INFORMAL GROUP DISCUSSION

Editor's note: The morning's presentations were discussed during the afternoon by three groups, each group discussing one of the morning's three topics. Summaries of the discussions, prepared by the discussion leaders, follow.

TOPIC I

What can we achieve through tree improvement? (Papers by J. W. Wright and Robert E. Farmer.) Discussion Leader, Hans Nienstaedt, North Central Forest Experiment Station, USDA Forest Service, Rhine--lander, Wisconsin.

The discussion not only considered what can be achieved through tree improvement, but also how the results of tree improvement can be put into use. The following questions were raised: Is industry ready and willing to use the information now available? Have tree breeders been too reluctant to make recommendations involving a moment of risk? Do tree breeders have to bear the entire burden of testing prior to release of improved types? How do we mass-produce improved seed?

A strong undercurrent in the discussion was the feeling that genetic researchers and tree breeders, on one hand, and the practicing foresters, on the other, have failed to communicate. Researchers and breeders have been "ultraconservative" and have qualified results and recommendations to such a degree that the man in the field has turned away with the attitude, "He has nothing now, I'll come back later when something has turned up!"

It has been stated that if the plant breeder strives for perfection, he will never develop a usable product. The breeder must be willing to take risks, perhaps like the weatherman — stating the risk as a probability. Industry representatives participating in the discussion indicated that their management would be willing to assume the risks involved. It was emphasized that without taking risks, we would, in fact, achieve a certainty *— the certainty of no improvement.*

If forest managers have questioned the credibility of tree breeders, the breeders have at times reciprocated when viewing the activities of forest managers. It was pointed out that foresters engaged in seed procurement and seedling distribution not infrequently jeopardize their own programs by ignoring common knowledge regarding the adaptation of seed sources and seed zoning.

The breeders of crop plants rely on the farmers for much of their testing in production situations. Tree breeders should do the same and would find industry willing to cooperate. But this will require advanced planning. The time to plan with industry is when the test is seeded in the nursery, not 2 to 4 years later when material is ready for field planting.

Methods of reducing risks when outplanting partially tested improved material was also discussed. One approach is to develop reliable predictors of growth. Work is now in progress on. potential predictors such as isoenzymes, DNA, other constituents of the plants, and defined processes of growth. An understanding of growth components may not only lead to the development of reliable predictors and reduced risks, but may lead to greater growth gains through breeding for specific combinations of growth components. Another suggested way of reducing risks would be to increase the number of species planted. Rather than relying on the potential improvement of one species, several promising products of tree improvement involving a number of species could be planted. This approach, particularly, would require cooperative tree improvement efforts, because it is doubtful that one company would have the funds for breeding programs involving more than one or two species.

In the past, tests of genetic material have essentially consisted of wildland plantings; they have involved a minimum of ground preparation and subsequent control of competing vegetation, and standard spacing such as 6 by 6 or 8 by 8 feet. Future silvicultural practices will, undoubtedly, be more intensive. They may involve more thorough ground preparation and control of competing vegetation, the application of fertilizer, and

spacings that will facilitate mechanized harvesting. The goal will be greater production per acre and shorter rotations. It was suggested that tree breeders, in their tests, should use the plantation management practices in the future. However, one participant pointed out that in the majority of tests conducted so far, genotype x environment interactions have been of a type that would indicate that genotypes good on one site would be good on all sites. In other words, the genotypes that are good under the present intensity of management would also be good under the management practices of the future. Be this as it may, it would be desirable to demonstrate through our genetics testing the degree to which improved material can increase production under optimized growing conditions.

Mass production of improved seed was discussed at length. It was emphasized that research costs in the region have almost exclusively been borne by the public, because research has been carried out by universities and federal organizations. Mass production of the improved material for commercial use generally is not the responsibility of the research organizations. It will require developmental programs. The question is — who will be responsible for the organization and funding of such programs?

Industry representatives in the audience indicated that industry is ready to become involved either independently or through cooperative efforts. It was also suggested that the State departments of natural resources would be in a particularly favorable position to organize such programs, and would be able to obtain federal financing.

In summary, the discussion emphasized the following:

1. Tree breeding only becomes meaningful when mass-produced stock becomes available for commercial plantings.

2. Geneticists and tree breeders have preliminary information for several species and the information should be put to use now. Some risks would be involved in using this material.

3. Industry is willing to assume these risks, and some industries are definitely willing to get started now.

4. Mass production of improved material will require cooperation involving Federal, State, and private agencies.

TOPIC II

What does industry need that tree improvement can provide? (Papers by J. W. Macon and R. B. Valley.) Discussion Leader, Dean W. Einspahr, Institute of Paper Chemistry, Appleton, Wisconsin.

The discussion leader briefly reviewed the views of the two speakers and pointed out that John Macon had presented his views on current and future use of conifers in relation to the current and future conifer inventory of the Lake States Region. He expressed concern regarding our ability to meet future pine fiber requirements and indicated the need for forest genetic programs that stressed: (1) improved growth rate, (2) improved wood quality, and (3) the need for species that respond to fertilization and irrigation and other intensive forest management practices and, (4) a maximum amount of cooperation between research and management.

Dick Valley, on the other hand, expressed the need for hardwood species that: (1) plant easily, (2) are well adapted to all environments, (3) have rapid cellulose production rates, (4) are compatible with low cost harvesting systems, and (5) have low bark adhesion, easy pulping, and longer fiber structure.

Dr. Valley, like John Macon, stressed the need for cooperation between forest geneticists, forest managers and mill managers in order that a satisfactory "complete" system be developed.

Following the summary, the groups were asked for "feedback" regarding their views on the topic. Bill Bromley (American Pulpwood Association) led off the discussion with a word of caution in which he stated that he hoped the forest geneticist would not go overboard and stress short rotation materials to the exclusion of other types of forest products. Bill expressed the need for everyone involved to consider the "multiple use of wood as well as a multiple use of land." Dick Valley, in defense of his comments in the morning session regarding intensive management-complete tree harvesting systems, indicated he did not feel that such a system could be used on all lands but instead felt that approximately one-third of the land area would be used primarily for recreation, one-third managed using conventional forest management techniques, and that the intensive management system approach would

be confined to those areas near the mill best suited for such an approach.

Dave Dawson, in expressing his views on the intensive management subject, pointed out that intensive management of certain areas would free other areas for alternative uses. Intensive management, Dave felt, should be viewed as a supplement to multiple-use rather than as a deterrent.

Mr. Gordon Connor and Fred Ziemann expressed similar points of view and suggested that we should be genetically improving species for future production systems but, more importantly, we should be getting the most we can out of our present forests by improved utilization (chipping tops, etc.) and through fertilization of hardwood stands. Total tree harvesting systems were discussed and the point was made that should these harvesting methods become accepted, proper consideration must be given to how we plan to revegetate these areas. Mrs. Gordon Connor stressed the importance of educating the public regarding the point that good forest management is good forestry and good conservation.

Hans van Buijtenen and others including Mark Hoist and Fred Ziemann expressed the concern that because of the time lag involved (as much as 40 years) in genetic improvement, paper industry needs could easily change before appropriate gains were obtained. A discussion of this aspect of tree improvement indicated that the key to the problem was to build a reasonable amount of flexibility into any genetics program so that the trees being developed could be used for other purposes (sawtimber, ornamentals, etc.) should industry needs change.

Tom Rausch and Clyde Hunt commented that progress in the Lake States Region was not as slow as the discussion might indicate. Tom indicated that the State of Wisconsin was presently using results of genetic studies to determine regions from which they should purchase spruce seed for nursery production. Also, Tom indicated that red pine seed production areas had been established and red pine seedling seed orchards were being developed by the State of Wisconsin in cooperation with the University of Wisconsin. Clyde Hunt commented that we are beginning to recognize the requirements of the type of tree that is needed to make the total tree system work. He also felt that we presently have genetically improved materials that meet the requirements and all we need to do now is to plug these materials into the system. Clyde stressed the use of *Populus* species, and the use of a mixture of clones; he commented that aspen, because of its flexibility (usefulness in recreation, lumber, and pulp), its site requirements, and growth habit, could be expected to work well in "the system." Jim Hensel along with the discussion leader commented further on the "total tree concept," stressing the need for demonstrating what our presently available improved materials can do on the areas being harvested via the total tree concept.

From the group came the comment that we have been working in forest genetics in the Lake States Region for a considerable time period, and what we now need are action programs to make genetically superior seed and seedlings available to industry and the public. Another comment from the floor referred to John Macon's concern about the low specific gravity of balsam fir. The question was raised about the possibility of improving specific gravity and other juvenile wood properties of such species as red pine, jack pine, larch, and balsam fir. Comments from several geneticists who had worked with these species indicate modest gains (± 10 percent) could be obtained. Following a rather lengthy discussion on improvement of juvenile wood characteristics, Clyde Hunt, John Macon, Dick Valley, and Hans van Buijtenen reviewed the problem of what fiber characteristics are wanted by the papermaker. It was pointed out that the fiber characteristics desired depend upon the end-product requirement , and that to produce the variety of products now being manufactured by the paper industry, anywhere from six to 30 basic fiber types would be required. It was pointed out, however, that by separating springwood from summerwood and/or mature wood from juvenile wood, more than one fiber type could be obtained from the same tree.

Dick Valley discussed the importance of fiber characteristics to end-product properties and production speed, and it was concluded that fiber properties (fiber length, flexibility, etc.) should be considered for improvement both by genetic and silvicultural techniques. Tom Rudolph, among others, emphasized the need for producing trees that will give greater volumes of wood per acre; as far as wood quality is concerned, perhaps the most important contributions that could be made would be to give the papermaker a uniform quality raw material with certain well-defined properties that would then allow him to optimize pulping and papermaking conditions.

Tom Rudolph reemphasized the comments of several of the symposium speakers who indicated we need a

balanced approach in which research effort is expended toward both tree improvement and forest management methods to get the improved materials into the field. Tom also felt that in many instances we are not testing our materials under the type of field conditions that they should ultimately be growing under, and that due consideration should be given to this aspect of improved-tree evaluation.

The final topic before adjournment was the difficulty encountered by the various research groups in obtaining adequate funding for tree improvement and testing of improved materials. Hoist, Garrett, Macon, and Einspahr each commented regarding funding problems, particularly as they pertained to the Lake States Region and the Northeast. Lack of adequate funding was of primary concern. The North Carolina State Cooperative program was described as a good one which has the desired flexibility. It was pointed out, however, that company size, forestry staff, and land-holding patterns in the North and Northeast differ from those in the South, and that some type of cooperative program in which several companies pool their resources to produce improved seed and seedlings would be more appropriate.

The discussion of the topic "What does industry need that tree improvement can provide?" stressed the following needs:

1. Action programs that provide adequate numbers of improved materials for the public and industry.

2. Rapid-growing hardwoods and conifers that have been tested for site requirements.

3. Continued emphasis on improvement of hardwood fiber properties.

4. Increased emphasis on improving the juvenile wood characteristics of tree species, particularly conifers.

5. Forest genetics research programs with built-in flexibility so that as paper industry needs change, the materials involved will still be useful.

6. Balanced programs that not only provide improved trees, but the "know-how" to establish and manage these improved materials.

7. Trees that are well adapted to future highly mechanized harvesting systems and that fit into the "complete system," which considers establishment, growth, harvesting, and manufacture of the final product.

It was also generally agreed that there is a need to establish lines of communication, cooperation, and feedback between forest geneticists, forest managers, and pulp and paper management so that a suitable overall production system can be developed.

TOPIC III

Tree improvement as a forest management supplement. (Papers by Gordon . White and William R. Bentley.) Discussion Leader, J. Douglas Brodie, Department of Forestry, University of Wisconsin, Madison, Wis.

The session leader introduced the topic with a brief summary of what he, as a nontree breeder, had learned from the morning session. Basically, tree breeding can offer improvement in two broad categories — quantity and quality. In terms of quantity, tree breeding will result in greater growth rates that will benefit forest management in two ways: (1) greater yields per acre, and (2) shorter rotations. The quality dimension can be divided into three parts: (1) the physical properties of the tree that enhance its desirability at the mill, such as fiber, bark, and chemical properties of the wood, (2) the form and stand characteristics and properties of the tree that enhance harvesting, and (3) the growing or tending properties of the tree, including biological resistance, tolerance for adverse site and climatic agents, and pest resistance.

Timber management is a long-term investment activity that is fraught with uncertainty. Initially, attention is likely to be focused on protection or stand improvement in existing stands. Terms such as "intensive management" or "high-yield silviculture" imply not only a systems approach to forest management but also shorter time periods for production, afforestation, and reforestation. Certain experimental maximum fiber production projects in the South have suggested the term agri-forestry. This might suggest that forestry at present, similar to agriculture in the past, may be able to make substantial strides forward through plant breeding.

Professional forestry during the past 70 years, by crying out against the wolf of scarcity, has instituted

substantial gains in fire protection, harvest control, reforestation, and afforestation. Economic scarcity of timber products within the next three decades appears to be a real possibility, without substantial increases in forest productivity during the interim. Such scarcity could be expected to develop sooner in local regions and for particular species. A conference such as the present one addresses itself hopefully to the real possibilities of forest tree improvment and perhaps somewhat ruefully to the seeming inertia in the adoption and application of modern tree breeding techniques in the north-central States.

In discussion the group decided that the production demand for improved tree stock will not be realized until scarcity or incipient scarcity occurs. The demand will appear first in short-rotation, reforestation-oriented operations. It is beginning to be felt in the Lake States now in seed source certification, nursery practices such as culling, and in the establishment of seed orchards. Part of the problem in the Lake States appears to be that the demand for the tree breeder's talents does not seem to be as intense as in other parts of the country, such as the South. Discussion indicated that conditions are different in the Lake States than elsewhere. In the South, the overhead of landownership has provided a spur to efficiency and to the adoption of high-yield management practices, including the application of tree breeding results. Such conditions are currently lacking in the Lake States, and the discussion focused on the question of what tree breeders should be doing while awaiting the development of demand. It was agreed that the Lake States tree breeding establishment had not been, and would not be, idle during this interim. As in the past, they should continue to develop a wide diversity of plant materials and stockpile knowledge and techniques; in the absence of widespread application of results, they might continue to develop and question the type and extent of future demand for improved trees.

It was agreed that the efforts should not be focused solely on basic research. There is, and will be, a real demand for applied research that will satisfy immediate needs once improved forest plant materials are required. The question was raised as to why Lake States industry found it impossible to support basic tree improvement research. An industry participant replied that interest on the part of industry was great; however, support for tree improvement research was impossible for a number of reasons. At present in the Lake States, growth of trees on industrial land is much greater than the current or prospective rate of drain through harvest. It was stated that if you are planting extensively, then you can use a better tree; if you aren't, you can't.

Attention should also be given to the communication of results that can be used and applied now to stimulate demand for future tree-breeding improvements. One of these techniques for immediate application would be the identification of superior trees for use even under natural regeneration systems. Small improvements spread over large-scale acreages can count significantly. Efforts that must necessarily be based on tree planting will be spread over a much smaller area, at least at present. The importance of the effort going into seed and tree improvement shouldn't be minimized; however, natural regeneration and selection systems should be considered as well. The implied correlation between genotypic and phenotypic characteristics suggested by the application of tree breeding expertise to natural regeneration systems was questioned. Discussion from the floor indicated that while the magnitude of this correlation is generally unknown, it could at least be assumed to be positive; therefore, it is better to apply phenotypic selection in natural systems than no selection whatsoever.