IWMPraise
Integrated Weed Management: PRActical Implementation and Solutions for Europe
Introduction to IWM Praise project

• 5 year project, started June 2017
• 8 European countries (UK, DL, DK, FR, IT, ES, SI, CH)
• >40 collaborators
• Led by Per Kudsk, Aarhus University, Denmark
• UK work mainly being led by NIAB/TAG and Rothamsted Research

“We know what we should be doing so why isn’t IWM standard practice in the industry?”
Objectives

1. To quantify and address current socio-economic and agronomic barriers to the uptake of IWM across the cropping system, including perceived short term economic losses and resistance to change. Output: **Review of barriers to IWM uptake in Europe.**

2. To develop novel alternative weed control measures and optimise the efficacy, applicability and use of novel as well as existing alternative weed control measures as stand-alone methods or in combination with other methods. Output: a ‘**tool box**’ of validated IWM methods.
Objectives

3. To design, demonstrate and assess the performance and environmental and economic sustainability of IWM strategies in various management scenarios. In each country, lead users and end users, research institutes and SMEs will work closely together. Output: validated context specific IWM strategies for the various management scenarios that address the needs and concerns of end users.

4. To make the results known publicly through dissemination and outreach, and development of educational and training programmes to support the adoption of IWM by European farmers. Output: On-line information, farmer’s field days, educational programmes, dissemination tools.
Structure of the project

WP1: Mental models
WP2: Innovation hub
WP3: Annual narrow-row crops
WP4: Annual row crops
WP5: Perennial herbaceous crops
WP6: Perennial woody crops
WP7: Soil cultivation
WP8: Long term responses and environmental impact
WP9: Dissemination
WP10: Management and coordination
At the heart of the project is our Toolbox

1. Transplanting
   - Sowing date
   - Seed rate
   - Cultivar choice
   - Spatial arrangement
   - Contact herbicides
   - Mechanical weeding
   - Intercropping
   - Patch/band spraying
   - Biological control
   - Sowing depth
   - Nutrient placement
   - Seed vigour

Reduce impact of weeds on the crop

2. Mature plants

Reduce seed return

3. Seeds

Prevent the establishment of weeds

Stale seedbeds
- Timing and depth of cultivation
- Cover crops
- Pre-emergence herbicides
- Allelopathic compounds
- Flamming
- Mulching (dead and living)
- Field margin management
- Clean seed

Clean machinery
- Stubble management
- Weed seed collection & destruction
- Late herbicides
- Chemical sterilents
- Hand weeding
- Seed predation
- Mowing
- Flamming
- Grazing
How widely are these tools being used?

• The same protocol / questions was used across all participating countries and cropping systems

• 4 sections:
  1. Farmer / farm details (size, ownership, problem weeds)
  2. What they do on their farm to control the weeds they have
  3. Factors that affect the decision making process
  4. Where they access information to make weed control choices

• Tried to avoid leading questions as much as possible

• Interviews recorded and then transcribed
How widely are these tools being used?
How widely are these tools being used?
We are adding new tools (but not focus of project)

*Alopecurus myosuroides* UK seed retention data

Average winter wheat harvest date
We are adding new tools (but not focus of project)

Experimental test mill arrived in UK, summer 2019
We are adding new tools (but not focus of project)

*Alopecurus myosuroides* populations from Denmark (14) and the Netherlands (9) screened in glasshouse experiment to produce leaf material to test suitability of NTSR markers
How effective is IWM and what are the trade-offs?
How effective is IWM and what are the trade-offs?

https://iwmpraise.eu/
How effective is IWM and what are the trade-offs?

- Narrow row crops
- Wide row crops
- Perennial woody crops
- Perennial herbaceous crops

**INTEGRATION**

**ANALYSIS**

Comparison of conventional and IWM:
- YIELD
- BIODIVERSITY
- ENVIRONMENTAL IMPACT
- PROFIT
- RESISTANCE RISK

**Meta-data catalogue**

**Collate data**
How effective is IWM and what are the trade-offs?

<table>
<thead>
<tr>
<th>Italy</th>
<th>United Kingdom</th>
<th>Netherlands</th>
<th>Denmark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alopecurus myosuroides</td>
<td>Capsella bursa-pastoris</td>
<td>Poa annua</td>
<td>Alopecurus myosuroides</td>
</tr>
<tr>
<td>Ammi majus</td>
<td>Chenopodium album</td>
<td>Polygonum persicaria</td>
<td>Brassica napus</td>
</tr>
<tr>
<td>Anagallis arvensis</td>
<td>Stellaria media</td>
<td>Solanum nigrum</td>
<td>Chenopodium album</td>
</tr>
<tr>
<td>Chenopodium album</td>
<td>Tripleurospermum inodorum</td>
<td>Stellaria media</td>
<td>Matricaria sp.</td>
</tr>
<tr>
<td>Cirsium arvense</td>
<td>Utrica urens</td>
<td>+21 others</td>
<td>Poa annua</td>
</tr>
<tr>
<td>Convolvolus arvensis</td>
<td>Veronica persica</td>
<td>Senecio vulgaris</td>
<td>Solanum nigrum</td>
</tr>
<tr>
<td>Echinocloa crus-galli</td>
<td>Viola arvensis</td>
<td>Stellaria media</td>
<td>Stellaria media</td>
</tr>
<tr>
<td>Equisetum arvense</td>
<td>+ 14 others</td>
<td>Veronica sp.</td>
<td>Veronica sp.</td>
</tr>
<tr>
<td>Matricaria recutita</td>
<td></td>
<td></td>
<td>+14 others</td>
</tr>
<tr>
<td>Myosotis spp.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Papaver rhoeas L.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Picris echioides</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Portulaca oleracea</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rapistrum rugosum</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rumex crispus</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sinapis alba</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Solanum nigrum</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Veronica persica</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>+ 47 others</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

• Regional differences in weed pressure?
• Explain in terms of traits, cropping systems and climate?
• Relate to evolution of resistance?
Also looking at weeds in long term systems experiments

Fully phased, replicated experiment established at Brooms Barn (2017) and Harpenden (2018). Currently being assessed for range of agronomic and environmental metrics.
Also looking at weeds in long term systems experiments
Can we predict the impact of systems on weeds?

Using Functional Traits to Model Plant Community Dynamics

Helen Metcalfe (helen.metcalfe@rothamsted.ac.uk)¹, Al
Florent Deledalle (florent.deledalle@poyry.com)¹, Jonat

1. Sustainable Agricultural Sciences, Rothamsted Research

AL5 2JQ

Running Title: Using traits to model community dynamics
A parting thought

- Reducing the number of weed individuals should not be the primary aim of IWM but rather it should aim for increased diversity, evenness and reduced dominance in the weed community.