Crop Mixtures in the Strategic Research Programme

Workshop, James Hutton Institute Dundee

Thursday 27th July 2017, 12:30 – 16:00

As part of our work in the Scottish Government Strategic Research programme we have continued to undertake research studies on crop mixtures. These have been exploring various aspects of the science of crop mixtures, including the impacts of the diversity of the crop (and its associated arable weed communities) on the functioning and biodiversity of arable ecosystems. We've also been looking at the response of some rare arable weeds to crop mixtures.

We were keen to let key stakeholders know more about our work, and to hear what they think are the most important aspects of the work and how it should develop in the next few years.

After presentations by various members of the research team, and a trip to look at some experiments being run at JHI Dundee, we had a round-table discussion. This focussed in particular on two questions: 1) What have you seen or heard today about our biodiversity research that was new to you?; 2) What would you consider a key focus moving forward? The following are brief set of summary notes from this discussion which we hope capture the main points.

Things that are new

Small changes in crop diversity can significantly improve disease resistance.

Weeds may not be detrimental, and can even be positively associated with crop productivity, for example in the positive barley biomass – weed diversity relationship. Questions arising with respect to this:

- Will this be maintained moving forward or will some of the weed species run to dominance?
- Might this indicate a role for native plants from a production perspective?

The concept of 3-way interactions between crops, common weeds and rare arable plants, and the potential for beneficial effects of the crops on rare arable plants.

The idea of conserving rare native plant species within the crop.

The role of patch scale in regulating positive effects of diversity.

Mixtures (/diversity) increase yield and crop stability.

Foci for the future

The possibility of diversity bringing resilience to farming systems – this is both diversity of the crop and the wider arable ecosystem.

Moving away from agri-environment schemes as a way to achieve conservation success in farmland.

Look at wider impacts on biodiversity at a larger scale, e.g. with birds (weedy crops are good for ground nesting birds because of changes in the sward structure).

The possibility of managing the weed community as part of a holistic approach to system management.

How to capitalise on the marketability of products harvested from biodiverse systems – e.g. reduced pesticide inputs? Discussions should be held with agricultural contractors and agronomists – they are very influential; in particular it is often the contractors that sow crops.

Potential benefits of not spraying (herbicides) in the middle of the field rather than just the (conservation) edges.

How to facilitate 'good' weeds and control pernicious weeds?

Non-harvested crops (e.g. green manures) might be a good place to start looking at the conservation of rare arable plant species; for example crops planted for wild bird seed under AES or game crop mixes; a seed mixtures industry exists and these might be a good first port of call.

What's the market mechanism that would promote increasing diversity in crop systems, even if it is related to increased productivity? Should we be thinking about creating a bigger rare plant seed industry in Scotland?

Hearts and minds is the way to go – need the evidence base and demonstration projects to improve the uptake of research findings.

We need a step change in knowledge exchange between all parties.

We should focus on species mixtures and not genotype mixtures within cereals.

Additional thoughts

In terms of the rare plants being sown in it would be worth considering where the seed suppliers get their seed.

Unpublished data (Iannetta et al.) indicates that the wild arable plant seed traits differ significantly between common and rare species – at least in current cropping systems. Therefore, there is the possibility that rare species could be selected to improve their functional traits to match common (not pernicious) weeds. Why not manage that process?

Workshop attendees

JHI: Rob Brooker, Pete Iannetta, Alison Karley, Adrian Newton, Robin Pakeman

Stakeholders: Cecile Smith (SNH), Davie Black (Plantlife), Deborah Long (Dundee University), Allan Perkins (RSPB), John Kerr (SASA and SBS Science Support Group), David Michie (Soil Association), Sandra Stewart (Farming and Conservation), Carol Littlewood (Littlewood Landcare), Christine Hall.