The aim of this study was to calibrate and evaluate the improved STICS-Intercrop model (Vezy et al., 2020) by simulating two types of cereal-legume mixtures (winter and spring intercrops) on the same field, used as a way of ecological intensification.

Intercropping increases system complexity especially mixtures of leguminous and non-leguminous crops could reduce inputs and potential environmental damage through N losses. Intercropping, i.e. multiple species grown simultaneously, could be correctly simulated further revision of height simulation and grain yield overestimation of biomass increased too quickly in crops (37.4 to 60.3 %) for the intercropped winter wheat/winter pea and spring barley/spring pea. The species and cultivar parameters calibrated in step 1 are used again for intercrop simulations in step 2.

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### Materials and Methods

- French data sets comprised of 4 years of winter wheat (*Triticum turgidum* L.) and pea (*Pisum sativum* L.) (Bedoussac, 2009; Kammoun, 2015), and 4 years of spring barley (*Hordeum vulgare* L.) and pea (Corre-Hellou, 2005) including different N levels and plant densities (Table 1).
- 3-step Approach: 1) Calibration of species and cultivar parameters with sole crop data; 2) Calibration of two intercrops parameters; 3) Evaluation for intercrop data, in order to determine the validity domain.
- Step 1 of calibration followed the order: phenology, leaf area, biomass, nitrogen uptake/fixation, and grain yield.
- The species and cultivar parameters calibrated in step 1 are used again for intercrop simulations in step 2.

### Results and Discussion

- Largest source of error was winter pea (nRMSE=40.0 %).
- All other crops had a nRMSE<17.0 %.
- Simulated winter pea reached max LAI too early, possibly a result of limited observed phenology data further research needed.

### Background

- Intercropping, i.e. multiple species grown simultaneously on the same field, used as a way of ecological intensification.
- Especially mixtures of leguminous and non-leguminous crops could reduce inputs and potential environmental damage through N losses.
- Intercropping increases system complexity.

### Conclusion

- Based on the sole crop calibration, some intercrop situations could be correctly simulated.
- Further analysis of the model's simulation of interspecific competition is necessary to better capture the large variation in observed data and to improve model accuracy.
- With these future improvements, the STICS intercrop model can be a useful tool for better understanding the biological functions of intercropping systems to and assist in optimizing their management.

### Table 1: Description of the observed field data.

<table>
<thead>
<tr>
<th></th>
<th>Winter Wheat</th>
<th>Winter Pea</th>
<th>Spring Barley</th>
<th>Spring Pea</th>
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<td>Angers,</td>
<td>Angers,</td>
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