# MULTIFUNCTIONAL LANDSCAPES

## WHY GOOD FIELD MARGIN MANAGEMENT IS IMPORTANT AND HOW IT CAN BE ACHIEVED

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OPERA

ELO
European Landowners' Organization

OPERA (European Observatory on Pesticide and Risk Analysis) is a research center of the Catholic University of the Sacred Hearth. It is an independent, not-for-profit scientific think tank, committed to the successful integration of agri-environmental measures within European legislation, to help achieve the desired objectives of the European Union Pesticides Package. Within this context OPERA reviews and advise in the implementation and measurement of risk reduction methodologies, which are crucial for the successful implementation of the Directive on Sustainable Use of Pesticides.

The fundamental contribution of OPERA is to use the potential of existing scientific researches and knowledge to support the stakeholders in their political and technical decisions concerning agriculture, and particularly the management of agricultural risks relating to pesticides and the environment. One objective is to create a list of recommendations to policy makers on improving the effectiveness of agriculture policies in EU.

ELO
European Landowners' Organisation

ELO is committed to promoting a sustainable and prosperous countryside and to increasing awareness relating to environmental and agricultural issues. Engaging various stakeholders, ELO develops policy recommendations and programmes of action. ELO organises interdisciplinary meetings gathering together key actors from the rural sector and policy makers at the local, regional, national and European level. Its ability to do all of this assures ELO its unique position among the think tanks in the agricultural, environmental and rural activities' sectors.

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## FOREWORD

Over the past decade, the focus of European Agriculture has shifted fundamentally, to focus on farmers providing environmental public goods and services, along with maintaining adequate and secure food supplies.

Environmental measures, initiated through a combination of European legislation and economic drivers, have sought to resolve issues of conservation and protection of biodiversity, preservation of landscape features, improving efficiency of water use and the protection of soil and water resources.

This paper aims to show that it is feasible and practical to balance biodiversity conservation and protect resources on the farm, alongside competitive farming practices, which will deliver a secure and sustainable food supply for Europe and help to feed a growing world population.

In particular, field margins, and other rural landscape features, can make a significant contribution to the achievement of these outcomes.

Indeed, the management of field margins, or other uncropped areas next to or near fields, is one of the most important environmental assets that a farmer can provide. Today, it is widely acknowledged that field margins are crucial for the protection of soil and water and, where appropriately managed, to boost biological diversity in farming landscapes.

Importantly, by strategically locating field margins on areas of the farm where they will provide maximum protection of watercourses and the greatest benefit to biodiversity, a high level of environmental gain can be achieved with minimal impact, if any, on farm income.

Whilst the basic requirement for farmers to leave uncropped field margins already exists within current legislative proposals, their extension and proactive management should be further encouraged. This could be achieved effectively through an explicit recognition by policy makers of the environmental value created by the proactive management of margins and other on-farm initiatives. It should also provide access to additional financial support for those farmers who wish to go beyond the basic and compulsory requirement and are delivering additional environmental assets and public services.

This discussion paper sets out some ideas on how this might be achieved in parallel with a productive and competitive farming system. The current review of agriculture and environmental policy in Europe, therefore, offers a valuable opportunity to introduce these proposals on multifunctional landscapes.

**Thierry de l'Escaille** **Ettore Capri**

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## INDEX


**1. THE EVOLUTION OF FARMLAND AND THE STORY OF THE FIELD MARGIN 4**

**2. THE FUTURE FOR FIELD MARGINS AND RURAL LANDSCAPE 5**

I. Definition 6

II. The Function 7

III. The EU legal framework 9

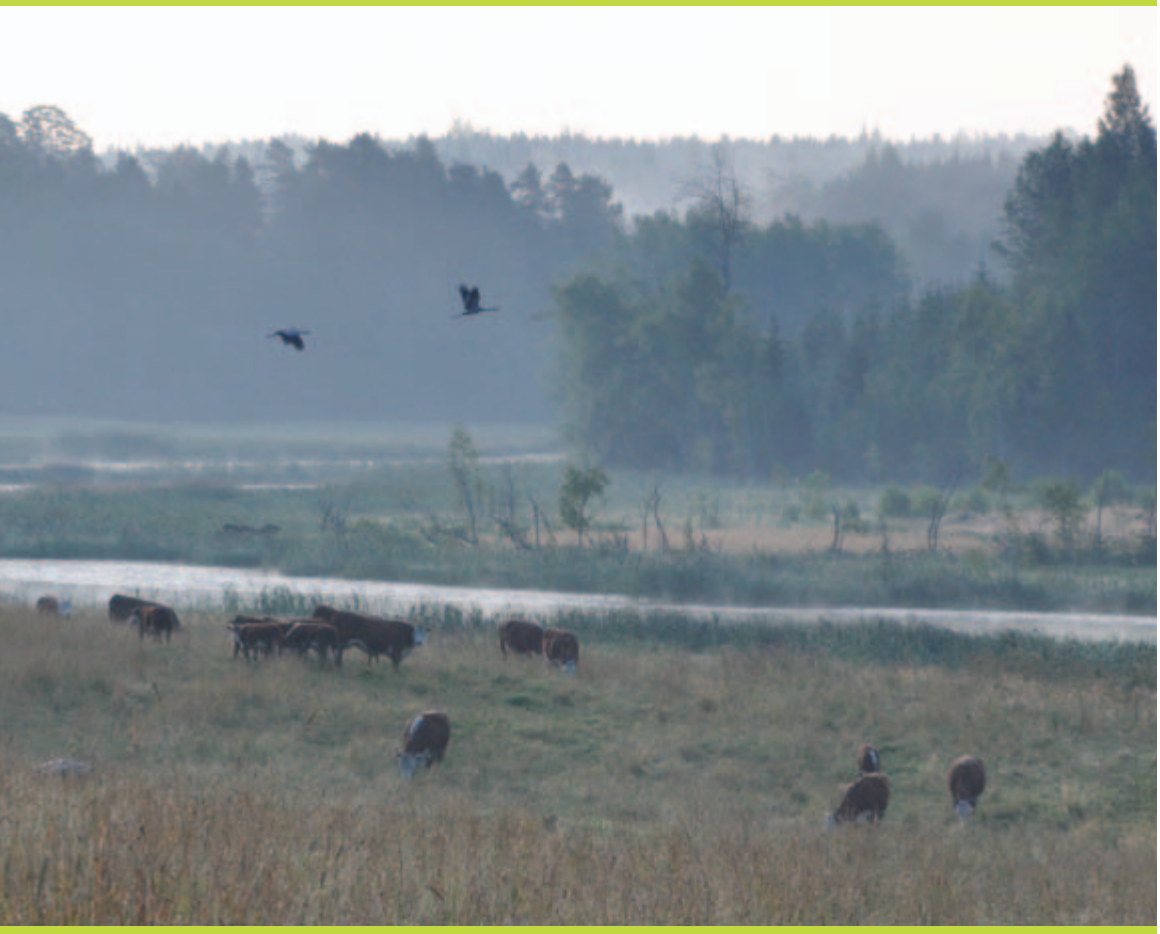
IV. Financial aid and assistance required for agri-environment programs 10

**3. FURTHER INITIATIVES TO ENHANCE EU BIODIVERSITY PROVISION 11**

**4. CONCLUSIONS 11**

**ANNEX I: Benefits of field margins to agriculture and the environment 12**

**ANNEX II: Advice for successful buffer zones 14**

## 1. THE EVOLUTION OF FARMLAND AND THE STORY OF THE FIELD MARGIN

Agricultural landscapes are primarily dictated by the activities of farming communities making their living within the physical constraints of the land. They vary with geography, topography, cropping system and intensity of management. In most European farming systems, the landscape presents a myriad of cultivated and uncultivated elements, separated by linear features including field margins, verges, and watercourses.

These linear features create the rich mosaic of farmers' fields, defining the diversity of agricultural landscapes across the regions.

The story of field margins and rural landscape features are linked to the story of agriculture. Changes in agriculture have often resulted in changes in field boundaries.

Since the 1950s agriculture has seen major changes, with significant step changes in production to assure food security, increased mechanization and farm consolidation – which addressed the need for more efficient production through larger field sizes. Land re-allocation programmes, in which ownership has been rationalised, have also been implemented in many countries.

These developments, in response to economic stimuli and the post-war demand for increased food supplies, have been accompanied by changes in field boundaries, which often resulted in modifications or even removal of field margins, hedges, ponds and other uncultivated areas, rich in biodiversity.

Changes in cropping options or the increased social use of agricultural land, such as for hunting or walking, have also influenced the way our rural landscape looks today.

Whilst the rural landscape is in a state of almost constant flux, it is also important that time is taken to step back and assess how it might be best structured and managed in ways that optimises production levels and the requirements for environmental protection.

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## 2. THE FUTURE FOR FIELD MARGINS AND RURAL LANDSCAPES

To a certain extent, this pause for thought about our rural landscapes is already happening. In recent years, there has been a close look at the positive role which field margins, hedges, and ponds on farmland, can play. These reflect agricultural, environmental, conservation, recreational and cultural or historical interests. Furthermore, new approaches to creating and managing these areas have shown how they can deliver greater benefits for the environment and the public good. Therefore, the important role and requirement of biodiversity-rich areas in European farming systems are now being re-evaluated.

Today, it is broadly acknowledged that measures to enhance farmland biodiversity and to protect essential resources – primarily clean water and soil – are as important as the need for food and feed production. Indeed, they are seen as key to the sustainability of such production systems. Not surprisingly then, the focus of a number of recent studies has been the development of proactive techniques to create and manage areas of farmland biodiversity. This scientific research and detailed monitoring has shown that it is possible to significantly enhance beneficial insects, biodiversity and environmental protection, whilst enabling the farmer to retain practical options for increased productivity and the profitable use of the farmed land.

Although there is still the need to better understand the complex interactions between fauna and flora, cropped and non-cropped areas and semi-natural habitat and crops, along with how cropping can affect the wider landscape, there are some important observations that are clearly worth noting:

*Sown strips of selected perennial species, between arable fields and alongside hedges, can supplement and enrich existing natural herbaceous flora. This can provide potential environmental benefits for plant species diversity and supporting larger insect populations, along with agricultural benefits for improved weed management.*

*Likewise, there can be hugely beneficial effects to protect against soil erosion and to enhance water quality through positive management of the flora of field margins and banks of watercourses adjacent to crop fields. More studies on the interactions between margins and fields are in progress.*

Furthermore, the importance of field margins and hedges in providing habitat and food sources for farmland birds has been highlighted. It has been shown that modification of field margin management specifically to help target species of farmland birds that are in decline may help in their conservation. These features are also important for pollinating insects, such as bees and butterflies. These studies have highlighted that relatively small areas of carefully selected and sited farmland specifically managed for biodiversity enhancement or environmental protection, can provide significant gains and meet clear objectives, with little or no impact on physical production from the farmed area.

Although it may be counter-intuitive, field margins might even be beneficial for agricultural production: many beneficial predators such as spiders and ground beetles which feed on a variety of foods, especially traditional crop pests such as aphids, are dependent on the field margins for part of the year. The high number of invertebrates provides food for farmland birds and mammals such as bats. Field margins and hedges are also important as refuges for arthropods in winter and may even influence the soil macrofauna, notably earthworms which can be beneficial for the quality of the soils.

With this new emphasis on environmental protection, combined with a renewed desire from consumers to understand and appreciate the production systems from which their food comes from, farmers are starting to be recognised as custodians and conservers of their land and providers of an irreplaceable resource managed for the public good.

## I. DEFINING THE FIELD MARGIN[1]

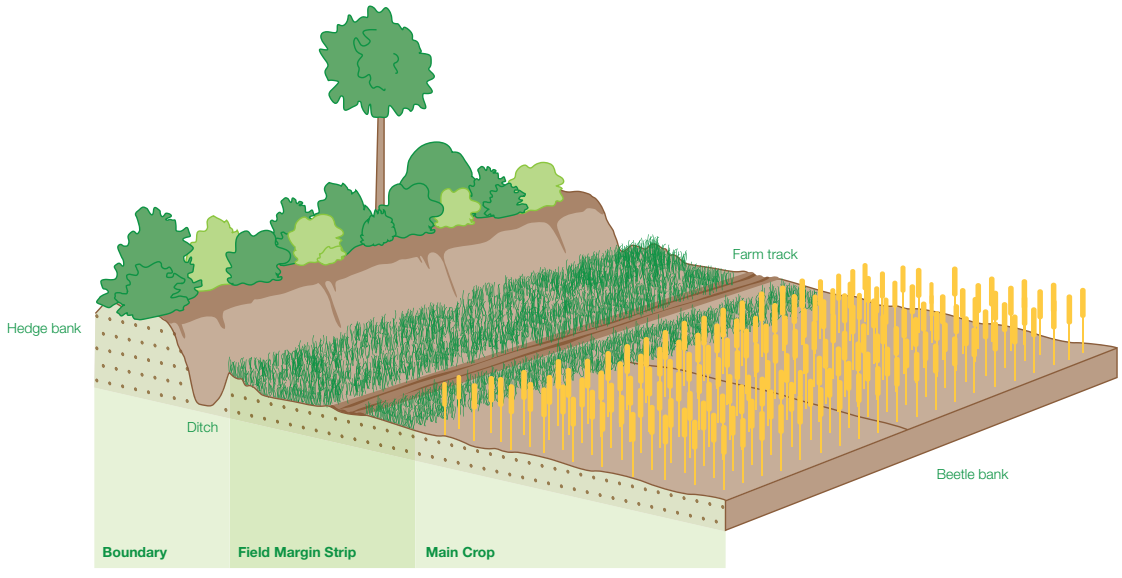
Field margins in both arable and grassland farming are typified by having some form of boundary structure – typically a hedge, fence, wall, bank, ditch, drain or water course. In most instances, this is accompanied by some form of associated herbaceous vegetation, adjacent to the crop. The boundary encompasses the barrier between fields or between two different types of land use. Under some conditions, there may be no border between the crops – just a simple post and wire fence dividing field areas with little or no non-crop vegetation.

A margin strip is any clearly defined strip established in the field or at the edge of the field, between the crop and the boundary. The purpose of this area may be for access or for wildlife and environmental objectives and may have agronomic, recreational or cultural functions. It is entirely possible that a field margin strip may be multi-functional combining all these agronomic, environmental and recreational facets, for example.

There are many forms that field margins can take based on historical function or, more recently, created for a specific purpose such as providing diverse habitat or environmental protection. These include grass strips, wildflower strips, strips sown to bird cover crops, unsown cultivated strips with naturally regenerated flora, sterile strips maintained by cultivation or herbicides, buffer strips and beetle banks. Beetle banks, however, are situated across a field instead of between the pre-existing boundary and the crop.

Alongside the field margin, the crop edge is defined as the outer few metres of the cropped area. Where the crop edge is being actively managed as a conservation headland or unsprayed area, it may in itself become part of a nature conservation and environmental protection area. Otherwise, it is a conventional crop edge, maintained alongside the field margin that is being managed for its biological and environmental value.

[1] We refer to the definition provided in the Convention on Biological Diversity



## II. THE FUNCTION & BENEFIT

The primary role of boundaries and field margins, as detailed in section 1, has been to define the ownership of land and to divide field areas for agricultural cropping. Field margins have also enabled access and facilitated field management.

In addition, physical boundaries of hedges and fences retain livestock in fields, as well as providing shelter for stock in adverse weather, with shade in summer and shelter from snow and wind in winter. Traditionally livestock areas are characterized by smaller parcels of land for rotational grazing, divided by a network of hedges, walls and fences. Where the agricultural land use has changed over time, however, fields created for livestock farming may not prove practical for arable cropping.

In arable landscapes, the physical boundaries of hedges can still play an important role as windbreaks to protect adjacent crops. When managed appropriately, these boundaries and their associated field margins may also help to reduce the spread of weed grass species from the boundary area into the crop.

Importantly, field margins may also influence the flow of nutrients and water within agricultural landscapes. Studies have shown margins alongside watercourses can act as buffers to stop the movement of soil from fields to adjacent watercourses and wetland habitats, including rivers, streams, ditches and marshlands. This, in turn, can help prevent any contaminants within the soil particles from reaching the watercourse.

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Historically, in livestock areas, many fields alongside watercourses had no permanent boundary. This enabled animals to easily access drinking water, but frequently led to excessive river bank erosion and water contamination. As a result, few of these fields with vulnerable river banks now feature field margins which could help to protect from further soil movement or erosion.

Field margins can provide a further social function with their use as footpaths and bridleways, providing controlled access in the countryside, whilst leaving the cultivated area undisturbed. Historically field margin footpaths linked settlements and features by the shortest possible route for walking; now there is the option to create new routes encompassing features of aesthetic value, to encourage further healthy recreational use of the countryside.

Enhancing the visual appearance of the countryside is not to be underestimated in the creation of an integrated field margin strategy that forges closer links between the farmers that use the land, and the customers who consume their produce. Flower strips around fields – provided as a source of pollen and nectar for pollinating insects – have notably improved the aesthetic value of the landscape.

Field margins can also be specifically managed to enhance game bird populations, by providing nesting cover and food resources, and can thus contribute to farm income in hunting areas.

Field margins are known to be important in providing over-wintering habitat, or refuges, for many insects. In some instances these may be beneficial predatory insects that will move into the adjacent arable crops and can help to reduce the threat of insect pest species building-up.

## ENHANCING BIODIVERSITY

Field Margins, beetle banks and other landscape features linking up isolated parts of habitats on the field.
"Possible components of multifunctional landscapes"

As linear features, boundaries, field margins, and other connecting landscape features, are also thought to act as corridors for the movement of insects and small mammals. Indeed, ecologists believe they have an essential role in linking up isolated parts of fragmented habitats (Illustrated above).

Providing a network of field margins of suitable habitat could enable colonies of fauna that have been left dangerously isolated in pockets of habitat, to link up and increase their chance of survival through greater numbers and enhanced genetic diversity. Species of rare or declining flora have been shown to move and spread along appropriately managed field margins.

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### III. THE LEGAL FRAMEWORK IN THE EU

In the implementation of the new European Framework Directive on the Sustainable Use of Pesticides (EC/128/2009), Member States must take appropriate measures to protect the aquatic environment and drinking water supplies from the impact of pesticide residues. In addition, Member States should recognise and support the implementation of boundaries, field margins, and other beneficial landscape features, as key tools for IPM.

The cross compliance requirements, as revised by the CAP Health Check, require farmers to establish buffer strips along water courses by 2012 to prevent nitrate run-off in accordance with fertilizer application rules in the nitrates Directive.

To further achieve these objectives, it is suggested measures should include zones designated to safeguard surface and groundwater used for drinking water supplies, along with buffer zones around water bodies.

Studies have shown that creating buffer zones, by establishing vegetative strips on unfarmed areas between parcels of cropped land, can have benefits in terms of soil and water protection, natural fertilisation and biological crop protection. At the same time, these measures can protect the natural heritage, wildlife, natural flora and biodiversity.

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Environmental monitoring of field margins has indicated that the optimum width of a margin will depend upon its intended purpose and its management. With biodiversity enhancement, for example, a margin created and managed to supply the needs of target species, such as wildflower sown to provide a food source for pollinators, may have a greater benefit than simply leaving an uncropped area. For soil and water protection, establishing and maintaining a vegetative margin could prevent soil movement more effectively than an uncropped margin.

In some countries, there is already a minimum requirement for the provision of margins around fields of cropped land in order to protect and manage water bodies, which can be either vegetative or fallow strips. Field margins should be a standard if there is a clear evidence of connection between the field and the water body (e.g. drainage, flow communication). These carry the stipulation that they should not be used for agriculture production, except for the purpose of access or livestock movement.

In transposing the Sustainable Use of Pesticides Framework Directive, Member States should establish a minimum standard whilst incentivising farmers for taking additional steps for good farm landscape management. This would motivate farmers to do more and allow individual adaptation to local conditions and territories.

## IV. FINANCIAL AID AND ASSISTANCE REQUIRED FOR AGRI ENVIRONMENT PROGRAMS

To successfully go beyond the existing legislation, a number of further policy measures and financial mechanisms are recommended.

**a.** Within the National Action Plans implementing the sustainable use of pesticides Directive, means should be identified to enable the extension of measures that go beyond the mandatory obligations for farmers to set up buffer zones along water bodies;

**b.** Farmers should be rewarded for the introduction of proactive management of field margins, buffer zones, and other on-farm biodiversity areas, which offer further protection of water and delivers broader environmental benefits;

**c.** The simplification and better promotion of agri-environmental measures within the Rural Development Programme will encourage greater voluntary commitments to the expansion of proactively managed field margins and farm landscapes as well as the creation of other on-farm biodiversity areas. Financial support for such an approach will offset any costs incurred in their establishment and maintenance.

**d.** Assistance should be made available to farmers across the EU to ensure that they have easy and timely access to the financial support and that any administrative burden is alleviated.

**e.** Additional education and support programmes for farmers should be established and delivered, in line with best management practices, that explain to farmers the agricultural and environmental benefits of expanding and introducing proactive management of field margins and rural landscape elements.

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## 3. FURTHER INITIATIVES TO ENHANCE EU BIODIVERSITY PROVISION

In addition to these direct measures to assist farmers with the creation of beneficial field margins, further initiatives should be encouraged that ensure areas of non-farmed land, such as road and rail embankments, are fully utilised to achieve the best possible environmental benefit.

Large areas of such land adjoining areas of surrounding farmland create a significant environmental asset for the whole community.

With a fully integrated approach between farm and non farm land management, it could be possible for farmers to assist in the fulfilment of the environmental obligation of road, rail and industrial infrastructure operators.

Non farm land managers would require the financial and educational support to implement such strategies alongside farm environmental enhancement measures. Funding of such projects could come from the EU environmental program LIFE+ or the EU cohesion fund.

Furthermore, initiatives to encourage the public and consumers to manage homes and gardens positively to provide habitat for pollinators and others, could prove entirely complementary to the actions being taken on farms to benefit biodiversity.

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## 4. CONCLUSION

Proactive management of field margins and rural landscape features will play an essential role in fulfilling the need to enhance biodiversity and protect the natural resources of soil and water. At the same time this approach will allow farmers to maintain a sustainable and competitive farming system. Using the opportunity of current legislative changes to adopt strategies for their wider adoption – from mandatory towards voluntary schemes – will achieve a higher overall landscape benefit, alongside a productive and viable agriculture.

## ANNEX I: EXPECTED BENEFITS OF FIELD MARGINS TO AGRICULTURE AND THE ENVIRONMENT

**a.** Avoid erosive soil loss:
- Minimises sedimentation of watercourses by slowing down run-off from land and preventing soil particles from reaching the water course;
- Helps rapid infiltration of the run-off in the field, to prevent erosion. Water will seep into the field margin area because vegetative surfaces are generally more permeable than farmed surfaces (prevents loss of seeds, soil, nutrients and plants caused by heavy rain).
- The erosion reduction capability of any field margin depends on its specific characteristics – soil porosity; type, density and height of plant cover, as well as its age and size.
- Where the primary requirement for a field margin is to intercept diffuse run-off, priority must be given to its position. Located along the downhill riverside banks of fields, margins represent an excellent means of protecting watercourses. Field margins may also contribute to the reduction of the soil degradation processes due to wind.

**b.** Protect water
- Contributes to the slowing down of run-off of particles of earth which may contain fractions of fertilizers or crop protection products into water flows. This will help to prevent the negative impact of polluting aquatic flora and fauna and reduce the cost of maintaining the required standard of drinking water supplies;
- Acts as a natural filter for seeping water, retaining fine particles rich in adsorbed substances;

**c.** In combination with spry drift reduction technology, buffer strips like untreated buffer zones contribute to reduce pollution by pesticides from spray drift (particles transported by wind). Enhance floral biodiversity
- Contributes to biodiversity by complementing plants adapted to the local environment;
- Combats possible weed invasion into the cropped area, by sowing non-invasive desirable plant cover along field margins in addition to the natural vegetation.

**d.** Encourage earthworms
- Increases earthworm populations and activity to help create a healthy balance of soil micro-flora and micro-fauna;;
- Contributes to improved soil structure that aides drainage, reducing run-off associated with erosion;
- Provides a source of food for animals and birds…

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**e.** Attract arthropods
- Provides essential habitat and food source for a broad variety of arthropods, including bees, bumble bees and the many wild pollinators, including birds. Proven to have a highly beneficial positive effect for crops and biodiversity. Potential to further enhance by introducing bees in field margins;
- Facilitates populations of beneficial predatory insects to help control crop pests, by feeding on other arthropods and molluscs;
- Pose minimal threat to crops since most species living on specific sown field margin flora do not affect agricultural crops. Creates a rich insect food resource, with positive impact on the bird population.

**f.** Help birds and small mammals
- Provides a year-round source of food and nesting sites for game birds and a diverse range of birds, small animals and insects;
- Reverse the loss of vegetation cover over the last two decades;
- Fills a gap in the food and habitat resource created by changes in cropping and land management;
- Provides a safe haven for birds and small mammals undisturbed by agricultural activities;
- Offers alternative feeding site to rabbits and large game, reducing the damage caused to crops.
- Provides biological corridors for animal movement;
- Provides an alternative to artificial feeding for game.

**g.** Enable carbon reduction
- Low intensity management of field margins reduces greenhouse gas emissions involved with these areas, compared to conventional agricultural production;
- Establishment of permanent field margins could serve as adaptation measure to help enhancing the moisture in the soil due to wind break and heat protection.

## ANNEX II: ADVICE FOR A SUCCESSFUL BUFFER ZONE

**a.** Sow plant species specifically selected to optimise results for the objectives of the field margin – for example, perennial grassy species for erosion prevention or pollen and nectar sources for insects;

**b.** Employ cultivation and management techniques on the cropped area that will minimise potential for soil erosion;

**c.** Use Integrated Crop Management techniques to balance crop production and biodiversity that will enable field margins to deliver the greatest benefits;

**d.** Position field margins to maximise environmental protection and ecological gain:
- On the bottom and crosswise of a slope to inhibit water run-off;
- Alongside watercourses to minimise pollution by providing a barrier to spray drift and run off of pesticides;
- At the base of hedges, with a minimum width of 2 meters from the crop boundary, to avoid ploughing close to trees;
- Along other existing lines – to encourage biodiversity by using vegetative verges along fencing, pathways, perennial crops (orchard, vineyard) or property boundaries to manage the useful farming surface area;
- Spread field margins around the farm to provide diversity of habitats;
- Utilise areas that minimise viable crop area loss or can enhance field management.

**e.** Field margin management:
- Maintain cover and food sources keep attention to breeding periods of birds and insect species while managing the field margins;
- Minimise risk of spray drift of pesticides from the cropped area of the field to protect the margin habitats;
- Avoid spread of fertilisers onto field margin areas, to minimise growth of invasive species, avoid waste of costly inputs and prevent potential pollution of watercourses.

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