



# Management of Grassland-like Wildflower Strips Sown on Nutrient-rich Arable Soils: The Role of Grass Density and Mowing Regime

Julien Piqueray<sup>1</sup> · Valentin Gilliaux<sup>1</sup> · Virginie Decruyenaere<sup>2</sup> · Jean-Thomas Cornelis<sup>3</sup> · Roel Uyttenbroeck<sup>4,5</sup> · Grégory Mahy<sup>4</sup>

Received: 18 October 2018 / Accepted: 26 February 2019  
© Springer Science+Business Media, LLC, part of Springer Nature 2019

## Abstract

Wildflower strips (WS) are proposed in many European countries as a strategy to enhance biodiversity and ecosystem services in arable fields. To create and maintain WS on nutrient-rich cultivated soils reveals challenging. Flowered species may be outcompeted by grasses due to high phosphorus content in soil. We studied during 5 years seed mixture (grass density in the seed mix) and mowing regime influenced the ability of WS to provide environmental benefits (flower provision for insects and landscape purposes, reduction of soil nutrient load) and respond to farmer concerns (noxious weed promotion, forage production). Lowered grass density increased flower abundance, but not diversity, only in the first 3 years. In the last 2 years mowing effects became determinant. Flower cover and richness were the highest under the twice-a-year mowing regime. This regime also increased forage quantity and quality. Flower colour diversity was conversely the highest where mowing occurred every two years. Potassium in the soil decreased under the twice-a-year mowing regime. Other nutrients were not affected. No management option kept noxious weed to an acceptable level after 5 years. This supports the need to test the efficacy of specific management practices such as selective clipping or spraying. Mowing WS twice a year was retained as the most favourable treatment to maintain species-rich strips with an abundant flower provision. It however implies to mow in late June, i.e. at the peak of insect abundance. It is therefore suggested to keep an unmown refuge zone when applying this management regime.

**Keywords** Agri-environment Schemes · Plant diversity · Soil nutrients · Weed management · Wildflower strips

**Supplementary Information** The online version of this article (<https://doi.org/10.1007/s00267-019-01153-y>) contains supplementary material, which is available to authorised users.

✉ Julien Piqueray  
jpiqueray@natagriwal.be

- <sup>1</sup> Natagriwal ASBL, site de Gembloux, Passage des Déportés 2, Gembloux 5030, Belgium
- <sup>2</sup> Walloon Agricultural Research Centre (CRA-W)—Production and Sectors Department, Rue de Liroux 8, Gembloux 5030, Belgium
- <sup>3</sup> Gembloux Agro-Bio Tech, Department BIOSystem Engineering (BIOSE), Water - Soil - Plant Exchanges, University of Liege, Passage des Déportés 2, Gembloux 5030, Belgium
- <sup>4</sup> Gembloux Agro-Bio Tech, Biodiversity and landscape Unit, University of Liege, Passage des Déportés 2, Gembloux 5030, Belgium
- <sup>5</sup> Gembloux Agro-Bio Tech, TERRA - AgricultureIsLife, University of Liege, Passage des Déportés 2, Gembloux 5030, Belgium

## Introduction

In the face of environmental degradation due to agriculture intensification, many European countries adopted Agri-environment Schemes (AES) as a response (Batáry et al. 2015). Among those schemes, flower strips are often proposed as a strategy to enhance flower-feeding insect biodiversity (Haaland et al. 2011) as well as ecosystem services, such as pollination (Nicholls and Altieri 2013; Uyttenbroeck et al. 2017), natural pest control (Landis et al. 2000; Hatt et al. 2017, 2018) and improvement in landscape aesthetics (Junge et al. 2015). The type of strips and their management may vary between countries, depending on their policy (Haaland et al. 2011). Several countries adopted AES prescription for perennial field margins made of indigenous forbs and grasses managed by mowing, with the aim to keep meadow-like vegetation (Smith et al. 2010; Haaland et al. 2011; Tarmi et al. 2011). In this way, Walloon (South Belgium) AES management prescriptions for wildflower strips include the use of species typical from