Supporting decisions on tricot trial design

The following elements are made available to users of ClimMob on the help pages. The text has some general recommendations about trial dimensions and two widgets that help with the calculation of the sample size and seed needs. The text is based on research that has also been reflected in a working paper, cited below. It clearly shows the need for more research on plot sizes and interplot competition.

This resource is available online at: https://climmob.net/blog/wiki/trial-dimensions/ It will be updated as more research becomes available.

Plot size

Plot sizes should generally be small, for the following reasons.

- With the same amount of seeds, more farmers can participate. Tricot is about external validity, so capturing the diversity in use contexts is important.
- Small plots sizes allow farmers with small farms to participate. This makes tricot trials more inclusive and representative.
- Small plot sizes increase the variation between farms, but do not systematically bias results upwards or downwards (unless edge/border effects play a strong role, see below).

Tricot plots should not be too small, however.

- Strong edge or border effects should be avoided. This can be avoided by not harvesting border rows.
- If varieties are also tested for processing or culinary characteristics, plots should produce sufficient volume to allow this.

Some remarks on specific crops:

- For potato, competition effects between plots consisting of single ridges seems unimportant for yield, as stolons rarely extend beyond ridges (Connolly et al. 1993).
- For cassava, interplot competition effects have been found to extend beyond the first row (Elias et al. 2018).
- For sweetpotato, interplot interaction is thought to be substantial due to above-ground competition (Grüneberg et al. 2019). For sweetpotato trials, 30 m2 plots with 100 vine cuttings have been recommended for on-farm trials (Grüneberg et al. 2019). For a tricot trial in Ghana, however, much smaller 6 m2 plots with 20 vine cuttings were used, which is two thirds of the recommended plot size of preliminary (on-station) trials.

Plot size is closely related to the number of seeds that is provided to farmers. In grain crops, breeders often provide seeds based on the average weight needed for a unit of land. However, this can be problematic when there are seed size differences between varieties. A small-seeded variety would be represented by more seeds. Consequently, the farmer may decide to increase the plant density of a small-seeded variety or add more planting positions. This could bias yield estimates to favour small-seeded varieties. It is therefore recommendable not to provide the same weight of seed for each variety, but the same number of seeds.

Number of farms

For a trial with around 12 entries (varieties, lines, etc.) typically 100-200 farms would provide solid results to make recommendations. This means that the trial has a 95% probability of identifying differences (effect sizes) between 0.7 and 1 standard deviations (Cohen's d). Since trials are done over several seasons, this number will diminish over time. See the interactive sample size calculator below.

This is the same order of magnitude that was found in previous on-farm trial work with cereals.

If the trial covers more agro-ecological environments (to which the set of varieties is expected to respond in different ways), the number of farmers should be proportionally higher. Future studies should provide better guidance regarding optimal trial dimensions.

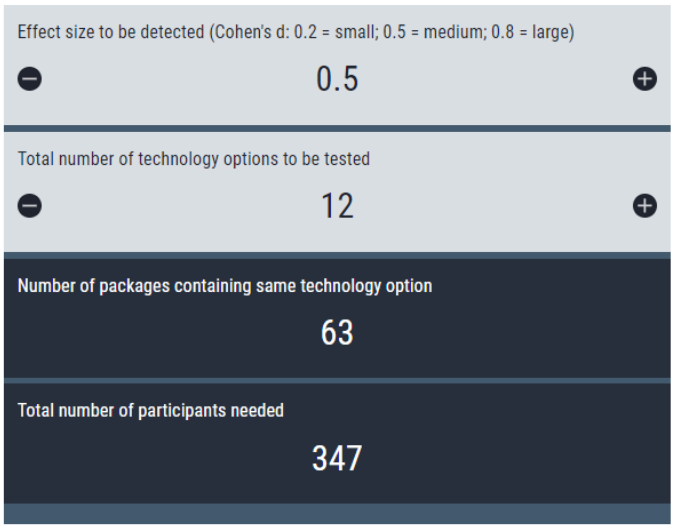
More information

van Etten et al. (2021). *The tricot citizen science approach applied to on-farm variety evaluation: methodological progress and perspectives*. RTB Working Paper.

Interactive sample size calculator

This calculator assumes that the tricot format is being used (blocks of size 3). It is based on Talsma, P., 2018. How much sensory panel data do we need? *Food Quality and Preference*, 67, pp. 3-9.

It calculates how many samples are needed to achieve a certain Cohen's d (effect size relative to the standard deviation of the technology options tested) with 95% probability. It does not take into account the data return rate. For a single season, a Cohen's d of between 0.7 and 1.0 is reasonable. For a consumer preference test, a Cohen's d between 0.2 and 0.5 is recommended.



Interactive seed needs calculator

The calculator assumes that the tricot format is being used (blocks of size 3).
The units of the “Seed quantity per plot” are the same as results (for example, kilograms but also number of plants can be used).