I find the task quite difficult, and I would start by saying that I am not 100% sure of my guess. But this is the game!

So, for forest models and TROLL in particular, I would say that one important point is the first assumption you mentioned in your first email: "the best competitors also produce the most biomass", which might not be true in this case. The distinction between productivity and biomass is also important. Indeed traits that confer high tissue productivity are typically associated with low tissue biomass, through functional trade-offs. However, I specify "tissue", as I am not sure this necessary holds at the individual-level, given that the link with species or indvidual stature and architecture might not be that clear and can blur the aforementioned trade-offs at the plant scale. This being said I thus expect the relationship between stand productivity and biomass for monoculture simulations in absence of seed rain not to be positive (maybe negative, but not sure about that).

Regarding my expectations for the Leibold et al's figure for TROLL:

- in absence of seed rain:

\* for a given initial species richness (i.e. the dashed lines in Leibold et al's figure):

For simulations for which the final realized species richness is lower than the initial species richness, I would expect that species that gain in abundance and can exclude the others are more likely to be the most productive ones, that can more quickly reach the size of maturity and produce seeds to occupy the new available empty sites. I would expect this should occur when there are important differences in species growth rates and especially very fast growing species. Given my first comment, I would say that these "winning" productive species are unlikely to be also the ones that present the highest biomass.

For simulations for which the initial species richness is maintained, this coexistence is likely due to a complementarity effect, that can emerge from the heterogeneity created by the gap formation and dynamics (this may not be the case for Nadja's PPA model if I am not wrong) and constrating species light requirment in their regeneration niche. This could emerge when there is less wide differences among species growth rate (i.e. when there is no species that completly surpasses the others in terms of growth rate), so that when the first species to have individuals at maturity size start producing seeds, there are already available sites for recruitement that have not enough light for this faster-growing light-demanding species to recruit and those sites can then be later occupy when a more shade-tolerant species finally produces seeds (cf. e.g. Muller-Landau 2010 PNAS). Thanks to this effect, I expect these simulations where species were able to coexist in absence of seed rain to reach a higher biomass in average than simulations were a species exclude the others.

So my guess would be that, among simulations of a given initial species richness, we could expect a positive trend between realized richness and biomass (at the end of the "assembly" phase), i.e., the opposite of what is shown through dashed lines in Leibold et al.'s figure. However, as always I made this "thought experiment" with a two-species system, and this might be less true for higher levels of species richness for which it is increasingly likely that there are at least two or three species that are complementary, so maybe the trend is less clear for high levels of initial species richness.

\*\* across all simulations (i.e. the thick continuous line in Leibold et al's figure):

I do not expect any trend, or if so it is more likely to be negative than positive, especially because I expect the monocultures simulations to produce a high range of biomass, some of them with very high biomass. However if we remove the monocultures from the plots, maybe they could be a weak porsitive trend, following (\*).

- with seed rain:

the reasoning made above does not hold: before any species present in the initial pool has individuals that reach maturity and produces seed, all species can equally compete for the empty sites available for recruitement, and at that early stages, most of them are likely to being able to recruit (i.e. light availability should allow all species to recruit).

I expect realized species richness to stay equal to initial species richness, so there is nothing to discuss regarding the pattern for a given initial species richness. Regarding the pattern across all simulations, I expect no trend for biomass, as we found in Maréchaux & Chave 2017. There would however be a small positive effect for productivity across simulations due to a selection effect (as found in Maréchaux & Chave 2017): if all species can persist, the most productive ones (that are more likely to occur as we increase the initial species pool) may reach higher abundance.

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looking quickly at your plots, considering the differences among the assembly and disassembly phases, it seems you took the simulations for a seed rain >0, right? if so, which level of seed rain?

and the plots for disassembly should be close to the assembly plot with no seed rain (but maybe not entirely true as the "initial" state is not the same, have to think more about that, if not can you show me the assembly phase with no seed rain?).

If this is correct, my guess in absence of seed rain was quite good, that's cool!

My guess regarding simulations with seed rain >0 was not specific enough however, as I only considered the fact that I expected the final realized species richness to stay equal to the initial species richness (Leibold's plot has realized species richness on the x-axis),

and did not think about a diversity index that accounts for species abundances such as Shannon. However, it seems to me at a first glance that these negative relationships for a given initial species richness are in agreement with the simulated dynamics we get in our previous paper (Maréchaux & Chave 2017).

Starting from a uniform planting (all species have the same abundance, and hence a high level of Shannon index), late succesional species which typically stock higher level of biomass than early succeisonal species progressively gain in abundance and dominate the community in the end.