European Commission

Science for Environment Policy

Ecological intensification farming benefits wildlife and increases yield

Ecological intensification, using land and resources in ways that minimises negative ecosystem impacts while maintaining agricultural productivity, has been proposed as a way to sustainably increase crop yields, but remains under debate due to a lack of evidence. This six-year study of a large commercial farm assessed how using land for wildlife habitat affected food crops. The study shows that it is possible to remove up to 8% of land from production and maintain (and in some cases increase) yield.

28 January 2016
Issue 444

Subscribe to free weekly News Alert

Source: Pywell, R., Heard, M., Woodcock, B., Hinsley, S., Ridding, L., Nowakowski, M. & Bullock, J. (2015). Wildlife-friendly farming increases crop yield: evidence for ecological intensification. *Proceedings of the Royal Society B: Biological Sciences*, 282(1816), p.20151740. DOI: 10.1098/rspb.2015.1740

Contact: rfp@ceh.ac.uk

Read more about:
Agriculture, Biodiversity, Land use, Sustainable consumption and production

By 2050, the global population will reach 9 billion, creating unprecedented demand for food. Pressure to meet this demand has led to expansion of agricultural land and intensification of practices, resulting in loss of natural habitat and negative impacts on the environment.

Ecological intensification has been proposed as a potential solution to both concerns. According to the FAO, ecological intensification is a 'process that requires optimal management of nature's ecological functions and biodiversity to improve agricultural system performance, efficiency and farmers' livelihoods'. It involves practical management strategies that integrate and enhance the ecosystem functions associated with crop production in commercial farming systems. Examples include increasing the diversity of plants and animals to create resilient agroecosystems and maintaining populations of pollinators, which benefits yield and may even compensate for low levels of fertiliser application[1]. Although this is a promising concept, evidence to prove that it can increase production is lacking, which means ecological intensification remains just that — a concept.

Large-scale implementation requires a clear demonstration of the benefits. In order to assess the costs and benefits of the practice, this study tested the technique on a large commercial farm in England. Over six years, researchers tested how removing small amounts of land previously used for food production to create wildlife habitat affected the yield of globally important food crops.

The experiment was conducted on a 900-hectare estate in central England, typical of a northwest European commercial farm. It contains large arable fields that are cropped under a rotation of autumn-sown first wheat (*Triticum aestivum*), followed by break crops of oilseed rape (*Brassica napus*) or field beans (*Vicia faba*).

Between 2005 and 2011, the researchers tested two different ecological farming treatments. The first, ELS, is a simple habitat enhancement based on the 'Entry Level Stewardship' agri-environment scheme which involved removing 3% of useable crop land (1% of total area) from production to create wildlife habitats. The second treatment, called ELS extra or ELSX, incorporated additional habitats, including of different types, and took a further 5% of cropped land out of production (to 8%, ~5% of the total area). Treatments were compared to a continuation of intensive agriculture in which no land was removed from production.

To apply the treatments, the entire field area was divided into five blocks. Each of the treatments plus the control was applied randomly to individual sections within each block. In the control, fields were cropped to the edge.

Continued on next page.

1.Marini, L., Tamburini, G., Petrucco-Toffolo, E., Lindström, S., Zanetti, F., Mosca, G. and Bommarco, R. (2015). Crop management modifies the benefits of insect pollination in oilseed rape. *Agriculture, Ecosystems & Environment*, 207, pp.61-66.

European Commission

Science for Environment Policy

Ecological farming benefits wildlife, increases yield

(continued)

The results for all three crops showed clear reductions in yield at the field edge compared with the rest of the field in the control treatment. At the edge, yield of winter wheat was reduced by 10.1%, beans by 25.9% and oilseed rape by 38.2%. Yield reduction at the field edge may be due to a number of factors, including soil compaction, competition for light and water resources with adjacent hedges and trees, and increased pressure from pests and weed species. However, habitat creation in these cropped areas increased yield. As a result, field-scale yields were maintained, despite loss of cropland. For beans, yield even increased, by as much as 35%. The authors say up to 8% of land can be removed from production without any net loss of yield. Both treatments also led to increases in the abundance and richness of pollinators, and ELSX increased the abundance of predatory ground beetles.

These findings support the argument that lower yielding and otherwise compromised areas of fields can be better used as non-crop habitats to provide services supporting crop production (e.g. pollen and nectar supply for pollinators and other beneficial insects), benefits for farmland biodiversity, and the protection of water and soil resources.

Habitat creation resulted in no loss to the farmer, in terms of monetary value or nutritional energy yield, across a typical five-year crop rotation. The results of this study indicate that yield and profitability of some insect-pollinated crops may even be increased by this approach. However, the authors say the benefits of removing land from production to create wildlife habitat must be carefully balanced against the costs and difficulties of establishing wildlife habitats on a commercial farm, such as time constraints and costs of labour. Furthermore, it should be noted that all crops were managed with fertilisers and pesticides, so the results may not fully reflect the ecological value of wildlife habitats.

EU agri-environment schemes currently pay farmers to manage their land to benefit certain habitats and species, and it may be beneficial to use these payments to encourage farmers to create wildlife habitat. However, the authors say further research is needed on a wider range of farming systems before the policy implications can be fully understood.

28 January 2016
Issue 444

Subscribe to free weekly News Alert

Source: Pywell, R., Heard, M., Woodcock, B., Hinsley, S., Ridding, L., Nowakowski, M. & Bullock, J. (2015). Wildlife-friendly farming increases crop yield: evidence for ecological intensification. *Proceedings of the Royal Society B: Biological Sciences*, 282(1816), p.20151740. DOI: 10.1098/rspb.2015.1740

Contact: rfp@ceh.ac.uk

Read more about:
Agriculture, Biodiversity, Land use, Sustainable consumption and production