**Global warming and seed orchards with special reference to Sweden**

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Global warming is on every-one’s mind, what are the genetic consequences for plant production and seed orchards in Sweden? Man’s activities add considerably to the uncertainty about future environments compared to variations in the past. A warming the coming century should be regarded a sufficiently safe prediction to motivate immediate actions.

More seed orchards constitute a recommended response to global warming, as they supply a more robust, predictable, reliable and controllable seed source. Seed orchards can be modified for climate prognosis immediate before seed harvest by rouging, selective harvest, supplementary pollination or artificial crosses. Natural regeneration or local seeds cannot be regarded as well-adapted any more, therefore seed orchards now become more competitive. The addition of around 20 percent to forest production added by improved material means a better utilization of the forest resource, which is a major component for a future sustainable world supported by renewable resources.

The recruitment population is routinely tested at several localities covering a range of environments, and is accumulated over several generations of testing at different times. This means that forest tree breeding produces seed orchard clones, which are plastic and adapted over a range of environments. The clones can be drawn from a desirable range or environments as a response to a predicted wider uncertainty.

Current recommendations for use of seed sources are based on provenance trials deployed and analyzed several decades ago, and are not considering the warming which already occurred, or the predicted additional warming in the future. The speed of temperature rise in Sweden relevant to seed sources I set to one degree 1991-2040 starting 1990 and continuously rising after that. Other factors are also likely to change (maritimity, precipitation, patterns of pests and pathogens), but quantitative predictions are highly uncertain and the response for seed source within species cannot be safely predicted, so the only safe-guard to these other possible associated changes is to make seed orchard crops robust to change. Half a degree warming (quarter of a century) may already have happened or occur in the near future. At planting, the critical period is the years immediately after planting, if the forest establishes well, it will probably grow acceptable in a warmer climate, at least where drought is not serious, and it is not in most of Sweden. In response to global warming it is recommended that seed sources are deployed at a higher elevation rather than transferred longer north, as north transfer also affect light climate, but rise in altitude does not. When establishing new seed orchards, the foreseen planting is several decades ahead and my recommendation is to care for a one degree warmer climate. A principle should be that changes seem safe, that they are unlikely to over-compensate for global warming and they will have marginal effects. The consequences of a one degree temperature rise will be limited. But if no change is made now and it becomes warmer than expected or the effect is larger than expected, there is a penalty for waiting with the change. Besides that, it is politically correct to respond to global warming and expected by forestry.