



Agriculture & Horticulture
DEVELOPMENT BOARD



Grower Summary

FV 334a

Automated Field Margin Design
for vegetable crops

Final 2013

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Before using all pesticides check the approval status and conditions of use.

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Further information

If you would like a copy of the full report, please email the HDC office (hdc@hdc.ahdb.org.uk), quoting your HDC number, alternatively contact the HDC at the address below.

HDC
Stoneleigh Park
Kenilworth
Warwickshire
CV8 2TL

Tel – 0247 669 2051

HDC is a division of the Agriculture and Horticulture Development Board.

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Project Title: Automated Field Margin Design for vegetable crops

Project Leader: Pat Croft

Contractor: Stockbridge Technology Centre Research Foundation (STCRF)

Industry Representative: Richard Moynan,

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Headline

A new website (http://www.stockbridgetechnology.co.uk/Automated_Margins/) has been produced to help growers identify the right seed mix for their field margins, specifically tailored to their own crop and management preferences. Login using the password 'entomos'.

Background

The horticultural industry faces a range of crop protection issues. Pressures to reduce pesticide use have led to the investigation of many alternative methods for maintaining pest populations below economic damage thresholds. Non-crop plants in farming landscapes can provide a range of important ecological services, including conservation of native flora and fauna and the enhancement of pollination and biological pest control (Gurr *et al.*, 2003). Field margins containing non-crop plants can play an important role in meeting current UK conservation targets (Vickery *et al.*, 2004). Margin seed mixes have already been developed that target conservation of bees (Carvell *et al.*, 2006), butterflies (Pywell *et al.*, 2004) and farmland birds (Vickery *et al.*, 2009). The effectiveness of field margins in boosting pest control strongly depends on their botanical composition. Not all flowers are suitable for supporting pest natural enemies, despite many biological control agents requiring flowering plants as a source of nectar and pollen (Wäckers *et al.*, 2005). Often non-crop elements that are designed for bird or pollinator conservation do not simultaneously make resources available to biological control agents (Olsen & Wäckers, 2007). Furthermore, the inclusion of certain flowering species in field margins can promote pests and impact upon nearby crops (Winkler *et al.*, 2010).

Research is now being conducted to design multifunctional field margin seed mixes that can be sown to provide benefits to many target groups simultaneously. Such margins still provide desirable conservation benefits to farmland birds and pollinators, but by also providing resources to encourage pest natural enemies (without encouraging pests) these margins can play a greater role in pest control than they have previously. To achieve this aim, the plants included in a seed mix must be carefully and individually selected based on many criteria and tailored to the crop next to which they are sown.

Ongoing research is also looking to develop field margins that can be employed on a longer-term basis, using perennial species in seed mixes (HortLink – HL0192). Such field margins should offer an improved return in the long-term, where repeat sowing after several years would not be necessary to retain the multifunctional margin.

It has been shown that growers are more likely to sow flowering margins if these can be tailored to their own fields and circumstances, and are designed to provide beneficial pest control, as well as pollination and conservation. Ensuring that margin mixes provide minimal resources to pest species is important to increase grower confidence in, and uptake of flowering field margins, particularly as evidence is emerging to suggest that this is not always the case (Winkler et al., 2010).

Summary

Whilst growers commonly construct their own seed mixes, selecting mixes that are beneficial to growers through providing food and nectar for predators/parasitoids and pollinators, is a knowledge-intensive and lengthy process, and unlikely to be embarked upon by the majority of growers. However, the automated system developed within this project is capable of providing details of field margin seed mixes best suited to a grower's crop, management and budget, making tailored, multi-functional margins available to all.

To create an easy-to-use tool for growers, and after feedback, five criteria from the database were selected as most relevant:

- 1) **The main crop** grown next to the proposed margin - Brassicas, carrots, peas and potatoes were chosen to be included after recommendation from the HDC FV Panel. The answer to this question led to the omission of plant species known to be associated with pests.
- 2) **Soil type** – clay, loam or sand. These three broad soil types were chosen because they represent the types of soil relevant to the selection of species from the raw database. Growers will choose the type that best describes their land.
- 3) **Margin lifespan** – annuals only or perennials included. This allows growers to choose if they wish their margin to persist for multiple years. An annual mix may be more relevant to a grower's rotation. Whereas, a mix with perennials included would have a longer lifespan and allow the margin to become a more permanent landscape feature.
- 4) **Provenance** – native only or naturalised species included. Growers can use this selection criterion to choose whether they would prefer to sow only native species. No truly exotic species are included in any of the mixes. The naturalised species are those that are already present to an extent in UK habitats (e.g. *Phacelia tanacetifolia*)
- 5) **Budget** – economy or premium. This will allow growers to reduce costs should they want to. An "economy" mix will exclude or reduce in number those species known to

be more expensive. An explanation on the role of the excluded species will be provided with the seed mix to inform the grower of the plant's value in a multifunctional mix. This will allow growers to decide on the balance between cost and function.

The website can be seen on Stockbridge Technology Centre web site and accessed using the password **entomos**. Growers will be able to access the site through a link from the HDC website (<http://www.hdc.org.uk/interactive-tools>) or directly through the STC website <http://www.stc-nyorks.co.uk/>.

There is a welcome page, explaining the background behind the project and the rationale for the website. The top of the page has several tabs relating to:

Home – returns the user to the welcome page

Establishment – contains notes on land preparation and margin establishment. These guidelines, as used in the hortLINK HL0192 project, give advice on the four steps for optimum margin establishment: site selection; site clearance and weed control; seed bed cultivation; seed sowing.

Management – contains notes on how best to manage the margin once established, with particular reference to controlling grasses and weeds in perennial margins using mowing regimes. This section has been developed in consultation with our project partner, Emorsgate Seeds, and a link is provided on the website for further information.

FAQ – contains ‘frequently asked questions’ relating to margins generally and this project more specifically such as justifications for including a greater diversity of plants in a seed mix for increased likelihood of good establishment and for multiple ecosystem service benefits.

Links – contains links to appropriate seed producers as well as relevant information on field margins and agro ecosystem research such as the ecostac (FV334 – Hortlink project HL0192), Natural England and SAFFIE websites.

Financial Benefits

1. Reduced labour costs and seed inputs where perennial rather than annual margin seed mixes are selected (annual options available if preferred), and through the use of seed mixes tailored to establish well under the conditions present on site.

2. Expected reduction in insecticide inputs as a result of improved pest control where field margins are used.
3. Provision of a quick and easy-to-use tool to generate field margin seed mixes, tailored to a grower's crops, site, requirements and budget, for use with vegetable crops in the UK. This will potentially save time and money compared to conducting their own research.
4. Provision of 'best practice' guidelines to assist margin establishment and management, potentially reducing the risk of a flowering margin failing to establish.

Action points for growers

- Use the website tool to identify the correct seed margin mix for your specific vegetable crop and conditions.
- Use the guidelines on the website to establish and manage the field margins.