A BRIEF REPORT ON FOREST TREE IMPROVEMENT IN JAPAN

Taisitiroo Satoo

Assistant Professor, Faculty of Agriculture, University of Tokyo

It is my pleasure to talk to you about some aspects of practical forest tree improvement in Japan. Since I was asked tc talk just this morning, I have to speak unprepared, depending only on my memory. I am a slviculturist not a professional geneticist, so I do not think I am qualified to talk about detailed technical problems in forest tree improvement.

As you people know, Japan is a very small country and its topography is very steep. About sixty percent of the land is covered by forests and it is of great importance. The most important forest tree species is Cryptomeria japonica, next Chamaecyparis obtusa, and pines have become more and more important as pulpwood after World War II. Most of the tree improvement is done on these species and some on firs, Japanese larch, and spruces which are also important in northern parts and higher elevations. But I will speak mostly of Cryptomeria which is the most important and has a long history of practical tree improvement.

First I will talk about some of the older races of Cryptomeria. We have a fairly long history of practical tree improvement made locally. These races are found only in areas where very intensive forestry has been practiced and where Cryptomeria trees have been propagated by means of cuttings. There are various types of intensive forestry of Cryptomeria in Japan, but we only find development of races in the areas where they have plantations with materials raised from cuttings. We have many such races in the southern island named Kyushu, some in the suburbs of the old city of Kyoto, one in Tiba prefecture near Tokyo (cover picture), and many others. Though these races are propogated exclusively by cuttings, they are not to be called clones, they are

considered to be mixtures of several or numerous clones having similar characteristics. There is some confusion in names; different types are called by the same name and the same types are called under different names.

The origins of these races are not clear, but there are two possible theories: (1) that a clone is contaminated with material from trees of similar characteristics, and (2) that they are the result of mass selection. However, they grow fairly homogeneously in a stand and the coefficient of variation in diameter and height is far less than comparable stands from seedlings. It is said that tree classification based on crown-class is very difficult in such stands of these races have particular characteristics in growth habit, site preference, morphological features of stem, branch and needles, color of needles, color of heartwood, etc. Races of such characters have been developed of Thujopsis dolabrata on the Japan-Sea side of central Japan.

Japanese foresters have not paid so much attention to tree improvement since European methods of forestry were introduced after the Meizi Reformation about 100 years ago. The Japanese had been so busy introducing western civilization that they did not pay much attention to traditional culture. The same thing also happened in forestry. However, at the same time, industry grew tremendously, the need for timber grew very rapidly, and large-scale plantations were made all over Japan, mostly of Cryptomeria and Chamaecyparis. As the result of some failures in these plantations, they had to pay attention to genetic characters of the planting materials, mostly of seed source of and influenced by European provenance experiments they made such experiments. Later, however, as the result of large-scale planting, natural regeneration became prevalent and little attention was paid to genetic problems, but small scale experiments were made. During this period, under bad influence of plant taxonomy and success in crop breeding, they only tried to work with morphological features of races or to make intraspecific crosses without any practical considerations, forgetting the traditional rather orthodox method. About the time of World War II, some people made duplication of chromosomes of some forest trees by means of colchicine which did not produce practically useful results, although we have some tetraploid and triploid trees or more years old useful as materials for experiment.

Meanwhile some private forest owners, who are not professional foresters but are occupied in the management of their own forests, developed clones of Cryptomeria for their own use. An old forest owner living near Tokyo has made clonal selections for 40 years and has more than 30 clones, and another in Kyushu selected a Cryptomeria clone from which it is said that much planting material is produced. It is very strange to me that most of the professional foresters did not pay any attention to such selection which the old farmers carried on. I think the reason for this is the fact that ornamental conifers are always propagated by cuttings from some mutants and the farmers are so naive that they accepted this method. When they found a fine tree in their forest they tried to propagate it by means of cuttings to use for their own plantings, whereas professional foresters are influenced by the success of improvement of crop plants.

After World War II, as a result of tremendous clear cutting during and after the war, large scale plantations were required. The need for tree improvement increased and the worldwide emphasis of forest tree improvement also, affected Japan. Now a nation-wide forest tree improvement program supported by government is under way and private industries also

have their own programs. Although the tree improvement program is carried out in almost the same way as in the United States and in Europe -- selection of superior trees, seed orchards, progeny tests, etc. -- development of clones of Cryptomeria which is rather easily propagated by cuttings, is continued. In the case of clonal propagation, trees belonging to a particular clone are planted as hedge or something like a seed orchard and trimmed so that abundant good cuttings are taken easily. This method of ting cuttings had been used in some parts of Japan for a long time. Although there have not been any apparent disadvantages in the use of monocultures of Cryptomeria clones, improvement by means of sexual propagation is also made and mixtures of clones or races are also considered.

DISCUSSION

HAUT. I have a question for Professor Satoo. Where you find your coldest temperatures in Japan, what would they be in relation to the Cryptomeria range? At what low winter temperature would you find injury?

SATOO Injury is not so rare especially in early spring and in mid-winter. I'm not sure about the figure, but minus 20° C will make injury even in winter in some conditions.

BESLEY. I would like to ask Dr. Rendle a question. Are you working on the correlation between the juvenile wood and the later formed mature wood so that you could use the juvenile wood in these young seedlings as a precursor of what you are going to get in the way of mature wood, as to whether it will be good quality or bad quality later on?

RENDLE. Yes, this is a problem which is engaging our attention very closely. As yet, we haven't done much more than study what work is being done in other countries, but we are alive to the possibilities of using the juvenile wood to predict the quality of wood that will be formed later, and we hope to work along those lines.

HAMILTON. I'd like to ask Dr. Matthews for clarification of one word. You said that the Japanese-European hybrid performed more satisfactorily than the European farther up the hill, on the bad sites. Could you clarify the word bad? Is it climatic or edaphic or both?

MATTHEWS. It is both. On upland sites in Scotland, peat formation is common. It is on these sites rather than on good fertile sites that hybrid larch shows the best growth relative to both European and Japanese larch.

HAMILTON. What would be the response as you move down on a drainage gradient? Does the hybrid perform more satisfactorily for you as the drainage becomes poorer?

MATTHEWS. The larches do not grow well on sites with impeded drainage and we would not expect the hybrid larch to do well under these conditions. Where the drainage is impeded we do a lot of site preparation, particularly deep ploughing, in order to get the water moving.