

NEW SEEDING AND LIFTING CONCEPTS

IN BRITISH COLUMBIA

Ralph F. Huber

ABSTRACT: All bareroot seed for Douglas-fir and lodgepole pine was precision-sown in 1984 at nurseries in British Columbia. Lifting was done with side-delivery systems on lifters into field bins on a trailer instead of tote boxes.

INTRODUCTION

Field foresters want seedlings that will have better survival and free growth. Research has shown that by lowering densities we can produce seedlings that will give better survival and growth in the plantation. In order to lower densities and achieve regular spacing in the seedbed a more efficient seeder than those previously used was a necessity. In 1982 a Summit precision seeder was purchased and in 1984 a Miniair precision seeder was acquired.

In 1983 the recession and restraints on FTE's indicated we needed to look at some of our nursery practices. One practice on which we could save manpower was field lifting. Tote boxes were being used in the field to retrieve seedlings behind both the Grayco and Fobro lifters. In place of tote boxes we have switched to field bins on a trailer. To fill the bins with seedlings, we installed a side delivery system on the Grayco lifters and purchased seedling combines to follow the Fobro. Switching to this type of system will save up to 12 employees per lifting shift.

SEEDING

Prior to 1984 all bareroot seeding was done with either a Wind River seeder or Oyard. Seeding with these machines resulted in uneven distribution of seed, thus giving clumps of seedlings in the row, resulting in poor growth of some seedlings. The Oyard did a better job of seed distribution, but still lacked in precision distribution. In 1982 limited experimental precision seeding was started, some operational seeding began in 1983, and

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Ralph F. Huber is Nursery Operations Officer, Ministry of Forests, Silviculture Branch, Victoria, British Columbia.

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PRECISION SEEDERS

Summit Precision

Seeder

Manufactured by Summit Engineering of Rotorua, New Zealand, the Summit Seeder originally was a unit designed to form beds, pack seed, and cover seed, in one operation. We have never used the bed-shaping capability of the machine. In the future, this seeder will be available in three models--seeder with a three-point hitch only, seeder with fertilizer injector, or seeder with bed-forming capability.

The vacuum sowing head on the Summit is one solid drum with seven rows of orifices corresponding to each row of nursery bed. Originally, the sowing drum was designed to handle large-seeded species such as Douglas-fir or ponderosa pine. They have since developed a drum which will handle small-seeded species such as spruce or lodgepole pine, as well as large-seeded species.

Spacing in the row by the Summit seeder is dictated by an arrangement of two sprockets. Sprockets with a different number of teeth (14 to 69) are used to give a spacing of 1.0 cm to 13.0 cm. Table 1 gives an example of the spacing the seeder is capable of.

When seeding with the Summit, speed of travel is very important. The recommended travel speed is 60 feet (18 meters) per minute. Accuracy of the machine decreases as travel speed increases.

Miniair Precision Seeder

Manufactured by H. Fahse and Co. of Duren, West Germany, the Miniair is used extensively for agricultural purposes in Europe. We use this machine for sowing lodgepole pine and a limited amount of white spruce on an experimental basis.

In comparison to the Summit, which has one vacuum drum for sowing seven rows, the Miniair has seven individual sowing heads. Each sowing head has a vacuum disc with orifices

Spacing in the row by the Mini-air seeder is dictated by an arrangement of four gears. By interchanging the gears the machine is capable of achieving spacing from 0.6 cm to 6.0 cm. Table 2 gives an example of the spacing the seeder is capable of. Interseed distances greater than those in table 2 can be achieved by using a smaller drive sprocket.

As with the Summit Seeder, speed of travel is important. The factory recommends that ground speed should be such that the seed can be visible on the rotating seed pickup discs. Our experience is that this is approximately 65 feet (20 meters) per minute. Accuracy of the machine will decrease with increased speed of travel.

Table 1.--Spacing capability of the Summit Precision Seeder showing the number of seeds laid down in seven rows per bed meter

Interseed spacing (cm)	Seeds per bed meter
1.00	700
1.26	555
1.53	457
1.75	400
2.00	350
2.27	308
2.47	283
2.75	254
3.07	228
3.30	212
3.46	202
3.79	184
4.01	174
4.21	166
4.45	157
4.71	149
4.95	141
5.20	135
etc.	

Table 2.--Spacing capability of the Mini-air Precision Seeder showing the number of seeds laid down in seven rows per meter

Interseed spacing (cm)	Seeds per bed meter
0.6	1 167
0.8	875
0.9	778
1.1	636
1.3	538
1.5	467
1.8	389
1.9	368
2.3	304
2.7	289
2.9	241
3.0	233
3.5	200
3.9	179
4.6	152
6.0	117

PRECISION SOWING

Before establishing precision sowing rules one must establish how many seedlings per bed meter one wants to ship and how many seedlings are required to reach this shippable number. In British Columbia, we looked at our sowing rules and worked from that point to establish new rules. Tables 3 and 4 give a comparison for coastal Douglas-fir and lodgepole pine, respectively, for old and new sowing rules. Note that amount of viable seed sown for Douglas-fir per bed meter is approximately 50 percent and lodgepole pine 17 percent of old sowing rules.

Because the number of viable seed per meter sown is down, the expected recovery per meter must also be down. Tables 3 and 4 show the projected recovery. You will have to take into account that precision sowing will take more bed meters. In our case, Douglas-fir takes 80 percent more bed meters, while lodgepole pine takes 15 percent.

Once you have established how many viable seeds per bed meter you want, you can establish spacing. Tables 5 and 6 show the spacing we use in our nurseries. You will notice that we broke viability percentage into blocks of 10. This was done to eliminate gear changes. You will note (table 5) that we keep an average of approximately 200 viable seeds per bed meter for all spacings in Douglas-fir. The spacing is figured out by dividing the number of centimeters per row times the number of rows per meter by the number of seeds to be laid down. Consideration must be given to the total number of seeds, not only the viable seeds.

The numbers presented here are our best guess and until such time as we gather more historical data, will probably not be changed. We feel we might be conservative in our numbers.

At this point, I remind you that what works for one nursery may not work at another location.

ADVANTAGES AND DISADVANTAGES OF PRECISION SEEDING

Advantages

- Greater dry weight
- Greater root collar diameter
- Fewer culls, therefore less spent on grading - Better survival and free growth after planting
- Larger number of seedlings from a given amount of seed

Disadvantages

- More seedbed, therefore greater cost for fertilizers, hand weeding, and lifting - More packages required
- Greater trucking costs

Table 3.--Projected recovery of plantable seedlings per bed meter by viable seed sown--
Douglas-fir (Coastal)

Nursery	Viable seed per meter sown		Projected recovery		Recovery factor %		Recovery increase %
	Old	New	Old	New	Old	New	
CRN	395	200	215	120	54	60	11
GTN	490	240	215	120	44	50	14
CHW	490	240	215	120	44	50	14

Table 4.--Projected recovery of plantable seedlings per bed meter by viable seed sown--
lodgepole pine

GTN	360	300	230	200	64	67	5
SKM	360	300	230	200	64	67	5
RRK	395	300	230	200	58	67	15
SUR	360	300	230	200	64	67	5
TLK	360	300	230	200	64	67	5

Table 5.--Sowing rules for precision sowing coastal Douglas-fir at Campbell River Nursery with
Summit precision seeder

Viability	Interseed distance	Seed per meter sown	Viable seed per meter	Recovery per meter	Recovery factor %
91 - 100	3.30	212	193 - 192	120	56 - 62
81 - 90	2.81	249	201 - 224	120	54 - 60
71 - 80	2.81	262	186 - 200	120	60 - 64
61 - 70	2.31	303	184 - 212	120	54 - 63
51 - 60	1.87	374	190 - 224	120	54 - 63
50	*	varies	250	120	48

*Sown with Wind River Seeder

Table 6.--Sowing rules for precision sowing lodgepole pine at all nurseries (spring 1984) with
Summit precision seeder

Nursery	Seed viability	Interseed distance	Seeds per meter sown	Viable Seed per meter sown	Recovery per meter	Recovery factor %
CRN	91 - 100	2.23	314	286 - 314	200	64 - 70
GTN	81 - 90	1.99	351	284 - 316	200	63 - 70
SKM	71 - 80	1.76	397	282 - 318	200	63 - 71
SRY	61 - 70	1.53	458	279 - 321	200	62 - 72
	51 - 60	1.30	540	275 - 324	200	62 - 73
	41 - 50	1.06	659	270 - 329	200	61 - 74
	40	*	Varies	360	230	64
TLK	-	*	Varies	360	230	64

*Sown with Wind River Seeder

LIFTING

Up until 1983, all lifting was done using either a Grayco or Fobro lifter. Seedlings, in the case of the Grayco, were deposited into tote boxes at the rear of the machine and then put onto a trailer travelling alongside. With the Fobro lifter we had from 12 to 16 people picking up seedlings from the seedbed, placing them into tote boxes and then onto a trailer. Lifting was one area that we zeroed-in on to save manpower. We installed a side delivery system on the rear of the Grayco to transport seedlings up into bins on the trailer. In cooperation with Fobro, a combine was developed to pick seedlings up off the seedbed and transport them by conveyors into bins on a trailer. We switched from tote boxes to bins in this change of lifting practice.

Grayco Lifter

Manufactured by Evergreen Tree Seedling Harvesters, Heidelberg, Ontario, Canada, our Grayco lifters originally were equipped with personnel carriers. The personnel carriers saw limited use in our operations. When the idea of a side delivery and bin system came up, the first place we looked for parts for fabrication was the personnel carriers. All parts for the side deliveries--chains, hydraulics, etc.--were cannibalized from the personnel carrier. This saved us a considerable amount of money; by using the side delivery we do away with seven people in the field.

Fobro Lifter

This machine is manufactured by Baertschi b Co. Ltd. of Hueswil, Switzerland. For the past few years, we have been using Fobro lifters in a number of our nurseries. Up until 1983, we had from 12 to 16 people following the Fobro to pick up seedlings from the seedbed, place them in tote boxes, and stack them onto a trailer. In 1983, we purchased our first Fobro combine to pick up seedlings off the seedbed and transport them up and over to a trailer with field bins. Since our first model was purchased, we have made numerous modifications to the combine. The major modifications were: using potato digger chains instead of belts, which eliminated a lot of soil in the bins; a lift on the side delivery system so tractors can pass under when changing trailers.

The combine can save you up to 15 people in the field lifting operation. Depending on production of the nursery, a combine will pay for itself in short order. During our 1984-85 lift we will have four combines in operation.