# FACING FUTURE NEEDS OF WOOD PRODUCTION WITH IMPROVED MATERIAL OF THE THIRD CONIFER IN SWEDISH FORESTS

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Planting lodgepole pine (*Pinus contorta,* LP) is the most efficient way of increasing the forest production in northern Sweden (+30–40%). LP is already by far the most planted exotic tree species in Swedish forests. A large-scale introduction started around 1970 and was accompanied by thorough collections of seed material and comprehensive research. The use of LP peaked in the late 1980s, but the annual planting area has decreased significantly since then. LP plantations cover today about 600 thousand hectares. Now, reforestation with LP is again increasing.

LP is easy to handle in any breeding strategy, due to the early, male and female, flowering and good capability to root cuttings. LP is suitable for strategies employing clone testing and short generation turnover. Significant breeding activities in LP in Sweden began in the end of the 1970s, when a seed orchard program was initiated with intention to make Sweden self-supporting with genetically good LP base material and seed sources. The program included plus tree selection in Canada, genetic testing of open-pollinated families in field tests in Sweden, and establishment of six seedling seed orchards for genetic rouging. Also, a limited number of plus trees that were grafted earlier in the very first Swedish seed orchards were incorporated in the new program.

After 10 years the field tests were evaluated and close to 3000 F1-candidate trees were phenotypically selected among the best op-families and grafted into breeding archives. The candidate trees originate from about 940 Canadian mother-trees and an unknown number of op fathers representing a huge gene pool. Currently, pair crosses are carried out among the candidate trees (F1), using positive assortative mating (PAM) with regard to mother breeding values, and the first F2-field trials have been planted. This strategy allows for combined backward and forward selection, best utilizing resources already invested giving good options for further long term breeding and selection for seed orchards. With clone tests a new generation is formed with little time delay by forward selection among and within families. The clonal testing is applied on a large scale and will substantially increase the accuracy of forward selection in the F2-tests. The LP breeding meta-population will be structured following a multiple population strategy with 11 separate breeding populations that cover climatic differences of Sweden. Each closed population has at least 50 parents giving a meta-population of more than 550 trees.

In order to immediate secure future needs of improved seeds, while awaiting the next breeding step, the second round of seed orchards is now being established using grafted seed orchards to replace the seedling seed orchards. By using result from the field test, high gain is reached by combining progeny tested (backward selection) old plus trees with phenotypically tested (forward selection, within-family) young plus-trees. The gain is estimated to be 23%. In 15 years, after evaluation and selections in currently planted clone tests, new seed orchards are estimated to give 32-36% genetic gain.