION OF ADDITIONAL HYBRIDS

Cuttings from 53 newly selected ortets in the 1927 and 1928 plantations of hybrid seedlings in Frye Maine, were planted in the Beltsville nursery in the spring of 1945. Jonathan W. Wright joined the genetics project in 1946 and was stationed at the Morris Arboretum to continue the exploratory breeding work with the native and the many exotic trees in the Philadelphia area. He and I selected additional hybrids in the Maine plantations for clonal propagation in October 1946 (92 selections) and October 1949 (44 selections).

The 189 hybrids were selected on the basis of their growth rate, general health, growth habit, and parentage. With the 58 original Oxford selections we were propagating a total of 247 hybrid clones in the Beltsville nursery for field tests in the Northeastern Region. They represented from one to 27 ortets in each of 49 different parentages to preserve the greatest practical genetic diversity.

There were 27 selected ortets from a cross between Populus deltoides Bartr. x P. trichocarpa Torr. & Gray, and 25 selected ortets from a P. deltoides Bartr. x P. cv. Caudina parentage. Because of the uniformity in these progenies I had to resist very considerable pressure to combine the cuttings from these selected ortets for "family" tests instead of individual clonal tests. My insistance on individual clonal tests was justified; in the 15-year clonal tests only 9 clones of deltoides x trichocarpa and 5 clones of deltoides x cv. Caudina were selected for the first commercial trials.[2]

[2]Ernst J. Schreiner. Procedure for selection of hybrid poplar clones for commercial trials in the Northeastern Region. Northeast. Forest Tree Improv. Conf. Proc. 19(1971):108-116, 1972.

The approved working plan for the hybrid poplar clonal tests in the Northeastern Region called for plantations of the 247 clones on the Station's Experimental Forests near Bangor, Maine, Alfred, Maine, Williamstown, Massachusetts, Kane, Pennsylvania, Huntington, Pennsylvania, Beltsville, Maryland, and Parsons, West Virginia. By the time cutting stock was available, administrative interest, funds and labor permitted establishment of complete tests of the 247 clones only at Beltsville and Williamstown (the Hopkins Experimental Forest had been reactivated) and a test of 50 clones at Parsons, West Virginia and Alfred, Maine.

NATION-WIDE DISTRIBUTION

Mr. Richard C. Davids, Associate Editor of the Farm Journal, visited the Morris Arboretum in 1954, saw specimen trees of the hybrid poplars and decided to write a popular article for the Journal. We advised Mr. Davids that such publicity invariably brought a large number of requests for cuttings, and suggested that we would prefer to wait a few more years until our clonal tests in Williamstown and Beltsville could provide a sounder basis for selection of the best clones. Mr. Davids did not wish to wait. Since it was obvious that we could not prevent his publication of an article on trees growing in the Arboretum, it was decided that we should use this opportunity to obtain nation-wide trials by distribution of cuttings in small numbers to farmers and land owners for planting in the spring of 1955. The best of the 247 clones being grown at Beltsville, Maryland, and Williamstown, Massachusetts, would be used for this nation-wide test; selections would have to be based on 2- to 5-year performance.

This was to be not only a test of the hybrids under nation-wide environmental conditions, but also a test of a practical method for getting new hybrids into use throughout the country. The poplar hybrids, because of their ease of propagation from cuttings, provided an excellent opportunity for testing a method of distribution and the value of local tests by farmers and other interested persons. Therefore, we requested Mr. Davids to include the following statement in his article:

> "HOW TO GET CUTTINGS. A limited number of cuttings are available at small cost to farmers who are willing to cooperate with the scientists in testing these new hybrids. Write to: Director, Northeastern Forest Experiment Station, 102 Motors Avenue, Upper Darby, Pa. The cuttings will be distributed between now and December 1, in bundles of five on a first come first serve basis. When your request is received the Station will send you further details."

Davids' article, "Hybrid poplars make news!" was published in the October 1954 issue of the Farm Journal (pp. 76-78), with one color and three black and white illustrations. A total of approximately 4,500 requests were received by October 15, 1954. Since this was the maximum number that could be supplied with the estimated available cuttings, a letter of regret was sent to all requests received after this date (approximately 7,000 requests were received by December 31, 1954).

A cooperative agreement under which each cooperator agreed to deposit one dollar in a Cooperative Work Fund, and to report on the hybrids at the end of 1 and 2 years after planting, was sent in reply to the 4,500 requests received by October 15, 1954. The Station agreed to send each cooperator 8 cuttings, 2 cuttings of each of 4 hybrids.

Seventy clones selected as the best in the 2- to 5-year-old clonal tests at Williamstown and Beltsville, were divided into four groups on the basis of their leaf and twig characters. Taxonomically similar clones were assigned to the same group; thus the clones in any one group could be distinguished on the basis of leaf and twig characters from the clones in the other three groups. Each cooperator received two cuttings from one clone in each of the four groups. If a cooperator lost the identity of his trees, it would be possible to identify the clones from leaf and twig specimens.

A total of 3,469 (Fig. 1) of the 4,500 applicants whose requests were received by October 15 returned the cooperative agreement with $1.00 (incidentally, this did not cover our distribution costs).

The instructions to cooperators, included with the cuttings, covered storage, planting, and first-year care. For several regions additional precautionary notes were attached, for example:

To cooperators in the Lake States:

> "Many requests from your State for cuttings of the hybrid poplars indicate that they will be tested on aspen or "popple" land. But we know already that they will do very poorly on the dry, infertile land where aspen is usually found in the Lake States.
>
> These hybrids are like the native cottonwood in their soil and soil water requirements. We recommend that they be tested only on fertile, moist bottomlands."

To cooperators in irrigated areas:

> "These hybrids need abundant soil moisture. In sections of the country where irrigation is necessary for good production of crops they should be tested only where there is a high water table (such as natural cottonwood draws) or where they can be irrigated."

A simple first-year report form and suggestions for handling the hybrid poplars in 1956 was sent to all cooperators in the fall of 1955. The report form requested height measurements of the living trees and "X" marks to non-technical questions for information on soil texture, moisture, and fertility, and on cultivation. Of the 3469 cooperators, 1 659 returned the first-year report form. A second-year report, based on the first-year reports, was sent to all cooperators in the fall of 1 956.

These data sheets had been reviewed by the Station's statisticians to be certain that the information could be coded for machine sorting and compilation. But when the reports were on hand for coding, punching, sorting, and compilation, the statistical personnel and equipment was committed to the forest survey--and remained committed for several years.

We did not have sufficient genetics personnel to do this statistical job "by hand," but we did get 70 clones representing 23 different parentages widely distributed throughout the United States (Table 3). Several private and State nurseries have been selling some of these hybrids by the thousands. I expect that outstanding clones will continue to "surface" in a wide diversity of environments.

With the passing years changes in upper echelon research administration and research emphasis and objectives prevented follow-up of the nation-wide distribution. It is seldom possible to circumvent opportunism and infinite wisdom; C'est la vie!

FIGURE 1

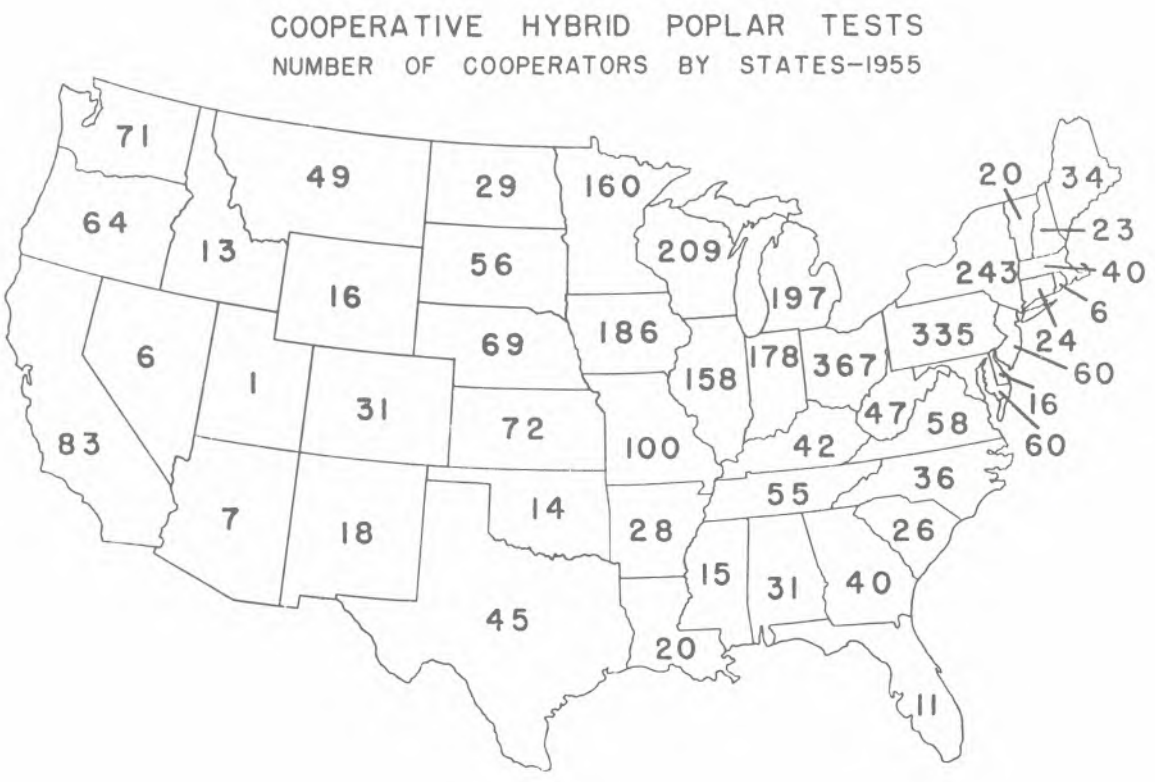

Table 1.--Summary of hybrid poplar distributions in The United States 1933-1954.

	YEAR[a]
U.S.F.S. EXPERIMENT STATIONS	
Allegheny	(34)
Appalachian	(35)
Central States	
Roseclare, Ill.	(35)
Cambridge, Ohio	(35)
Carbondale, Ill.	(54)
Southern	
Harrison Exp. For.	(38, 39)
Delta Exp. For.	(38, 39)
Holly Springs	(35)
Crossett	(35)
Lake States	
Cass Lake Nur.	(35, 38, 39)
Towner, N. D.	(35)
Northern Rocky Mt.	
Priest River	(35)
Pacific N. W.	
Wind River Nur.	(35, 38)
California	
Berkeley	(35)
Placerville	(38, 39)
Feather River Nur.	(38, 39)
Devil Canyon Nur.	(38)
U.S.F.S. NATIONAL FORESTS	
Allegheny	(33)
Regional Nurseries	
Reg. 1 Savenac	(38, 39)
Reg. 2 Bessey	(38, 39)
Reg. 5 Durbin	(38, 39)
Reg. 7 Parsons	(38, 39)
Reg. 8 Stuart	(38)
Ozark	(38)
Reg. 9 Licking	(38)
Chittenden	(38)
Hayward	(38)
Valonia	(38)
Tenn. Valley Authority	(35, 38, 39)
B. P. I. Field Station, Cheyenne	(38, 39)
Biol. Survey, Bowdoin Lake Refuge	(38, 39)
SOIL CONSERVATION SERVICE NURSERIES & PROJECTS	
Albuquerque	(38, 39)
Mandan	(38, 39)
Manhattan	(38, 39)
Pullman	(38, 39)
Thorsby	(38, 39)
Tully	(38, 39)
Vermillion	(38, 39)
Zanesville	(38, 39)
Winooski River Project	(38, 39, 40)

[a] Underline indicates cooperation in the 1938-1939 uniform clonal tests of 58 clones.

Table 1.--cont.

STATE AGENCIES	
N. Y. State Cons. Dept.	(33, 37)
N. Y. State Div. Lands & For.	(38, 39)
N. Y. State Div. Fish. & Game	(41, 42)
Minn. Div. Forestry	(39)
Pa. Forest Res. Inst., Mont Alto	(34)
Fla. State Expt. Station	(34, 35)
Fox. Expt. Forest (N. H.)	(35)
ARBORETUMS	
Morton Arboretum	(33)
Morris Arboretum	(34)
Highland Park, Rochester	(34)
Brooklyn Bot. Garden	(35)
Arnold Arboretum	(34)
Mayo Institute	(48)
UNIVERSITIES & SCHOOLS	
Univ. Wisconsin	(34, 38, 39, 53)
Univ. Mich (Ann Arbor)	(33)
W. Va. Univ.	(34)
Yale School of Forestry	(33, 40)
Univ. Idaho (Ext. Dept.)	(38, 39)
Iowa State Col.	(38, 39)
Oregon State Univ. (Corvalis)	(38, 39)
Woodstock College	(54)
Cornell Univ.	(54)
N. Y. S. Col. Forestry (Syracuse)	(54)
Huntington Wild Life Sta.	(54)
Mich. State Col., E. Lansing	(34)
Kellogg Forest	(52)
S. Dakota State Col.	(53)
PRIVATE INDUSTRIES & ORGANIZATIONS	
Dow Chem. Co., Michigan	(35, 36, 38, 39)
Allied Chem. & Dye Co., Ill.	(54)
Armstrong Forest Co., Penn.	(37)
American Box Co., Mich.	(51)
Brewer Nienstadt Lumber, La.	(33)
Glatfelter P. Co., Penn.	(34, 35)
Nekoosa Edwards Paper Co., Wis.	(34)
Nut Tree Nurseries, Penn.	(40)
Guggenheim Foundation, N. Y.	(35)
Dept. Welfare, Portsmouth, Va.	(35)

Table 2.--Summary of hybrid poplar distribution to foreign countries 1933-1974.

COUNTRY	YEAR[a]	SHIPMENTS[b]
Argentina	(39)	(6)
Australia	(46)	(3+)
Austria	(ca. 38)	(1+)
Belgium	(51)	(2)
Brazil	(60)	(1)
Bulgaria	(ca. 38)	(1+)
Canada	(39)	(10+)
Chile	(54)	(1)
China	(ca. 74)	(?)
Czechoslovakia	(74)	(1+)
Finland	(ca. 65)	(1+)
France	(ca. 34)	(1+)
Germany, East	(36)	(2+)
Germany, West	(36)	(7+)
Great Britain	(34)	(7+)
Greece	(58)	(1+)
Hungary	(ca. 38)	(1+)
Iran	(?)	(1+)
Israel	(?)	(1+)
India	(?)	(1+)
Italy	(34)	(4+)
Japan	(53)	(4)
Jordan	(?)	(1+)
Korea	(57)	(3)
Mongolia	(ca. 74)	(?)
Netherlands	(34)	(9+)
New Zealand	(49)	(1+)
Pakistan	(61)	(2)
Philippines	(53)	(1)
Poland	(34)	(3+)
Portugal	(36)	(1)
Romania	(34)	(2+)
Russia	(34)	(2+)
South Africa	(38)	(2+)
Spain	(56)	(5+)
Sweden	(40)	(2+)
Thailand	(?)	(1+)
Turkey	(66)	(1+)
Uruguay	(46)	(2)
Yugoslavia	(58)	(3+)

[a] Year of first shipment of cuttings.

[b] Number of shipments, in the same or in later years (+ indicates a probable minimum number).

Table 3.--Poplar (Populus) hybrids distributed in 1955 for nation-wide test by the Northeastern Forest Experiment Station.

P. cv. Angulata x P. deltoides	NE-244, -245, -246
P. cv. Angulata x P. trichocarpa	NE-249, -251, -252, -253, -254, -255, -374
P. cv. Betulofilia x P. trichocarpa	NE-296, -299, -300
P. cl. Candicans x P. x berolinensis	NE-327, -386, -387
P. cv. Charkowiensis x P. cv. Caudina	NE-17, -20, -21, -378, -313, -314
P. cv. Charkowiensis x P. deltoides	NE-318
P. cv. Charkowiensis x P. cv. Robusta	NE-316
P. deltoides x P. cv. Caudina	NE-221, -222, -224, -225, -228, -353, -355, -358, -359, -360, -366, -367
P. deltoides x P. cv Plantierensis	NE-240, -241, -242
P. deltoides x P. trichocarpa	NE-202, -205, -206, -207 -212, -215, -216, -346, -350
P. deltoides x P. cv. Volga	NE-236, -237, -238
P. maximowiczii x P. x berolinensis	NE-46, -50
P. maximowiczii x P. cv. Caudina	NE-53
P. maximowiczii x P. cv. Plantierensis	NE-51, -52
P. maximowiczii x P. trichocarpa	NE-41, -388
P. nigra x P. cv. Eugenei	NE-278
P. nigra x P. laurifolia	NE-5, -8, -284
P. nigra x P. trichocarpa	NE-9, -285
P. cv. Petrowskyana x P. cv. Caudina	NE-40
P. cv. Rasumowskyana x P. cv. Plantierensis	NE-341
P. sargentii[a] x P. x berolinensis	NE-36, -37
P. sargentii x P. cv. Italica	NE-273
P. sargentii x P. simonii	NE-274

[a] Currently accepted U. S. Forest Service nomenclature is P. deltoides var. occidentalis Rydb. (Schreiner, Ernst J. Genetics of Eastern Cottonwood, USDA Forest Serv. Res. Pap. WO-11, 1971.

DISCUSSION

Farmer - Ernie, if you were doing it all over today, how would you, I mean the distribution, angle, and the timing and so forth, how would you handle it?

Schreiner - I would hope to test them for half a mini-rotation (5 to 10 years) and then distribute the selections through state nurseries for commercial trials. And I would definitely favor a nation-wide trial at the same time similar to our 1 955 distributions.