

## **BRIEF 1 LOG SHEET: The Common Agricultural Policy can strengthen biodiversity and ecosystem services by diversifying agricultural landscapes**

IEEP was contracted on behalf BiodivERsA by the Royal Belgian Institute of Natural Sciences (RBINS)/Belgian Science Policy Office (BELSPO) to produce a series of policy briefs based on the results of research projects funded by the BiodivERsA calls 2010-2011, 2011-2012 and 2012-2013, and the joint BiodivERsA FACCE JPI call 2013-2014, as well as other EU-funded research projects where relevant.

### **Knowledge and methodology used**

The Policy Brief “The Common Agricultural Policy can strengthen biodiversity and ecosystem services by diversifying agricultural landscapes” is based on the scientific results of five projects funded by the BiodivERsA network, FACCE-JPI and the European Commission DG RESEARCH FP7 programme. The Brief extracts and summarizes some key results of the projects and provides a list of relevant policy recommendations linked to current EU policy processes.

The Brief was drafted by the Institute for European Environmental Policy (IEEP), in consultation with the BiodivERsA Policy briefs Working Group, and with researchers from the respective projects. The project team of IEEP initially consulted all relevant BiodivERsA project reports from the relevant time period (2010-2014) as supplied by the BiodivERsA secretariat. Some potentially interesting project findings were identified from these reports and the IEEP team then identified the most relevant peer-reviewed scientific articles produced by the projects. Project leaders and researchers were then contacted to request additional publications and project findings. All sources used are listed below.

Sources of information for the policy recommendations also include the 2011 IEEP study ‘Addressing biodiversity and habitat preservation through measures applied under the Common Agricultural Policy’.

**Quality control** and validation was done by all parties (co-authors) involved:

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- Heather McKhann, INRA France

#### **Sources of information consulted for key research findings**

Project reports used :

APPEAL final project report and website (BiodivERsA-funded)

CONNECT final project report (BiodivERsA-funded)

EC21C final project report (BiodivERsA-funded)

ECODEAL interim progress report (BiodivERsA/FACCE JPI-funded)

FARMLAND interim progress report and website (BiodivERsA-funded)

Peer-reviewed scientific publications used:

- Bertrand, C, Baudry, J and Burel, F (2016a) Seasonal variation in the effect of landscape structure on ground-dwelling arthropods and biological control potential. *Basic and Applied Ecology* No 17 (8), 678-687. (FARMLAND)
- Bertrand, C, Burel, F and Baudry, J (2016b) Spatial and temporal heterogeneity of the crop mosaic influences carabid beetles in agricultural landscapes. *Landscape Ecology* No 31 (2), 451-466. (FARMLAND)

- Carrié, R, Andrieu, E, Cunningham, S A, Lentini, P E, Loreau, M and Ouin, A (2017) Relationships among ecological traits of wild bee communities along gradients of habitat amount and fragmentation. *Ecography* No 40 (1), 85-97. (FARMLAND)
- Fahrig, L, Girard, J, Duro, D, Pasher, J, Smith, A, Javorek, S, King, D, Lindsay, K F, Mitchell, S and Tischendorf, L (2015) Farmlands with smaller crop fields have higher within-field biodiversity. *Agriculture, Ecosystems & Environment* No 200, 219-234. (FARMLAND)
- Häussler, J, Sahlin, U, Baey, C, Smith, H G and Clough, Y (2017) Pollinator population size and pollination ecosystem service responses to enhancing floral and nesting resources. *Ecology and Evolution* DOI 10.1002/ece3.2765. (ECODEAL)
- Papanikolaou, A D, Kühn, I, Frenzel, M and Schweiger, O (2016) Semi-natural habitats mitigate the effects of temperature rise on wild bees. *Journal of Applied Ecology* No 54 (2), 527-536. (EC21C)
- Rusch, A, Bommarco, R, Jonsson, M, Smith, H G and Ekbom, B (2013) Flow and stability of natural pest control services depend on complexity and crop rotation at the landscape scale. *Journal of Applied Ecology* No 50 (2), 345-354. (APPEAL)
- Schulp, C J E, Lautenbach, S and Verburg, P H (2014) Quantifying and mapping ecosystem services: Demand and supply of pollination in the European Union. *Ecological Indicators* No 36, 131-141. (CONNECT)

Findings from other EU research projects were used to contextualise and corroborate the findings:

- Billeter, R, Liira, J, Bailey, D, Bugter, R, Arens, P, Augenstein, I, Aviron, S, Baudry, J, Bukacek, R, Burel, F, Cerny, M, De Blust, G, De Cock, R, Diekotter, T, Dietz, H, Dirksen, J, Dormann, C, Durka, W, Frenzel, M, Hamersky, R, Hendrickx, F, Herzog, F, Klotz, S, Koolstra, B, Lausch, A, Le Coeur, D, Maelfait, J P, Opdam, P, Roubalova, M, Schermann, A, Schermann, N, Schmidt, T, Schweiger, O, Smulders, M J M, Speelmans, M, Simova, P, Verboom, J, van Wingerden, W, K R E, Zobel, M and Edwards, P J (2008) Indicators for biodiversity in agricultural landscapes: a pan-European study. *Journal of Applied Ecology* No 45 (1), 141-150. (GREENVEINS DG RESEARCH FP5 funded project)
- Garibaldi, L A, Steffan-Dewenter, I, Winfree, R, Aizen, M A, Bommarco, R, Cunningham, S A, Kremen, C, Carvalheiro, L G, Harder, L D, Afik, O, Bartomeus, I, Benjamin, F, Boreaux, V, Cariveau, D, Chacoff, N P, Dudenhöffer, J H, Freitas, B M, Ghazoul, J, Greenleaf, S, Hipólito, J, Holzschuh, A, Howlett, B, Isaacs, R, Javorek, S K, Kennedy, C M, Krewenka, K, Krishnan, S, Mandelik, Y, Mayfield, M M, Motzke, I, Munyuli, T, Nault, B A, Otieno, M, Petersen, J, Pisanty, G, Potts, S G, Rader, R, Ricketts, T H, Rundlöf, M, Seymour, C L, Schüepp, C, Szentgyörgi, H, Taki, H, Tschardtke, T, Vergara, C H, Viana, B F, Wanger, T C, Westphal, C, Williams, N M and Klein, A M (2013) Wild pollinators enhance fruit set of crops regardless of honey bee abundance. *Science* No 339 (6127), 1608-1611. (STEP DG RESEARCH FP7 funded project)
- Rader, R, Bartomeus, I, Garibaldi, L A, Garratt, M P D, Howlett, B G, Winfree, R, Cunningham, S A, Mayfield, M M, Arthur, A D, Andersson, G K S, Bommarco, R, Brittain, C, Carvalheiro, L G, Chacoff, N P, Entling, M H, Foully, B, Freitas, B M, Gemmill-Herren, B, Ghazoul, J, Griffin, S R, Gross, C L, Herbertsson, L, Herzog, F, Hipólito, J, Jaggard, S, Jauker, F, Klein, A-M, Kleijn, D, Krishnan, S, Lemos, C Q, Lindström, S A M, Mandelik, Y, Monteiro, V M, Nelson, W, Nilsson, L, Pattemore, D E, de O. Pereira, N, Pisanty, G, Potts, S G, Reemer, M, Rundlöf, M, Sheffield,

C S, Scheper, J, Schüepp, C, Smith, H G, Stanley, D A, Stout, J C, Szentgyörgyi, H, Taki, H, Vergara, C H, Viana, B F and Woyciechowski, M (2016) Non-bee insects are important contributors to global crop pollination. *Proceedings of the National Academy of Sciences* No 113 (1), 146-151. (BEEFUN DG RESEARCH FP7 funded project)

Other research findings were consulted to evaluate the generality of the BiodivERSA research findings, but have not been cited in the policy brief itself. Key papers include:

- Cormont, A, Siepel, H, Clement, J, Melman, T C P, WallisDeVries, M F, van Turnhout, C A M, Sparrius, L B, Reemer, M, Biesmeijer, J C, Berendse, F and de Snoo, G R (2016) Landscape complexity and farmland biodiversity: Evaluating the CAP target on natural elements. *Journal for Nature Conservation* No 30, 19-26. - Cormont et al (2016) found that landscapes in the Netherlands with 3–7% of natural elements harboured generally 37–75% of maximum species richness (of vascular plants, breeding birds, butterflies, hoverflies, dragonflies, and grasshoppers). However, differences between the 3 and 7% limits were considerable for butterflies, birds, and hoverflies. Also, the shape of the butterfly species richness response differed between landscape types.
- Holland, J M, Storkey, J, Lutman, P J W, Henderson, I and Orson, J (2013) *Managing uncropped land in order to enhance biodiversity benefits of the arable farmed landscape: The Farm4bio project*. HGCA Project Report No.508, Agriculture & Horticulture Development Board (AHDB), UK. - Holland et al (2013) found that farms with <3% uncropped land (ie fallow or sown with wildlife seed mixes) supported approximately 60% less birds than those with >10%, and even those with <5% were relatively under-populated.

#### **Interviews carried out**

Clelia Sirami and Lenore Fahrig, FARMLAND project researchers (email correspondence, July 2017)

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