Seedling Conversion Factors

Issue

To assist with seed policy, planning and orchard capacity a species specific seedling recovery factor (seeds per seedling) is an important attribute. It has been a mainstay of FGC Species plans and has been a highly debated variable due to the large range of values placed on it depending on seedlot quality, nursery or client.

Background

Seedling conversion factors have been discussed and agreed to at various TAC meetings over time. They were last reviewed in 2015 by Stephen Joyce and Jack Woods by using SPAR sowing guidelines, efficient seed-use factors, consulting with seedling request agencies and expert advise from the nursery industry. These factors were agreed to with ITAC and CTAC chairs and have been used in FGC Business Planning since (Table 1). With a renewed look at seed planning, orchard capacity and the move to CBST reporting, it seemed appropriate to review these seedling conversion factors, and Jack Woods, Stephen Joyce, Sabina Donnelly and Dave Kolotelo were tasked with this. Sabina Donnelly put together the datasets for consideration.

Methodology

Requested Seedlings and Seed Supplied

In SPAR, clients place seedling requests in terms of **Requested Seedlings** and the sowing guidelines calculate the **grams required** = **(Number of seedlings requested X seeds supplied per seedling) / seeds per gram**. Nurseries or the clients can adjust the grams required to meet this request and this may involve incentives or hard limits placed on the seed by the client. These gram adjustments are recalculated in SPAR to provide an estimate of **Calculated Seedlings** based on actual grams used, but seedlings requested remains the same. Most gram adjustments are reductions in seed use, but not all. The difference between Requested and Calculated seedlings due to gram adjustments (seed use efficiency) has resulted in savings of between 30 to 40 million seedlings worth of seed per year in the past decade.

The values in Table 1 represent only data from seed orchard seed from the 2016 to 2020 seedling production years. The calculated grams (after gram reductions) was multiplied by the seeds per gram for that specific seedlot, summed and then divided by the sum of requested seedlings by species and year to provide a representative estimate of seeds per seedling. This weighting by the number of requested seedlings by seedlot provides a more realistic seeds per seedling estimate for the program compared to simply averaging the seedlot or seedling request contribution.

The advantage of this data is that it is easily reproduced from SPAR queries and accounts for the entire seedling production program. It does assume that seed sent to the nursery is the actual amount sown to produce seedlings. Although the returned seed program is small, we never know exactly how much seed was sown to produce seedlings. This downside of this data set is that it does not reflect the actual number of seedlings produced, just the number requested.

Lifted Seedlings and Seed Supplied

For Ministry requests, we have the advantage of being able access the number of lifted seedlings through a BCTS database. This represents actual seedlings obtained, so a much better estimate than requested seedlings, but it represents only about one third of the entire seedling production program. The seeds per seedling estimates based on lifted seedlings also assumes all seed sent to the nursery is the amount sown to produce seedlings. It is recognized that Ministry practices (larger stock types, provision of incentives for seed efficiency, and more rigid seedling specifications) may not be reflective of the entire seedling production program. As a comparative variable, the % lifted column is presented in Table 1 with values >100% indicating overruns and values less than 100% indicating deficiencies relative to seedlings requested.

Table 1. Seeds per seedling estimates for orchard produced seed: historic values and five-year averages based on seedlings requested for the entire program and seedlings lifted for the Ministry program.

Species	FGC Now	Seedlings Requested Basis (2016 – 2020)	Seedlings Lifted Basis (2015-2019)	% Lifted	RECOMMENDATION
CW	3.00	2.61	3.10	84	**2.85**
DR		2.22	2.28	97	**2.22**
FDC	1.90	2.01	2.34	86	**2.20**
FDI	1.90	1.89	1.73	109	**1.89**
HW	2.22	2.31	2.23	104	**2.31**
LW	2.20	2.66	2.32	115	**2.50**
PLI	1.50	1.58	1.56	101	**1.58**
PW	2.50	2.54	2.60	98	**2.54**
PY	1.80	2.39	1.62	148	**2.00**
SS	1.90	2.12	2.20	96	**2.12**
SX	2.20	2.42	2.65	91	**2.42**

Discussion

Species specific seedling conversion factors are highly variable depending on seedlot quality, client, and nursery. The use of a variable that is weighted by seedlings requested is more reflective of the program than simply the seedling request average. The benefit of using requested vs. lifted seedlings are that it reflects the entire reforestation program and is relatively easy to duplicate. The limitation of using requested seedlings are that it reflects requested seedlings and not seedlings actually obtained at the nursery. The lifted seedling information is a very useful and informative dataset, but it likely is not representative of seed usage for the entire reforestation program. The calculation of both estimates assumes the amount of seed sent to the nursery was the amount sown.

Considering the lifted seedling information there appears to be greater efficiency in producing PY seedlings than the seedling requested results indicate and we recommend adjusting the seedling conversion factor to 2.00. Seed orchard seed has only recently been available with this species. Western larch also shows greater efficiencies and we have adjusted the factor to 2.5. There are concerns with underrun production in CW and FDC and we have adjusted the seedling conversion factors to 2.85 and 2.20 respectively. The FDC issue is likely due to significant root rot losses that nurseries have experienced. The reason for the CW underruns is not as clear.

Recommendations

The group recommends using the seeds per seedling estimates based on the weighted average of requested seedlings for the 2016 to 2020 production seasons. We have adjusted the factors for CW, FDC, LW and PY based on the lifted seedling information. We recommend that this variable be updated on an annual basis.

David Kolotelo
Jack Woods
Stephen Joyce
Sabina Donnelly
Kevin Astridge

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