USER MANUAL

File: selective_seed_harvest.xlsx

This Excel workbook is designed to optimize selective seed harvest following the methodology presented in the accompanying scientific paper (see reference in the README file in this repository).

Note: For large-scale applications, more powerful optimization tools such as Gurobi can be used. However, Microsoft Excel's Solver has been tested and performs well for the seed orchard scenarios considered in the manuscript.

Getting Started

If the **Solver** tool is not visible in the **Data** tab of your Excel installation, search online for guidance on how to enable it.

You can modify the workbook to match the number of parents in your seed orchard. For help with adjustments, feel free to contact me at:
📧 *lstiburek@fld.czu.cz*

Please refer to the **Materials and Methods** section of the manuscript for full methodological context.

Data Structure (Optimization Input)

- **Column B**: Clonal IDs (should be consecutive integers starting from 1).
- **Column C**: General Combining Ability (GCA) values. Paste **as values only**.
- **Columns F–AK**: Specific Combining Ability (SCA) values. Only the **strict upper-triangular** part of the matrix is used in the optimization. Paste **as values only**.
- **Column M**: Male gametic contributions (as proportions). Paste **as values only**. These must sum to 1.
- **Cell AN39**: Declared minimum status number.

Optimization Output

- **Column F**: Optimal female contributions (proportion of cones to collect per clone).
- **Cell AN37**: Genetic gain from GCA.
- **Cell AO37**: Genetic gain from SCA.
- **Cell AQ37**: Status number of the resulting seed crop.
- **Cell AQ39**: Total genetic gain (GCA + SCA).

Running the Optimization

1. Open **Solver** from the **Data** tab.
2. Set the objective: **maximize** total genetic gain (AQ39).
3. Set **variable cells** to the female contributions (Column F).
4. Add constraints:
    - Sum of female contributions = 1.
    - All female contributions ≥ 0.
    - Calculated status number (AQ37) ≥ declared minimum (AN39).
5. Click **Solve** to run the optimization.