Goal of measurements:

- Determine performance of mixtures and of follow-on crop (yield, quality, species composition)
- Identify means of benefits (Nutrient flows)
- Identify potential covariates / explanatory variables across sites (environment, site conditions)

All measurements are carefully balanced to be accurate enough to produce high quality publications, while being affordable to allow many sites to join

Relevance of measurements:

- Required
- (Highly) desirable

Scales of measurements:

- Plot / field level
- Single / repeated / continuous measurements

Measurement scales and relevance are indicated in protocol
Prior to establishment

Prior to establishment all measurements are at the field scale, meaning that one pool sample for the entire experimental field is sufficient. Make sure that pool sample is representatively composed of sufficient subsamples.

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Scale</th>
<th>Required/Desirable?</th>
</tr>
</thead>
<tbody>
<tr>
<td>For the duration of the experiment, daily air temperature (min, mean and max) and precipitation, either from research station where experiment located or from nearby weather station.</td>
<td>Field scale</td>
<td>Required</td>
</tr>
<tr>
<td>Soil type (usually known already for the research institute).</td>
<td>Field scale</td>
<td>Required</td>
</tr>
<tr>
<td>Soil pH</td>
<td>Field scale</td>
<td>Required</td>
</tr>
<tr>
<td>If possible, soil temperature and soil moisture (e.g., from a local weather station, not expected at a plot level).</td>
<td>Field scale</td>
<td>Desirable</td>
</tr>
<tr>
<td>If possible, C:N ratio of soil.</td>
<td>Field scale</td>
<td>Desirable</td>
</tr>
<tr>
<td>If possible, mineral nitrogen (Nmin) in soil before experiment is established (or before the first fertiliser application). Sampling from the top 10cm is recommended.</td>
<td>Field scale</td>
<td>Desirable</td>
</tr>
</tbody>
</table>

Essential are information on environmental parameters (continuous measurements), at least from a close by weather station (make sure you have access to the data), and soil type and pH (one time measurement)
Grassland stage

Dry matter yields

At every harvest, DM yields need to be determined in each plot.

-> need to be measured

  a) Forage harvester: harvest a 1.5 m strip in the center of the plots or the entire plot
  b) Mow the plot and measure the fresh material of the entire plot in a net using a spring scale
  c) Harvest a quadrat (generally 0.5x0.5 m) to a residual height of 5 cm and extrapolate to plot level

Determine DM content from representative subsample

Grassland stage

Species composition

Estimate botanic composition prior to each harvest by guessing
  - Should weeds become excessive (>20%), or the plots become partially barren (pests), experiment needs to be terminated/resown

At selected harvests (2-3 in total), determine dry matter botanic composition by sorting
  - subsample (quadrat or random grab method) sorted into all sown species (individually) and weeds (sum)
  - Weeds contain all unsown species in that plot
  - Dry the species and determine species composition
    - Optional high species mix does not need to be sorted
Grassland stage

NIRS analysis for forage quality

Of each harvest and each plot, a subsample should be analyzed for forage quality.

- If dried at 60°C, the sample to determine DM content can be used for forage quality analysis
- Mill samples using sieve of 1 mm, homogenize material and place around 4-5 g (min. 2 g) in a vial.
- Label these vials with a running number on the lid and the vial and attach a sample list where the running number is decoded into a uniform code (for details on naming convention, see protocol section 2.5.4)

The joint analysis at a single site is required to yield comparable results across all sites.
For each sample, we will need to charge 5 EUR to cover the analytical costs

Grassland stage

Nmin analysis

Prior to destruction of the grassland, measure Nmin (NH₄ + NO₃) concentration in the topsoil (0-10 cm)

Not mandatory, but HIGHLY desirably

- Use a soil auger (diameter of your choice)
- Take ca. 5 soil samples (randomly or transsect) and pool
- Determine soluble mineral Nitrogen
  -> Nmin can be analysed by each site individually
  -> A sheet will be added to the reporting template where the Nmin values can be entered
Follow-on crop stage

If follow-on is a grass:
• measurements must include DM determination of several harvests
• IT SHOULD only be *L. multiflorum* at this stage, but if not, at least sort to determine share of Legumes
• N concentrations can be determined anywhere of your choice (no centralized measurements required)

If follow-on is a cereal:
• Nitrogen concentrations in wheat (or other cereal) need to be determined at two timepoints:
  Anthesis and harvest (in leaves, stem and grain (at harvest))

Details on threshing (manual/automated) and separation will be provided at a later stage

Thank you very much for your attention — Questions?