Workshop: Designing Roots

On July 2, 1997, AAI held a workshop titled "Designing Roots". A total of 30 participants from universities, forestry organizations and construction companies took part. In the morning, the idea of "designing roots" was introduced using a photo database. In the afternoon, participants tried hands-on work using actual equipment.

Even in dry sand areas which are constantly moved by wind, if you dig 1-2 m below the surface you will find small amounts of moisture. This subterranean moisture is relatively stable regardless of seasonal fluctuations in ground surface moisture. Trees naturally growing in this type of area extend their roots to this deep moist layer. However, even a drought-resistant seed can only just manage to sustain its life with this amount of water. In order to grow, there are different root system at the 20-40 cm level which spread radially over distances of more than 10 m. These roots collect water efficiently from infrequent rain. In short, there is a division of labour: deep roots support life, and shallow roots play a role in growth. This is how trees in arid regions survive.

When planting trees artificially, the first task is to ensure survival of the plant by ensuring its roots reach the level characterized by stable moisture as soon as possible. We can leave considerations of growth to the parallel roots in the shallow level that collect natural seasonal precipitation. If possible, it is a good idea to water the plant from time to time. Anyway, the important thing is for roots to reach the deep layer as soon as possible. In this respect, how about growing long roots before planting? Fortunately, plant roots are highly adaptable. We have found out that it is possible to grow roots one or two meter in length, if we try.

The difficult bit is digging a hole sufficiently deep to plant such long roots. The ease with which sandy soil collapses makes the planting task even more difficult. However, even in these difficult circumstances there is a way to cope; namely by applying a device made from vacuum cleaners which employs two long tubes. The first fat tube, which covers the second thin tube, prevents the sandy soil from collapsing. The thin tube inside the fat tube vacuums sand out. The space between the two tubes acts as an air supply pipe. In early days of innovation, this device was only used in sandy soil, however, the technology has been improved and can now also be used in hard clay soil.

The basic idea for the technology was consolidated several years ago, and a number of experiments have been conducted in the Middle East, as a part of overseas assistance projects concerning arid agriculture and greening of the area. In May 1997, we held a workshop in cooperation with staff from the UAE's Afforestation Bureau which has been enthusiastically promoting plantation projects in desert areas. This was the basis of our workshop in July. A workshop is not just a one-way lecture. It is a gathering of people who interact with one another in order to find something new. We hope that this workshop does not end up with just one gathering, but will instead lead to the creation of networks among the participants that will help further examination and/or improvements in the field of root design. As a result, we hope that the idea of designing roots will spread in many directions to many people, leading to the improvement of afforestation technologies in arid areas, a reduction in labour and water use, and an increase in the number of self-standing trees.



Digging device made from a vacuum cleaner



Long-rooted and ordinarily-rooted saplings