temperatures are at times as high as 90 degrees.

In general we get a much better bud stand with the dormant buds than with green buds, particularly on the Thornless Honeylocusts and the Plum and Prunus. We can also bud earlier in the season and get this budding out of the way before green buds are ready to use on other budding.

I am sorry it is not possible for me to attend this meeting this year, but if anyone has any questions and would care to write to me in care of Mount Arbor Nurseries, Shenandoah, Iowa, I will be happy to answer to the best of my ability.

MODERATOR TINGA: I am always surprised at the amount of hand labor required in these operations. My objective is to eliminate just as much hand labor as we can. Very often this means changing species and systems. But, if hand labor is the problem I think it is and is going to be, I think everyone has to think in terms of eliminating whole steps in production if that's necessary in order to come out on the net profit side. The next talk that we have will be seed bed treatments prior to seeding by Mr. Ralph Shugert.

SEEDBED TREATMENT PRIOR TO SEEDING

RALPH SHUGERT
Plumfield Nurseries
Fremont, Nebraska

Dr. Tinga, President Vermeulen, Society members and honored guests:

It is a real pleasure to discuss with you this morning the most fascinating, perplexing, and at times incomprehensible, phase of plant reproduction . . . seedling propagation. Over the years we have heard excellent papers presented covering many aspects of seedling production, and it is my intent today to discuss a few techniques we use at Plumfield Nurseries in Fremont, Nebraska.

Our seedling operation is divided between seed beds and seed rows, and most of the remarks and slides will concern the former. The field which encompasses our seed beds is very level, and the soil texture is quite sandy. There are approximately thirty acres of seed beds in this field. Perhaps I should pay more attention to the soil pH, and to N., P., K., but I don't — except that based on previous soil tests, we are quite high in both Potash and Potassium. These results are compiled on a response based on field crops. Soil pH is rather confusing due to the fact that one section of our field of seed beds, a strip seven hundred feet long, will show a pH variation from 7.1 to 8.0. The same species are seeded in this area, and little if any difference can be noticed in the growth of 1-0 and 2-0 seedlings. Perhaps a comment on weed control, that shall follow might provide an answer to this pH variation.

Our seed beds are prepared and constructed quite simply. After the seedlings are lifted in the fall, the vacant beds are disced lightly to go into the winter. This ground is then kept disced down during the spring and early summer. The first week in August the seed beds are constructed, so that the seeding can start the first week in October. We prepare our beds with an Allis-Chalmers tractor, and all our beds measure four feet from center of alley to center of alley. The soil is raised about six inches with two rear discs, and leveled with two inch by four inch boards mounted at about a thirty degree angle to the front cultivator bars. After the beds are raised they are the harrowed, and ready for weed control prior to seeding.

The only weed control we use in seed beds is that of a pre-emergence, and the material used is Calcium Cyanamid, shipped in cars from Niagara Falls, Canada. The material cost is $61.00 per ton, FOB Canada, and our cost — which includes freight, unloading and labor to apply — will be close to $185.00 per acre, applied. This figure does not include overhead, but rather is a direct labor cost. We apply this material at the rate of seventy-five pounds per one thousand square feet of bed, in two applications. The tractor and spreader go over the bed the first time with one-half the amount and then the bed is harrowed. The second and final application is identical to the first. After a section of seed beds is treated the entire section is then watered. This material gives us about 20% Nitrogen which could explain the pH variation mentioned earlier, and the weed control is perfect until the wind blown weed seeds start germinating in mid-May. From this point on, until frost, all of the seed beds are hand-weeded.

Seeding starts the first week in October, with the stratified seed going in the ground first. This includes varieties such as: *Cotoneaster acutifolia, Juniperus scopulorum, Tilia americana, Tilia cordata* and *Viburnum* species. All of our seed is drilled in with a Planet Junior five row drill, and mulched with oat straw. We apply the straw immediately after seeding each bed. As the slides will point out, we have four seed rows per bed for increased light intensity. The center drill is plugged, and this gives us a seven inch row spacing between rows one and two and three and four. There is then fourteen inches of space between rows two and three. The straw is applied at the rate of one manure spreader load to a bed of three hundred and thirty feet. This gives us ample, but thin coverage. The straw is held in place with two inch mesh wire, pegged to the bed with steel pegs. We normally finish seeding by the middle of November, and our normal Nebraska winters will cover the beds for us with snow until spring. In the spring the pegs and wire are removed, but the straw remains on the beds. We will make our initial hand-weeding through the straw, allowing protection for the

germinating seedlings. Many of the conifers are then shaded in early June with snow fencing, and in most cases the shades stay on the beds throughout the second year.

Now a short word or two about our seed rows, and then we shall show a few slides. The acreage involved in rows is between forty and fifty, dependent upon seed supply. We prepare soil by winter fallowing, and then discing all summer, prior to seeding in October. Immediately before seeding the ground is disced, harrowed and rolled, and the seed is drilled with a one-row Planet Junior drill. We ridge our seed rows quite high, up to a hill of about ten inches to go into the winter. This hill is removed in the spring, partially with a Budding In-Row-Weeder, and by hand with a potato hook. We apply a band of perlite when we seed, and this enables inexperienced laborers to know when they have gone deep enough with their hooks. This has saved us much embarrassment in having seed hooked, or raked, out of the rows. The rows are then maintained during the growing season by weeding with the In-Row-Weeder, while the seedlings are small, and then by weeding crews when they are larger. We do not use any type of weed control in the seed rows.

Before we view the slides, I would like to comment that we are growing a wide list of plant materials from seed. The acute problem today for the propagator growing seedlings from *Abies to Viburnum*, is that of seed source. We use private collectors exclusively, and rely strongly upon our own seed mother rows. It is not inexpensive to pick and clean seed, but it is well worth the additional cost to have the seed when you want it, and to be assured of viability and the germinative capacity necessary to assure decent seed stands.

The challenge in seedling propagation is probably no greater than that of vegetative propagation, but nothing gives me a greater feeling of exhilaration than to observe seedlings germinating in the spring. Another new growing year is approaching . . . "God's in his Heaven, all's right with the world."

PETE VERMEULEN: How much water do you put on?

RALPH SHUGERT: I have had several people say you need a very heavy water seal, but I have never followed this. I would say that if we used more than ⅛", I would be surprised. What we do is to water until the ground is black.

JOE HOULIHAN: How soon do you water after the material is applied?

RALPH SHUGERT: We apply the water immediately after application, section by section.