

# Co-design of locally adapted wheat variety mixtures

## Problems

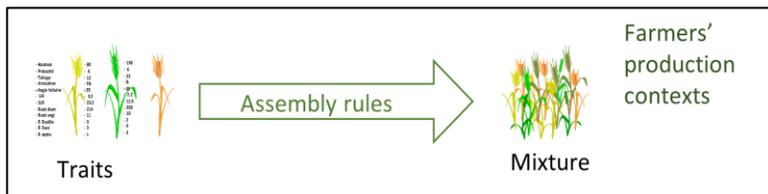
A growing number of organic farmers cultivate **variety mixtures** for their ease of use and their ability to buffer stress and environmental heterogeneity. Farmers have to **choose the varieties for designing their mixtures**, but few guidelines have been proposed so far.

In the case of **winter wheat**, mixtures are usually assembled primarily based on yield. It is advised to mix varieties with **complementary levels and sources of foliar disease resistances** and to maintain homogeneity of **maturity** to ensure good quality.

## Solutions

To guide farmers with optimised composition mixtures, it has been proposed to identify **assembly rules** for combining mixtures components (Figure). A **participatory approach**, based on workshops, was suggested as particularly suitable for designing locally adapted mixtures. Here, we adapted this approach to organic farming with a group of **eleven organic farmers** from the Ile-de-France region (GAB IdF).

Farmers, researchers and technical experts **exchanged knowledge** on how to favour complementarities and synergies between varieties, in accordance with farmers' practices and production contexts.



*Designing assembly rules to combine traits within mixtures*

## Practical recommendations

- **limit disease development** by keeping proportion of **susceptible varieties** < 30%, and by using varieties able to compensate through high tillering ability or high TKW.
- increase **weed control** through **wheat competitive ability** by (i) using varieties with early vigour or high tillering ability, (ii) diversifying varieties for earliness, height and growth habit.
- **face nitrogen stress** by (i) tolerating an early deficit, by complementarity (ii) in time of **nitrogen demand** (diversified earliness), or (iii) for **nitrogen use efficiency**.

## Further information

The assembly rules are currently being validated and integrated in a **multi-criteria assessment tool**:

<http://moulon.inra.fr/optimix/>

1. Barot et al 2017. Designing mixtures of varieties for multifunctional agriculture with the help of ecology. *Agron. Sust. Dev.* 37: 13.
2. Wheatamix project: [https://www6.inra.fr/wheatamix\\_eng/](https://www6.inra.fr/wheatamix_eng/)
3. CASABio project: [https://www6.inra.fr/basc\\_eng/Research/Innovation-in-partnership/CASABio](https://www6.inra.fr/basc_eng/Research/Innovation-in-partnership/CASABio)
4. Emma Forst 2018 (PhD thesis): <https://tel.archives-ouvertes.fr/tel-02114929>

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