MECHANICAL HARVESTING-SEEDLINGS

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(Panel Moderator)

I had the priviledge of working with Sanford Darby on the Georgia pine seedling lifter. I started work on it in 1956 and we had a period of about 4 years of trials and tribulations. We're going to start the program off this morning with a silent film showing some of the work on it.

COMMENTS (E. G. Terrell, New York Department of Conservation, Ballston Spa, New York):

First, let me tell you that it's a real pleasure to be down here. We have found that although we do some things the same way as you do, many of the things we do in New York are probably not applicable here. During today's session, Bill and I are going to work together. We thought that if we did it separately, we would have a great deal of repetition; mostly because both of us are talking primarily about the Georgia seedling harvester. The one developed by Professor Rice. In addition, we should also point out the increasing need for such a machine. The history of the development we have already taken up partly with the Georgia machine. Now, we should see about where we stand today. If we had already completed this machine, we wouldn't be discussing this today. So, we'll look ahead and see where we may be heading tomorrow or next year.

Certainly, the labor that we are able to get, as little as it is in the North, is becoming increasingly poor. The laborers want to give us approximately 4 hours work for 8 hours pay. Supervision of the job also goes up in proportion to the kind of labor we get. So, we don't have much labor and what we get is of poor quality. I might point out that while your shipping season lasts from November to February or March, ours starts the first week in April and finishes at least by the last week in April. We have only 3 to 4 weeks to get out something like 16 to 18 million seedlings per nursery. Our whole situation is dumped into one very short period of time, which means that the employees we may normally get are often times layed off before they get their first pay check. We have some situations where we have to lift with snow on the ground, or in snow storms, rains, and heavy winds. So, in general, we're not getting labor and we have felt for quite a period of time that we must have some kind of mechanical harvesting. We heard about the Georgia machine and in 1962 we decided to build one. This is not an easy job and I'm sure you've seen enough already to know that problems are still unsolved. In the North we have 10 species to deal with. This includes some hardwoods and probably will include more. We have the basic difference in roots on spruce. which are very fine, fibrous

1/ Panel presentation. Comments of the participants are included.

root systems, very much entangled with its neighbor's, soil, or organic matter. We have different sizes of seedlings. Japanese larch, for instance, in 2 years can be 24 inches tall. Some of our smaller species, like Austrian pine, in 2 years can be as short as 4 to 6 inches. We have quite a variety of seedling sizes and weights. One of the problems that we ran into with the Georgia harvester was the fact that we had very large stem caliper in comparison to the southern pines. We have problems that are a little different from what you have. The soil types, I think, are very comparable to yours, but we operate at the time of year when we have little control over the moisture content or over frost conditions in these soils.

The machine sat around with a series of trials whenever we could find time to work on it, and we'd show it whenever we had guests we wanted to impress with our great progress toward mechanical harvesting. It sat in the barn until the winter of 1968. We had conversation with Bill King of Virginia several times about the possibility of using the machine there and with a very minimum of red tape, Bill picked up the machine and took it back to Virginia to make some more trials.

Besides the Georgia machine, we've heard recently of successes with other machines, especially in Canada and Germany. As a result of the trials that were conducted in Virginia, Joe Dean, State Forester, visited the U. S. Forest Service and made an appeal to them for assistance in the development of the mechanical harvester. The result is that there has been an assignment by the U. S. Forest Service of the Equipment Development Center at Missoula, Montana, to pursue the development and construction of a proto-type.

COMMENTS (G. W. KING, Virginia Department of Conservation, Providence Forge, Virginia):

When we first started with the seedling harvester, I went to see a man by the name of Hobbs. I was very much impressed with this man's work. Continental Can Company had approached him about a peanut digger and he finally gave them one to try out. We went to see how it worked. The peanut digger was excellent for getting plants out of the ground. After a personal conference with Hobbs, he came up with the idea that I'll present to you. However, it's never been developed. It sounded good and I think it might work; but Hobbs won't touch it because of the patent problems, etc. We finally gave up on this idea.

As a result of a little meeting at the New Kent Nursery last spring, we began to come up with some ideas based on the Georgia machine and the experience that New York had with one. Personnel of the U. S. Forest Service, Missoula, Montana, went away with these ideas of

what we thought we should have and it wasn't too long before they called me and said, "Have you ever heard of a machine that is being used in Germany?" They explained that one was being built in Germany, in fact being used, and that it was exactly like the sketch of the one we had come up with.

What we want to try to do is bring out some of these ideas. As a result of the lifting machine, we found that we had to have a lot of backing equipment--equipment to handle the plants after they are lifted (slides shown). This machine is self-propelled by a 7 HP engine and it operates hydraulically. We ran it over three beds at a time. It straddles one bed and lifts the seedlings on the bed on each side at the same time. Notice the platform on the side where the crew lifts the plants by hand and lays them on the platform. Then a man picks them up and packs them on the packing frame. Ahead of him is the steering and forward motion device. The machine is all hydraulically operated. Hydraulic motors under the wheels and a gasoline engine up front. This eliminates the tractor and is quite safe.

All of this has been done since 1958. First thing is undercutting. It's simple, but the seedlings have to be undercut somewhere in the process. The next is the folder. We feel that we need a folder, or plowing device. Now comes the plow that to date hadn't entered into the picture. We are going to need a plow. We work one row at a time. The idea is to work one row and do it perfectly; then we can add to it. All of these things, of course, have been tested out except the plow in the original machines. Now, the elevator--just giving you a picture of what the thing is all about. We need an elevator to lift the seedlings and we need a root beater. To combine all this and get it to work is what we've been up against since 1958. Along with this, we need something durable, something that is dependable and in order to have a machine that is going to work, we're going to need willing and able people to run it. The crew is going to have to give us all the support they can--get enthusiastic about it--or we're lost right there.

Along with this, it has to be economical, and it has to be adaptable to our problems, all of them, and they are different.

COMMENTS (E. G. TERRELL, New York Department of Conservation):

We have made modifications in our machine, and Bill has made a few. We feel that the money we put into this machine, despite the fact that it didn't work for us, was well spent. The meeting at New Kent Nursery in the spring of 1968 got the interest of the State Foresters and the U. S. Forest Service, so that we now have

a Federally sponsored program which will eventually include the construction of a machine that will work.

COMMENTS (G.W. KING, Virginia Department of Conservation):

Getting back to the back-up equipment, this is what we call the New Kent seedling wrapper. We use this in the field and it works very well. It is a canvas wrapper that is used to hold the seedlings to put the roots in the sack. It's held together by rubber bands. You can make it any size you want. The rubber bands are made of innertubes and they have hooks on them. We use reinforcing sticks in them for easier handling. They weigh about 60 to 70 pounds each when full of seedlings.

This is the New Kent packing trailer, which resulted in the hydraulic machine which I showed you earlier. Essentially, it is a table that holds the canvas. It runs along parallel to the lifting machine that throws the seedlings out. By having some arrangement like this trailer, with two packing rigs on it and a roller conveyer, the men who are packing simply put the canvas on the conveyer, push them, and they end up at the back on a little trailer big enough to carry them to the end of the bed. With this device, we lifted some 20 million seedlings last year and we reduced the 35 to 40 men lifting crew to 12. That's a lot of difference. We could also do it faster and stay ahead of some 85 people who were working in the grading room.

Even though there are a great many things to be done on this machine and the back-up equipment, work has been done from Georgia to New York to Virginia. There have been some fantastic improvements and eventually we're going to have a mechanical harvester.

In the way of new development, Missoula has gone into the construction of this harvester very seriously and very enthausiastically. Jim Lot at Missoula has found the asparagus machine and he thinks it will do the job. The principle is that it is going to eliminate a lot of our power train. It has a continuous belt and by taking these wheels down on the beds and raising the power train to the top of a pulley, there will be more room to do the other things we have to do.

COMMENTS (W. H. MAYO, Joseph Campbell Company, Cairo, Georgia):

The job of our Division is the procurement of vegetable ingredients. This includes vegetable seedlings; namely, tomato seedlings. We produce them in the South and ship them to the East and West and to Canada for transplanting and production of tomatoes. We are responsible for the growing, harvesting, grading, packaging, and shipping of several hundred acres of tomato seedlings that are grown in the Southwestern part of Georgia, as well as several hundred acres grown on a farm in southern Mississippi.

Our machine is a really simple machine and I'd like to throw this out to you people working on mechanical harvesting--don't overlook the people on the lower end of your organization. Often times these people give you simple, practical ideas. I've observed this in my 26 years of business. The first model we had built was by a practical mechanic whose formal education consisted of 3 years in grammar school. Because of that, I think, sometimes the simple thinking people will give you good ideas. Our machine is built around the main principle of two parallel belts lifting the plants up and delivering the plants to any place you want them. The machines we have in operation today will satisfactorily lift the seedlings out of the soil, knock the excess soil from the root system, place the plants in heavy-duty corregated boxes in an orderly manner, without ever being touched by human hands.

Getting to some of the limitations of our machine; tomato seedlings, for our use, have to be quite uniform in stem diameter and height. We work on a minimum stem diameter of 3/16-inch with a variance in height of from 6 to 9 inches. We prefer 8-inch and 9-inch plants. The number one factor with us is uniformity in diameter and height. We tried all types of ideas trying to get this uniformity. Precision seedlings, precision preparation of the soil, and a new procedure we are using (one that is helping us quite a bit today) is our judicial, or prudent, clipping of the plants. When the larger plants in the bed reach 7 to 8 inches in height, we go in with a specially designed precision mower and lightly cut the tops out of the larger plants. This slows down the growth of these plants and enables the younger, weaker plants to grow and reach the same height. This one problem is the thing that keeps us from going to 100 percent mechanical harvesting of tomato seedlings. Other problems are: wet soils, our machine is not sophisticated enough, we could use some better electronic controls in order to improve the system.

A practical way to grade the plants is another factor that ties in with uniformity or the lack of it. Under the present setup we mechanically harvest the plants in the field, bring them to a packing shed, and run them across belts where they are graded and the count estimated, then they are packaged in suitable containers.

I'm not too familiar with the pine seedling industry. I don't know if uniformity is as essential with your nurserymen as it is with us; I gather that it isn't. If this is true and you plant in rows, I believe our machine will do a pretty good job for you.

COMMENT (Rice): We have shown you some of the work that has been done in mechanical harvesting and hope for more work in the future. I feel certain that mechanization of the job is absolutely essential, primarily because of labor and economics.