Conservation at the Crop Edge

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The I.F.M. (Integrated Farm Management) wheel encourages cross-disciplinary thinking amongst farmers and the idea that actions primarily intended to have one consequence will have incidental effects elsewhere.

An example is the impact on conservation and biodiversity of plant protection products used to control weeds. Removing almost all weeds in cereal crops through effective herbicides has had unintended consequences on the wider food web.[1] The seedbank of many arable soils has declined substantially over the last 40 years with many once common weeds of arable crops becoming increasingly rare[2] and this may be having impacts on ecosystem function[3]. The IFM wheel challenges farmers to think through the consequences on their own farms and to address the problem for themselves. Solutions are site-specific in line with the LEAF doctrine "to do the right thing in the right place for the right reason".

At Gilston Mains, a LEAF demonstration farm in Fife and habitual study site for the James Hutton Institute, a program was put in place 25 years ago to address the scarcity of partridge chick-food invertebrates in cereal crops. A detailed appraisal of the impacts after such a long period is now underway comparing fields at Gilston Mains which have had treatment over the past 25 years with fields on adjacent farms which have not. There are some exciting preliminary findings.

Background

The Game and Wild Life Conservation Trust identified that loss of the weeds which were the host plants for the invertebrates that made up the diet of partridge chicks was limiting the partridge population[4]. In the mid-1980s they researched and developed Conservation Headlands (click on the link for a full explanation and guide) https://www.gwct.org.uk/farming/advice/habitat-issues/conservation-headlands-field-margins/. At Gilston Mains the original technique was adopted enthusiastically in 1988 but soon modified to exclude nitrogen fertiliser and to include annual rotation of the conservation headland around the cereal fields. This solved two important problems with the GWCT initial prescription – firstly the growth of nitrophilous weeds such as *Stellaria media* (chickweed) and *Galium aparine* (cleavers) in the presence of nitrogen but the absence of herbicide and secondly the rapid build-up of weeds to uneconomic levels though excessive seed return. The new technique was called a 'wild headland'.

Preliminary Results

Following James Hutton Institute's protocols, two experiments have been done looking at seedbanks. In 2014, 29 headlands (25 in fields in Fife and 4 at the Institute's Centre for Sustainable Cropping at Bulruddery) were sampled and 23 of the same fields revisited in 2015. From the 2014 data, numbers of plant dicot species in headlands with a history of intervention over the last 25 years are about twice those in headlands with no history (Fig 1)

The second 2015 experiment was designed to test for the effect of a wild headland in 2014 on numbers of weeds in the seedbank in 2015. The hypothesis was that seedbank populations would increase after a wild headland and diminish where the headland had been sprayed and farmed conventionally. The results confirmed the hypothesis with statistically significant changes in seed bank populations (p=<0.001) after a wild headland. The periodic nature of wild headlands (they are a maximum of one in four years and are often less) therefore causes seedbank populations to cycle within sustainable limits.[5]

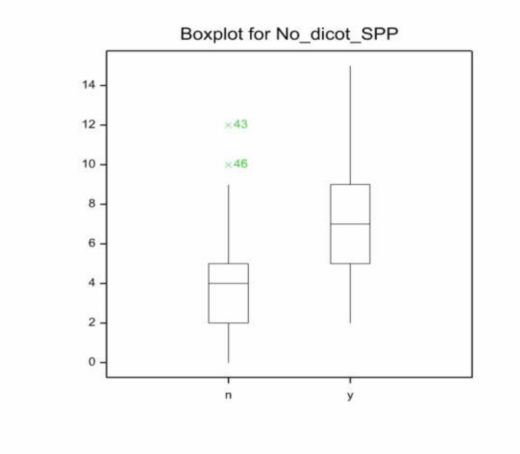

Fig. 1 Boxplot showing the number of dicot species found in the 2014 experiment in headlands without (n) and with (y) a history of intervention.

Next Steps

Species assemblages within headlands may reflect a complicated interaction between past cropping intensity, soil type[6] and wild headland history. Quantifying the relationship is the next phase of the research. Additionally yield monitoring from the combine has given data on opportunity cost through yield forgone on wild headlands (mitigated by the saving in fertiliser and herbicide) for 80 fields over three years across a range of cereal crops, which means a financial model can be constructed.

Conclusion

Wild headlands may prove to be a practical, easily adopted and cost effective method to help restore lost biodiversity to intensive arable farming systems. The evidence from this thesis will help shape policy and contribute substantially to sustainable intensification.

References

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