



# Can environmentally-friendly farming also be productive?



**James Bullock**

***NERC Centre for Ecology and Hydrology***

*jmbul@ceh.ac.uk*

# Agri-environment schemes



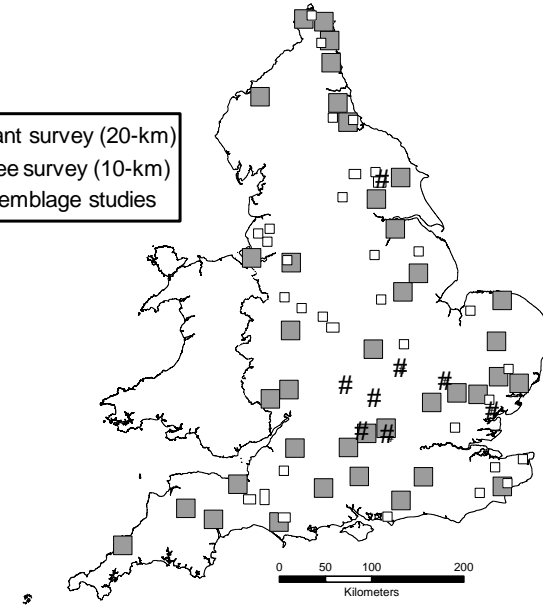
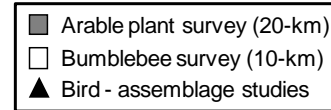
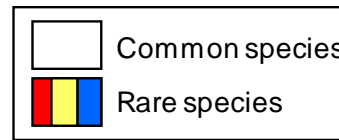
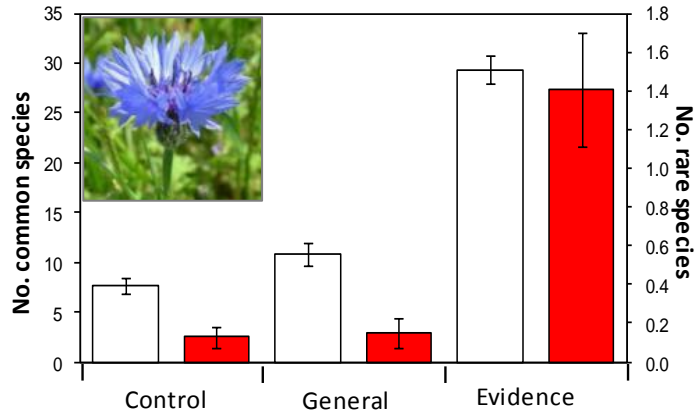
- **Implemented in the EU through the CAP (but also elsewhere in the World)**
- **Targeted primarily at wildlife, but also other environmental benefits – reducing pollution, storing carbon, increasing soil health, etc**
- **Budget in the EU *ca* €2.5bn per year**
- **Payments compensate farmers for “profit foregone”**



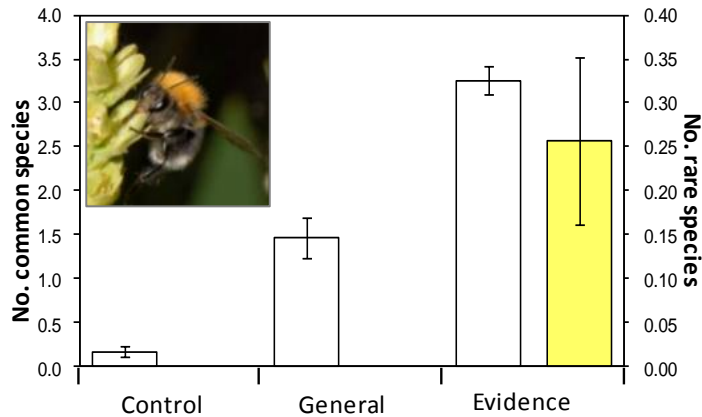
# Agri-environment schemes do work

- Although they need to be well designed

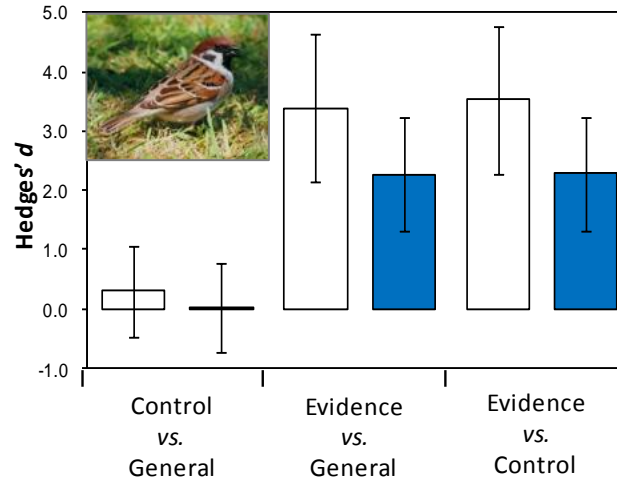
a) Plants



b) Bumblebees

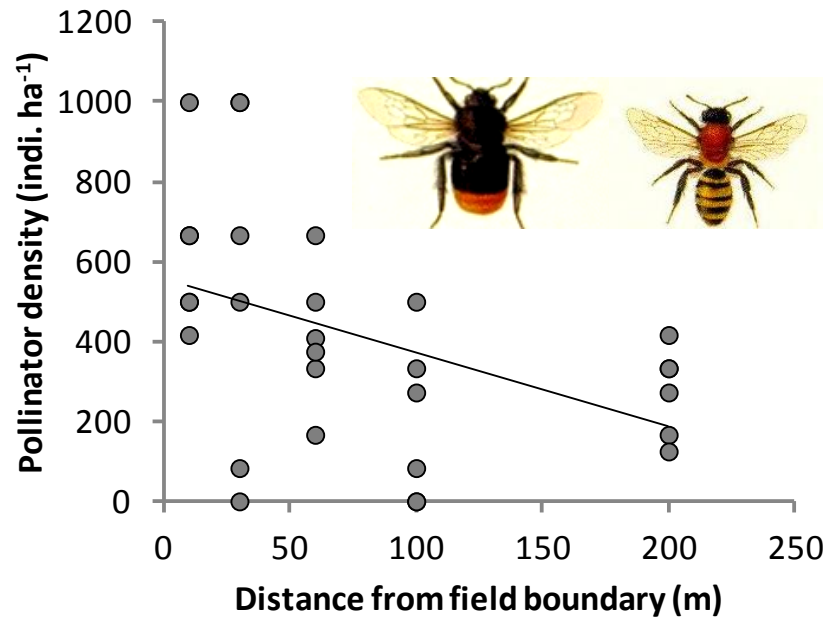


c) Birds



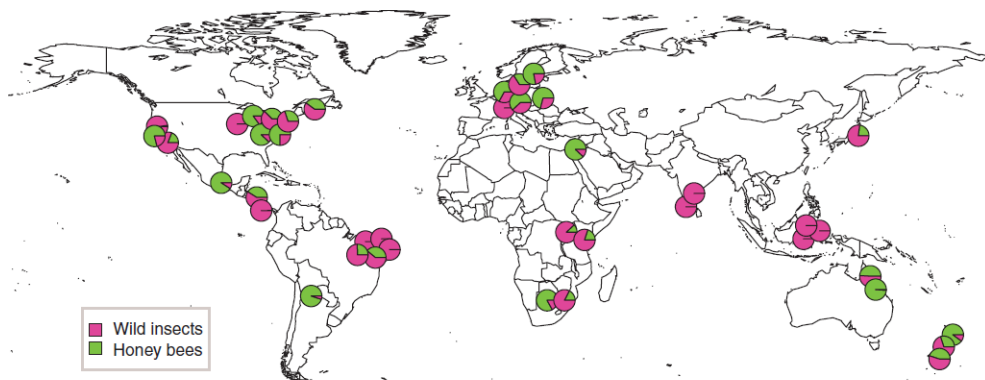
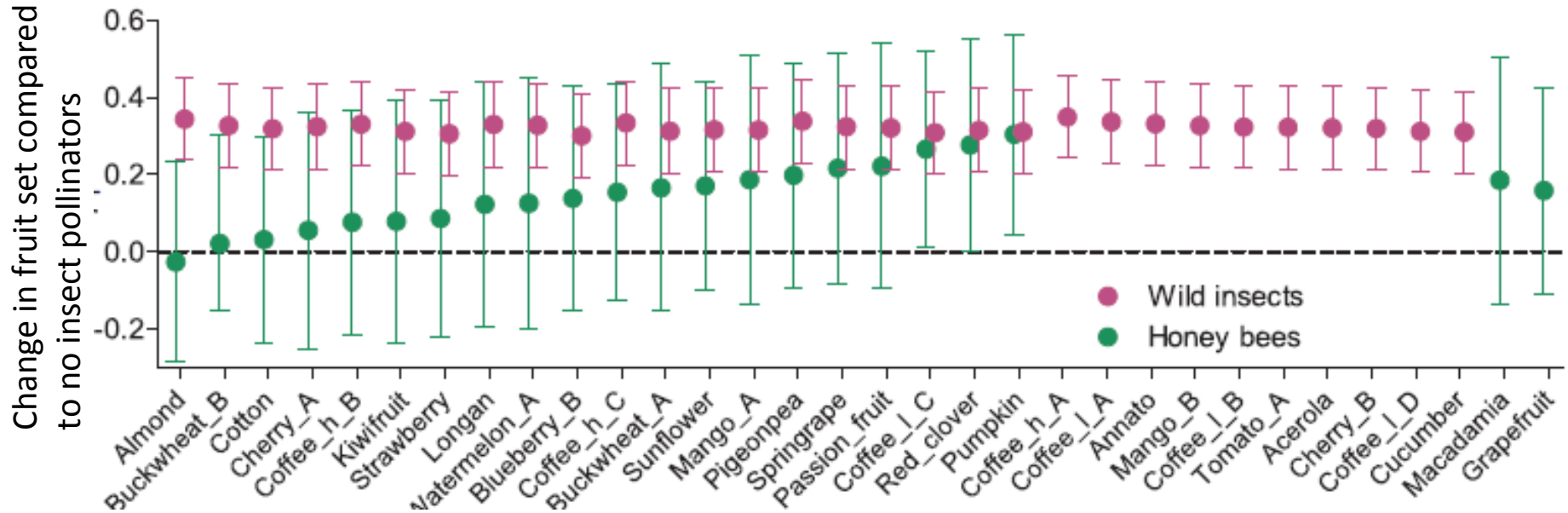
# But are AES simply a cost to productive farming?

- Encouraging wild bees as crop pollinators?



# Worldwide – wild pollinators enhance crop fruit set

- Wild insects more important for crops than honeybees



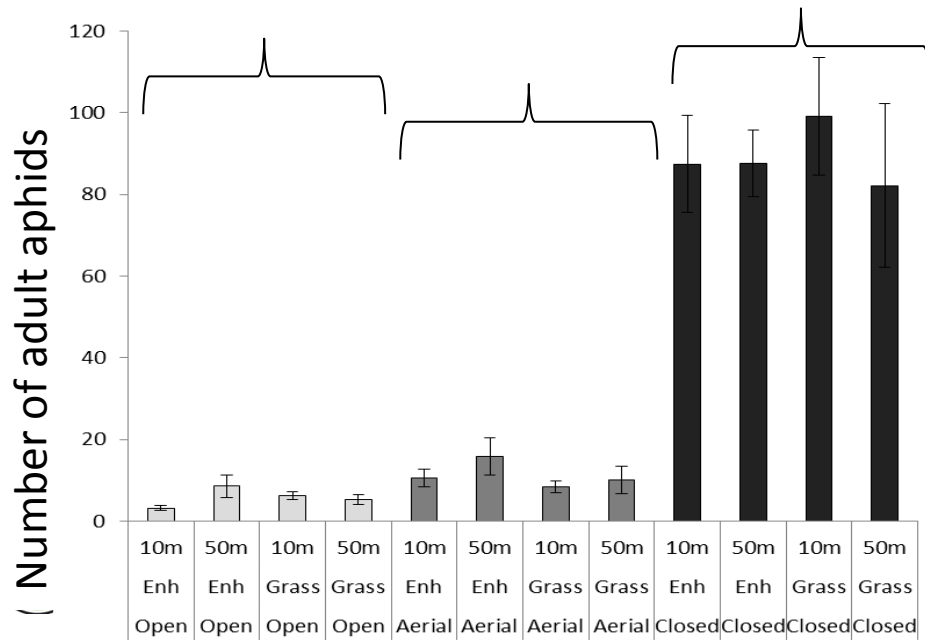
**Wild Pollinators Enhance Fruit Set of Crops Regardless of Honey Bee Abundance**

Lucas A. Garibaldi,<sup>1\*</sup> Ingolf Steffan-Dewenter,<sup>2</sup> Rachael Winfree,<sup>3</sup> Marcelo A. Aizen,<sup>4</sup>



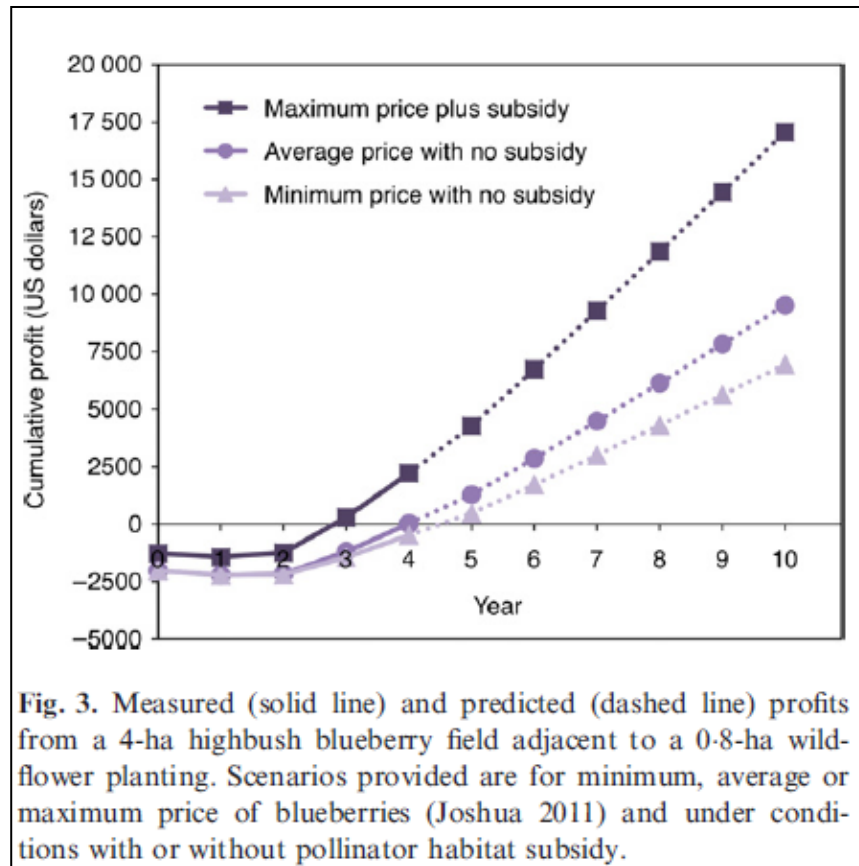
# But are AES simply a cost to productive farming?

- Encouraging natural pest control?



# Might AES enhance crop yields?

- **Studies of blueberries in the US & of mangoes in S. Africa show wildflower patches increase pollination and fruit yield**



4. Crop pollination parameters including percentage fruit set, berry weight and mature seeds per berry were significantly greater in fields adjacent to wildflower plantings 3 and 4 years after seeding, leading to higher crop yields and with the associated revenue exceeding the cost of wildflower establishment and maintenance.

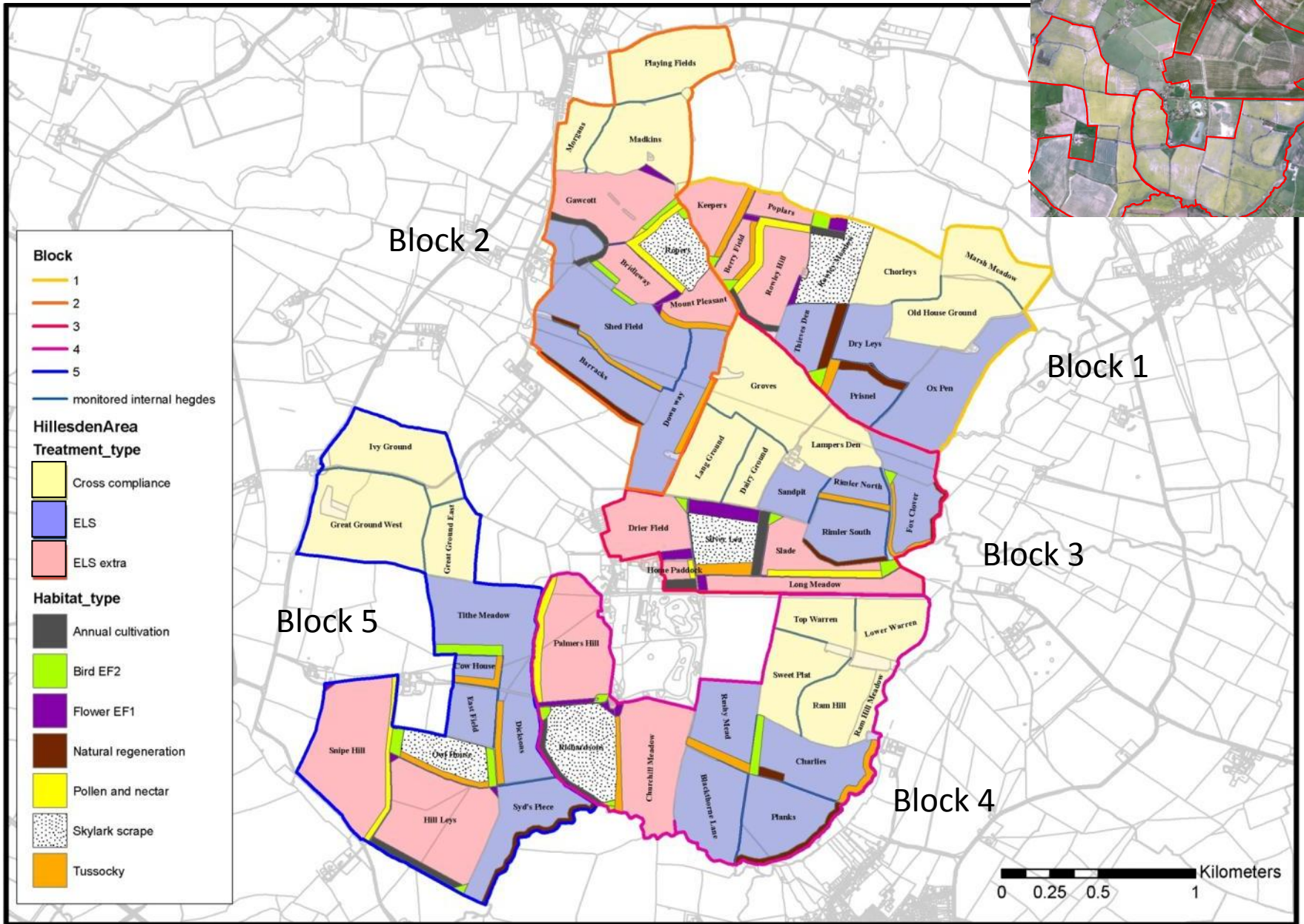


# The Hillesden Project

- Quantify effects of agri-environmental measures on biodiversity, beneficial species & crop yield
- 1000ha commercial arable farm
- Three treatments applied to 50-60ha patches:
  - **Cross Compliance (0% land removed)**
  - **Typical Entry Level AES (1% land removed for two wildlife habitats)**
  - **Entry Level Extra AES (6% land removed for six habitats)**
- Habitat location in awkward/low yielding margins /corners



# Design





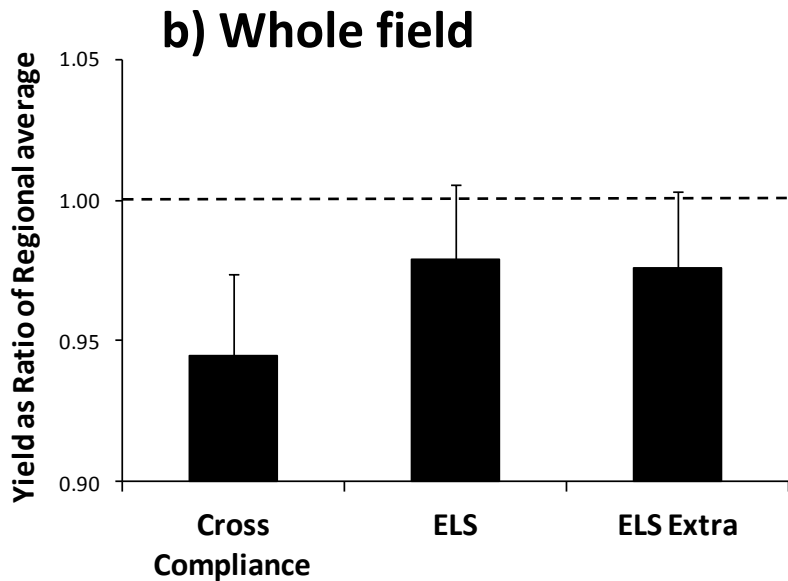
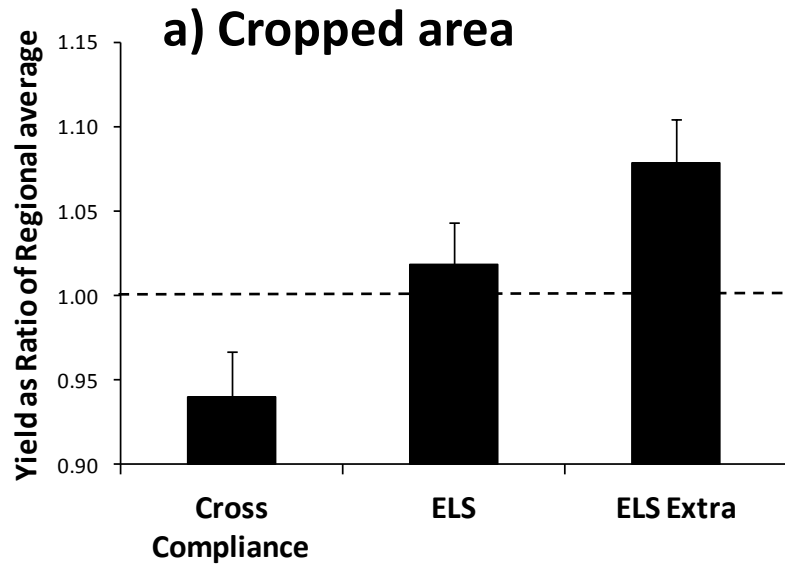
# Hillesden: monitoring

- 10 years of monitoring
- Crop yield & inputs
- Beneficial species associated with crop production (pollinators, pest control)
- Declining farmland species (e.g. birds, butterflies)

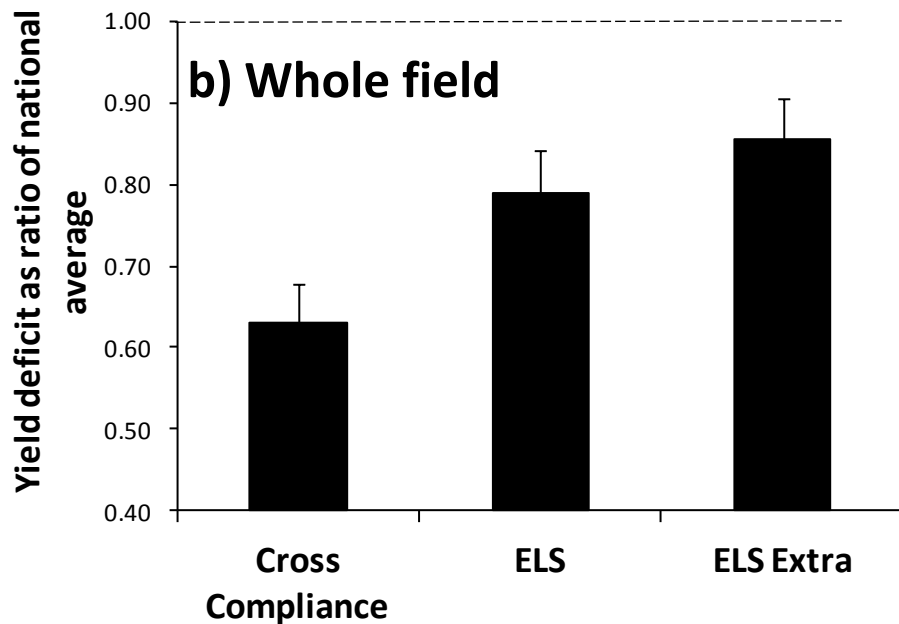
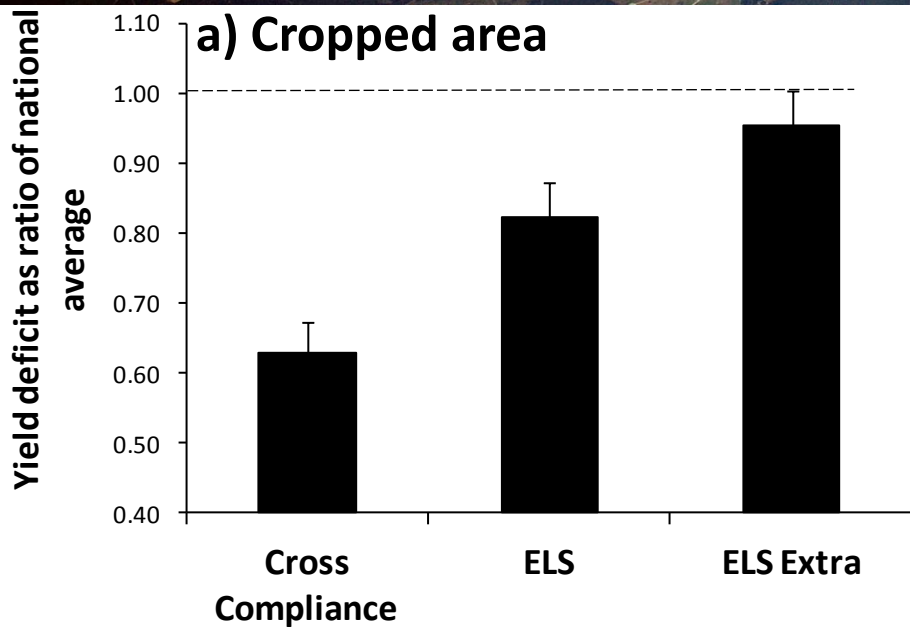




# Effects on yield (6yrs): all crops (wheat, OSR, beans)



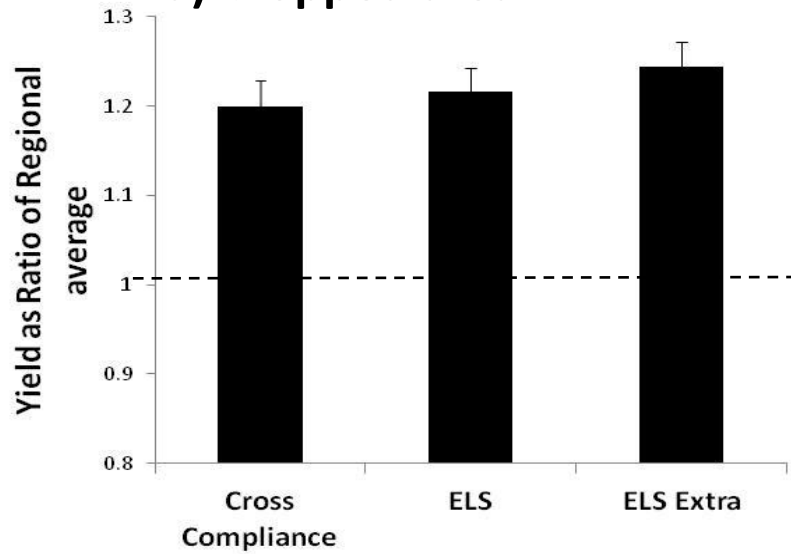
# Effects on yield: Beans



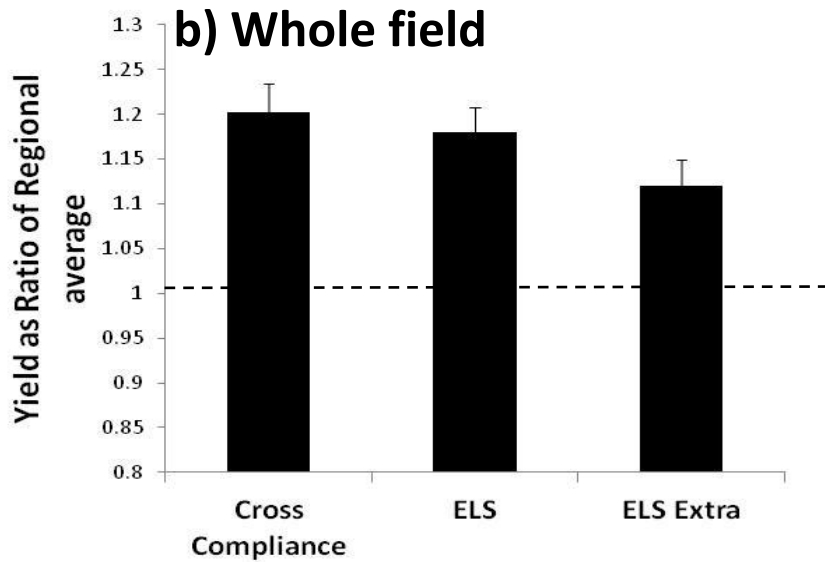


# Effects on yield: Wheat

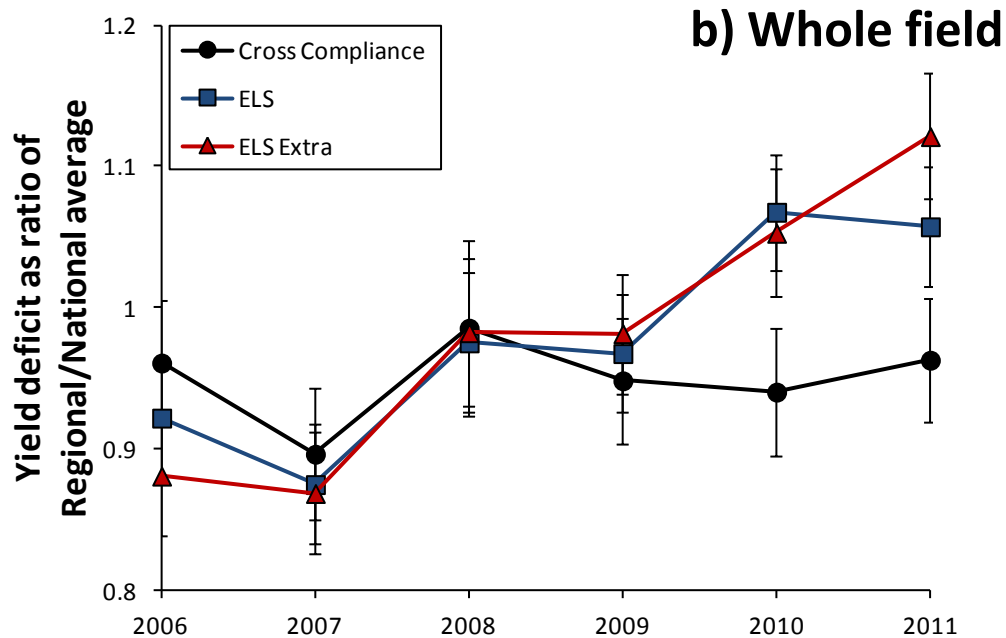
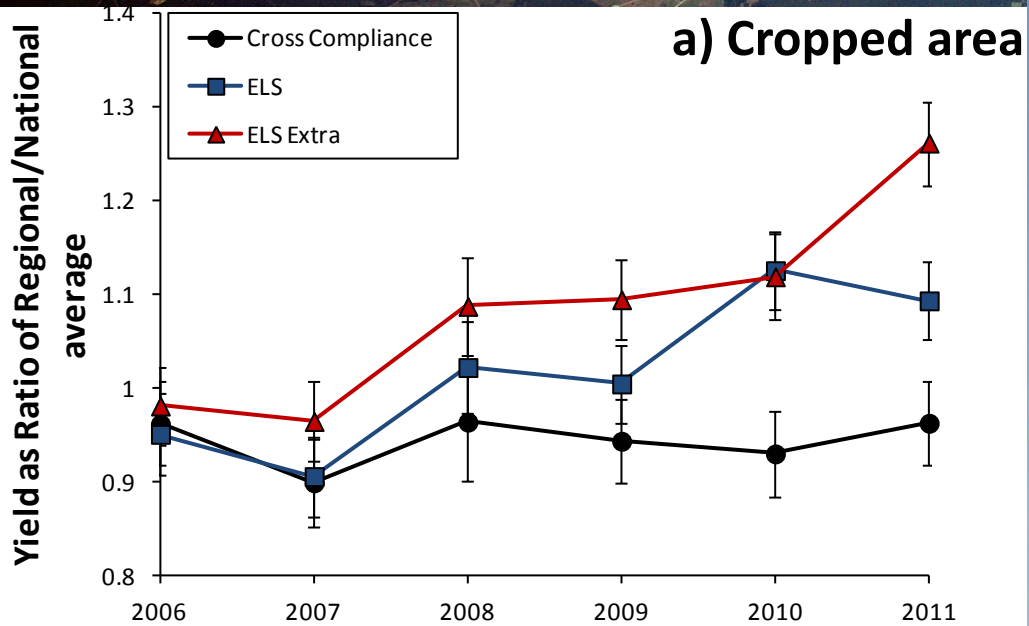
## a) Cropped area



## b) Whole field

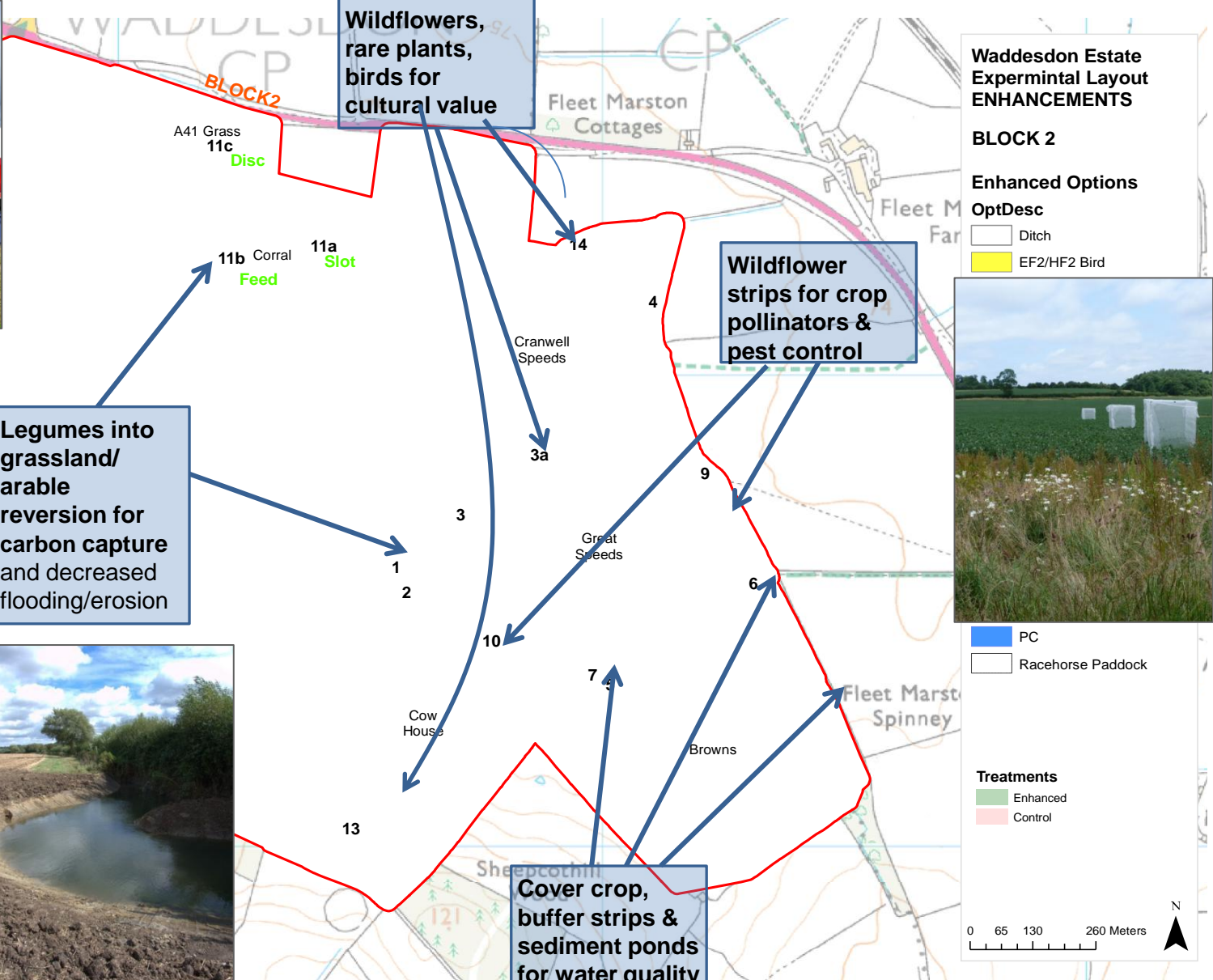


# Yield trend with time





# Using AES more broadly for sustainable farming?



**Wildflowers, rare plants, birds for cultural value**

**Wildflower strips for crop pollinators & pest control**

**Legumes into grassland/ arable reversion for carbon capture and decreased flooding/erosion**

**Cover crop, buffer strips & sediment ponds for water quality**





Department  
for Environment  
Food & Rural Affairs

- Sustainable Intensification Research Platform
- A multi-partner research project funded by Defra to investigate approaches to more sustainable farming.
- 3 projects:
  - **SIP 1** Integrated Farm Management for improved economic, environmental and social performance
  - **SIP 2** Opportunities and risks for farming and the environment at a landscape scale
  - **SIP 3** A scoping study on the influence of external drivers and actors on the sustainability and productivity of English and Welsh farming
- Platform aims to develop more integrated and collaborative ways of funding, conducting and applying agricultural research around sustainable intensification.



# Farmers have a very important role



## The FarmCat project



RURAL ECONOMY  
AND LAND USE

- **Farmers with longer and more intense experience in AES produce better quality margins**
- **And so they have more birds, bees & butterflies**