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J-DISTAS: a new tool to predict field readiness to ensure efficiency of field operations and avoid soil compaction.

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1. Context & objectives

- Sustainable crop production requires high efficiency of field operations and natural resources protection (soil).
- Soil compaction is a major threat for soils, inducing yield losses on spring and summer crops.
- Size and weights of agricultural machinery have significantly increased during the last decades.
- An evaluation tool is needed to evaluate **Soil Readiness**, considering soil compaction risk.

Workability

Soil suitability for cultural operations (defined by soil properties & climate).

Trafficability

Soil capacity to support machinery during traffic without soil physical degradation (to avoid soil compaction).

Soil Readiness or Workable days

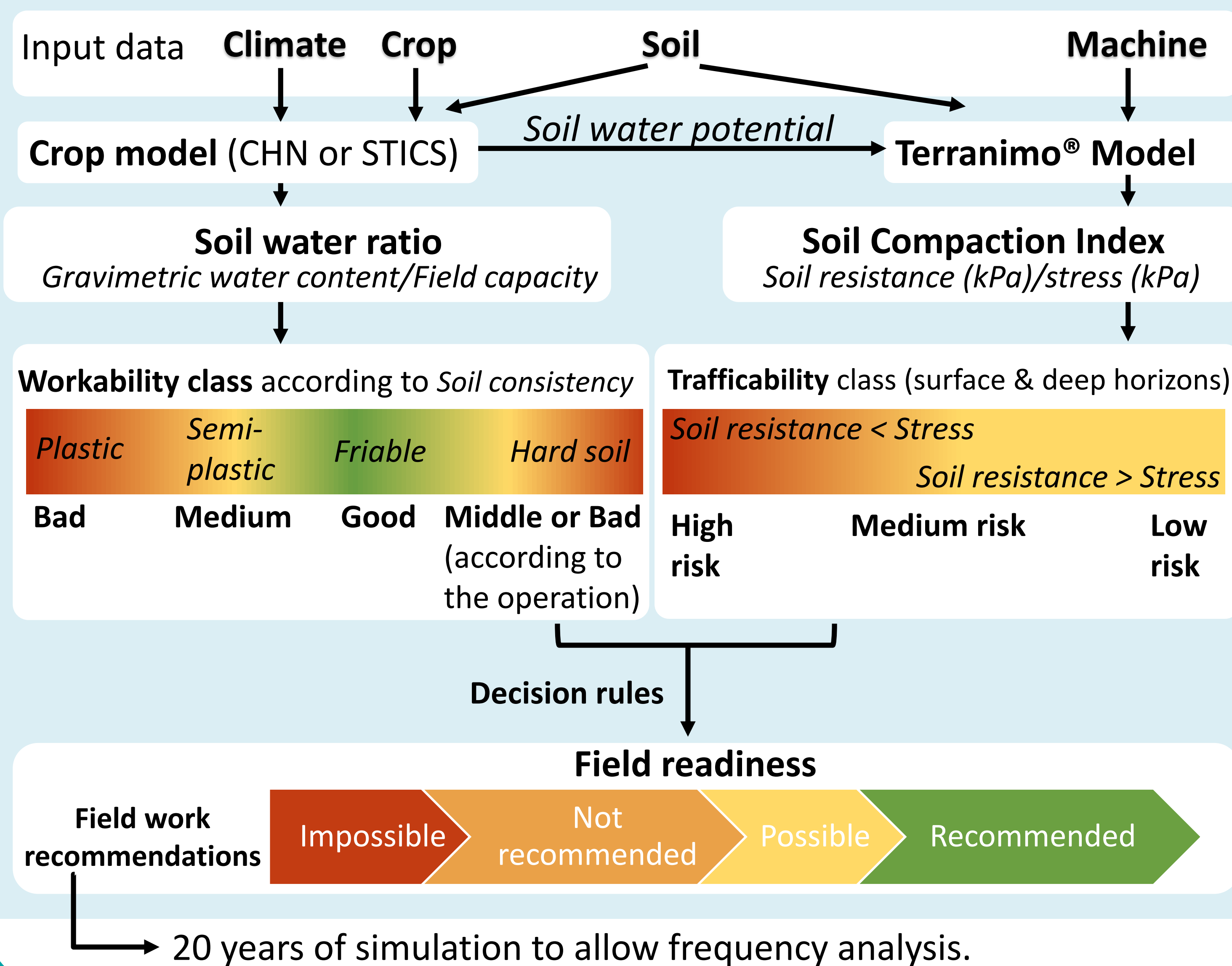
Decision support tool for strategic application:

- Conception of cropping systems (global change context).
- Optimization of mechanical (machinery) and labour force costs.
- Soil physical quality protection.

Possible uses and users:

- Modelling tool: technical institutes, research, specialist advisers.
- References for agricultural system design: cooperatives for the use of agricultural equipment, farmers, farm advisers, agricultural machinery sellers.

2. Global approach to predict field readiness for agronomical strategy



4. Example of application

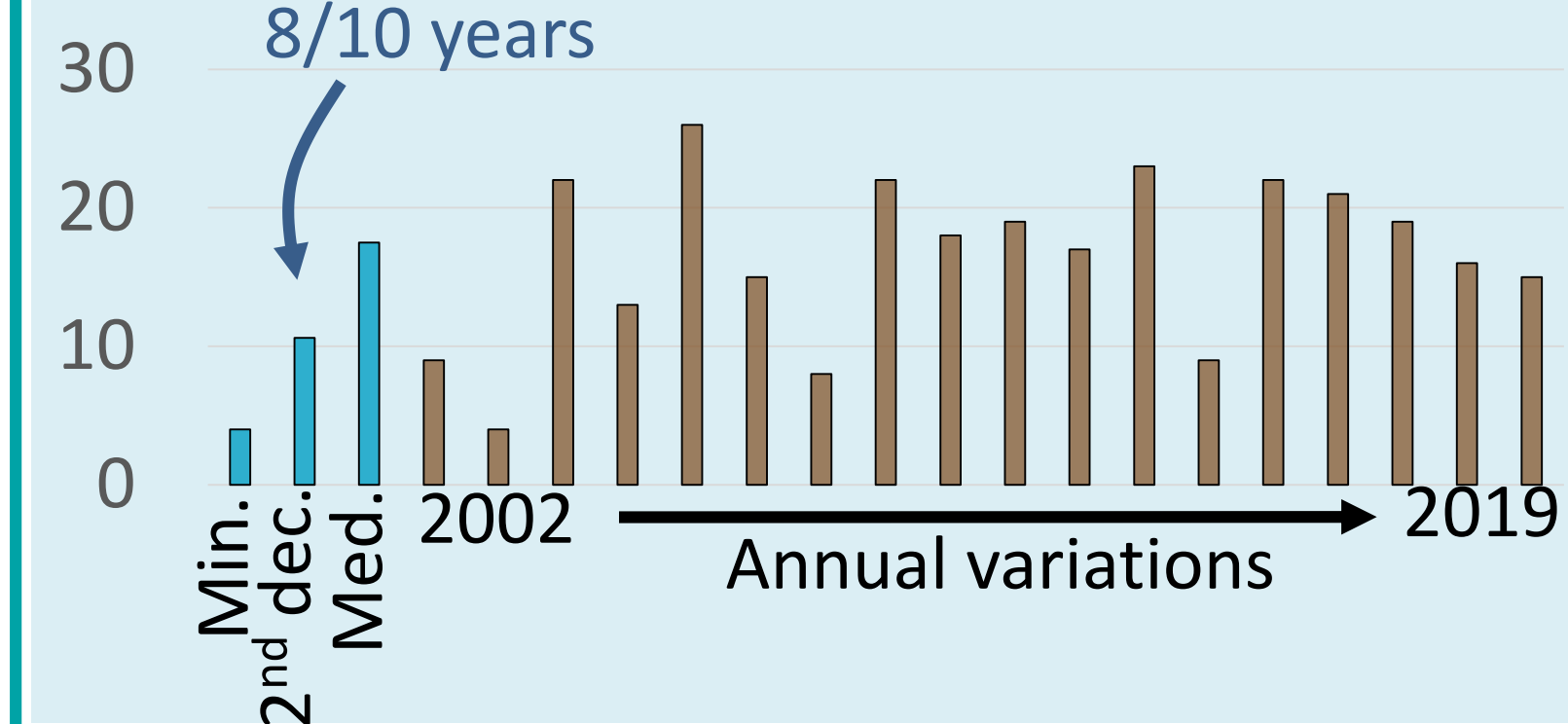
Question: there is a need to renew a Corn planter. Should we take advantage of it to go from 6 to 8-rows?

Data:

- Area to be sown: 200 ha
 - Sowing period: from April 1st to 30th
 - Traction time: 8 h/day
 - Working speed: 6 km/h
- 21.6 ha/day with a 6-rows seeder
28.8 ha/day with a 8-rows seeder

Results:

Field readiness (Number of workable days)



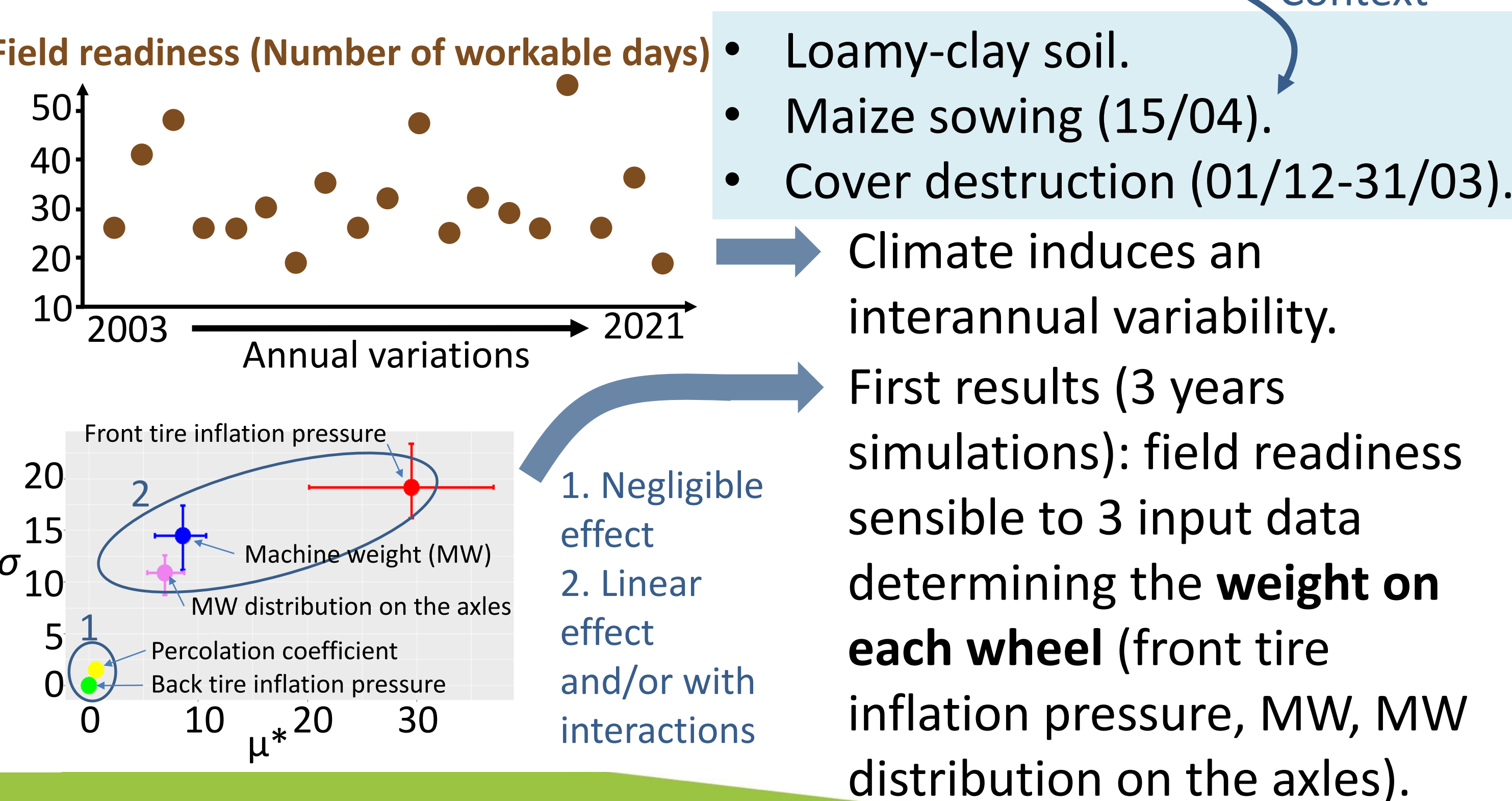
Area that can be sown on workable days

	6-rows	8-rows
Min.	86 ha	115 ha
2 nd decile	229 ha	305 ha

Conclusions:

- The type of seeder had no impact on the number of workable days.
- The 6-rows seeder is sufficient for 8/10 years. There is no need to invest in larger/heavier equipment if the risk is accepted.

3. Morris global sensitivity analysis (on going)



5. Where we are and were we go

- J-DISTAS is an **interoperable tool** combining several models (crop and soil compaction models) and databases (describing soil, machine and climate).
- J-DISTAS offers major improvements compared to previous tools used to estimate field readiness, considering **soil compaction risk**, and including a range of cultural operations suitable for the **evaluation of innovative crop systems**.
- Currently, a stable but not friendly version exists. An application programming interface (API) will be developed to make the use of the J-DISTAS tool easier (expected in 2023).
- Interest in using the J-DISTAS tool: economic, technical, scientific, social and environmental.