

Summary of main topics and conclusions from the meeting

Hans Roulund & Tore Skrøppa

This report summarizes main topics from presentations and conclusions from the discussions. Major points are stated by numbers and are followed by some explanations.

1. More basic research is needed in forest genetics, tree physiology and silvicultural methods.

Large uncertainties exist concerning the future forest environment. The forests will be utilized by the society in a number of different ways, and a multi-purpose forestry is called for. This requires flexibility in forest management and to change goals. The scientists should provide both the forestry and the society in general with answers for a wide array of future potential situations. Forest genetics should cover a much wider field than research for tree breeding only and should also address other species than those that are commercially utilized.

2. A better understanding of the components that constitute complex traits is necessary.

This relates both to the genetic variation of the processes behind complex characters and a better physiological understanding. It will be important to obtain reliable estimates of the genetic relationships between different traits or groups of traits and utilize this information in breeding.

3. Breeding for wide adaptability should be a major concern.

A main reason for this is all uncertainties concerning the future forest environment and the multiple uses of the forest. More research is needed on how the adaptability of a population relates to its level of genetic variability.

4. Research in plant physiology is an important complement to forest genetics.

Tree physiology should be an integrated part

of forest tree breeding. Physiologists and geneticists should work together in joint research units to obtain a better cooperation. Important topics are: flowering physiology, description of key factors in site adaptability, nutrient use efficiency, drought tolerance, frost tolerance and ageing.

Flowering, in particular, is a topic that requires more attention by both physiologists and geneticists. More information is needed about the mechanisms that regulate flowering and about potential physiological and genetic effects of flowering manipulations.

5. The reproduction system in the present open-pollinated seed orchards is unpredictable and does not match advanced breeding methods.

Research is needed on reproduction systems that can more efficiently capture the potential gains of bred material. A warning: Genetic material should not be selected to match the reproduction system used.

6. Physiological tests can generally not replace field experiments, but should complement these.

Screening methods should be developed for physiological test criteria that are reliable predictors of field performance.

7. Long-term field trials with genetically diverse material may be important in the future.

Some of the old trials should therefore be kept and managed. Of particular importance are trials that are planted in large plots.

8. The ideotype approach is interesting but still immature for practical applications.

Morphological and physiological components need to be investigated by means of modeling and experimental studies. Silvicultural and economical systems must also be taken into consideration.

9. *The research in biotechnology is still on the basic level.*

Biotechnological methods cannot replace conventional breeding techniques, but can supplement these in the future. The most likely applications of biotechnology in practical tree breeding seem to be vegetative propagation by in vitro methods, in particular as a breeding tool. Most likely, it will take a long time before practical tree breeding can utilize results from the research in gene technology.

10. *Gene resource conservation should be a major concern of forest geneticists, and tree breeders should more actively take part in the*

gene conservation activities.

Gene conservation should be a major concern when planning long-term breeding strategies. Long-term breeding should be considered as one of several conservation strategies.

11. *More emphasis should be placed on forest genetics in teaching.*

Important subjects are evolutionary, ecological and population genetics of forest tree populations. It is important that foresters and other managers of the forest resources have a good understanding of the genetic mechanisms operating in the forest stands.