6.2. All farming systems
## 6.2 All farming systems

Based on the collated evidence, what is the current assessment of the effectiveness of interventions on all farming systems for enhancing natural pest regulation?

| Likely to be beneficial | • Grow non-crop plants that produce chemicals that attract natural enemies  
| Trade-offs between benefit and harms | • Use chemicals to attract natural enemies  
| Unknown effectiveness (limited evidence) | • Leave part of the crop or pasture unharvested or uncut  
| Evidence not assessed | • Plant new hedges  
|  | • Use alley cropping  
|  | • Use mass-emergence devices to increase natural enemy populations

### Likely to be beneficial

- **Grow non-crop plants that produce chemicals that attract natural enemies**
  
  - *Natural enemies*: Four studies from China, Germany, India and Kenya tested the effects of growing plants that produce chemicals that attract natural enemies. Three (including one replicated, randomized, controlled trail) found higher numbers of natural enemies in plots with plants that produce attractive chemicals, and one also found that the plant used attracted natural enemies in lab studies. One found no effect on parasitism but the plant...
used was found not to be attractive to natural enemies in lab studies.

- **Pests:** All four studies found a decrease in either pest population or pest damage in plots with plants that produce chemicals that attract natural enemies.

- **Yield:** One replicated, randomized, controlled study found an increase in crop yield in plots with plants that produce attractive chemicals.

- **Crops studied:** sorghum, safflower, orange and lettuce.

- **Assessment:** likely to be beneficial (effectiveness 68%; certainty 40%; harms 0%).

http://www.conservationevidence.com/actions/724

### Use chemicals to attract natural enemies

- **Parasitism and predation (by natural enemies):** One review and two of five studies from Asia, Europe and North America found that attractive chemicals increased parasitism. Two studies, including one randomized, replicated, controlled trial, found greater parasitism for some but not all chemicals, crops, sites or years and one study found no effect. One study showed that parasites found pests more rapidly. One study found lower egg predation by natural predators.

- **Natural enemies:** Five of 13 studies from Africa, Asia, Australasia, Europe and North America found more natural enemies while eight (including seven randomized, replicated, controlled trials) found positive effects varied between enemy groups, sites or study dates. Four of 13 studies (including a meta-analysis) found more natural enemies with some but not all test chemicals. Two of four studies (including a review) found higher chemical doses attracted more enemies, but one study found lower doses were more effective and one found no effect.

- **Pests:** Three of nine studies (seven randomized, replicated, controlled) from Asia, Australasia, Europe and North America found fewer pests, although the effect occurred only in the egg
stage in one study. Two studies found more pests and four found no effect.

- **Crop damage:** One study found reduced damage with some chemicals but not others, and one study found no effect.
- **Yield:** One study found higher wheat yields.
- **Crops studied:** apple, banana, bean, broccoli, Chinese cabbage, cotton, cowpea, cranberry, grape, grapefruit, hop, maize, oilseed, orange, tomato, turnip and wheat.
- **Assessment:** likely to be beneficial (effectiveness 40%; certainty 50%; harms 15%).

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**Trade-off between benefit and harms**

- **Leave part of the crop or pasture unharvested or uncut**
  
  - **Natural enemies:** We found eight studies from Australia, Germany, Hungary, New Zealand, Switzerland and the USA that tested leaving part of the crop or pasture unharvested or unmown. Three (including one replicated, controlled trial) found an increase in abundance of predatory insects or spiders in the crop field or pasture that was partly uncut, while four, (including three replicated, controlled trials) found more predators in the unharvested or unmown area itself. Two studies (one replicated and controlled) found that the ratio of predators to pests was higher in partially cut plots and one replicated, controlled study found the same result in the uncut area. Two replicated, controlled studies found differing effects between species or groups of natural enemies.

  - **Predation and parasitism:** One replicated, controlled study from Australia found an increase in predation and parasitism rates of pest eggs in unharvested strips.

  - **Pests:** Two studies (including one replicated, controlled study) found a decrease in pest numbers in partially cut plots, one of them only for one species out of two. Two studies (one replicated, the other controlled) found an increase in pest numbers in
partially cut plots, and two studies (including one replicated, controlled study) found more pests in uncut areas.

- **Crops studied**: alfalfa and meadow pastures.
- **Assessment**: trade-offs between benefits and harms (effectiveness 45%; certainty 50%; harms 25%).

  [http://www.conservationevidence.com/actions/725](http://www.conservationevidence.com/actions/725)

### Unknown effectiveness (limited evidence)

#### Plant new hedges

- **Natural enemies**: One randomized, replicated, controlled study from China compared plots with and without hedges and found no effect on spiders in crops. One of two studies from France and China found more natural enemies in a hedge than in adjacent crops while one study found this effect varied between crop types, hedge species and years. Two randomized, replicated, controlled studies from France and Kenya found natural enemy abundance in hedges was affected by the type of hedge shrub/tree planted and one also found this effect varied between natural enemy groups.
- **Pests**: One randomized, replicated, controlled study from Kenya compared fallow plots with and without hedges and found effects varied between nematode (roundworm) groups.
- **Crops studied**: barley, beans, maize and wheat.
- **Assessment**: unknown effectiveness (effectiveness 20%; certainty 19%; harms 20%).

  [http://www.conservationevidence.com/actions/752](http://www.conservationevidence.com/actions/752)

#### Use alley cropping

- **Parasitism, infection and predation**: Two of four studies from Kenya and the USA (including three randomized, replicated, controlled trials) found that effects of alley cropping on parasitism varied between study sites, sampling dates, pest life stages or the width of crop alleys. Two studies found no effect on parasitism. One study found mixed effects on fungal infections in pests and one study found lower egg predation.
• **Natural enemies:** One randomized, replicated, controlled study from Kenya found more wasps and spiders but fewer ladybirds. Some natural enemy groups were affected by the types of trees used in hedges.

• **Pests and crop damage:** Two of four replicated, controlled studies (two also randomized) from Kenya, the Philippines and the UK found more pests in alley cropped plots. One study found fewer pests and one study found effects varied with pest group and between years. One study found more pest damage to crops but another study found no effect.

• **Weeds:** One randomized, replicated, controlled study from the Philippines found mixed effects on weeds, with more grasses in alley cropped than conventional fields under some soil conditions.

• **Yield:** One controlled study from the USA found lower yield and one study from the Philippines reported similar or lower yields.

• **Costs and profit:** One study from the USA found lower costs but also lower profit in alley cropped plots.

• **Crops studied:** alfalfa, barley, cowpea, maize, pea, rice and wheat.

• **Assessment:** unknown effectiveness (effectiveness 15%; certainty 35%; harms 50%).

http://www.conservationevidence.com/actions/718

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**Evidence not assessed**

- **Use mass-emergence devices to increase natural enemy populations**

  • **Parasitism:** One randomized, replicated, controlled study in Switzerland found higher parasitism at one site but no effect at another site when mass-emergence devices were used in urban areas.

  • **Pest damage:** The same study found no effect on pest damage to horse chestnut trees.

  http://www.conservationevidence.com/actions/775