Antonín Zajíček, Petr Fučík, ZbyněkKulhavý,RenataDuffková, and OndřejHolubík

Harmonizevarious types ofecosystem services by redesign of agricultural drainage systems – a pending challenge

Agricultural drainage of the modern era has profoundly contributed to enhanced provisioning ecosystem services(ES) by increasing crop yields and enabling proper soil management. However, densely placed and one-function drainage systems considerably affect the supporting and regulating ES by altered hydrological and hydrochemical state of drained catchments. Worldwide, land drainage has been recognized as a source of nutrients and/or pesticides, emitted to surface waters in non-negligible amounts. The undue runoff, produced by free drainage, may contribute to a negative water balance and unfavorable dropped groundwater levels, which ends up in overheating of large landscape segments. Since around 1970´s, there have been attempts to study and invent measures and approaches which would enable to manage the drainage intensity in order to set up groundwater levels and soil moisture according to actual crop needs. Later, the research has focused on drainage water quality, as influenced by these measures. Among them, various types of controlled drainage on tiles as well as on ditches have been found, constructed wetlands, small water ponds or land use and management changes have been discovered as reasonable solutions.

In the Czech Republic, more than 1 087 000 ha has been tile drained, which is about ¼ of agricultural land area. The condition of many of these systems is unsatisfactory, due to long-lasted neglected maintenance and repairs and issues connected to land owner/user relationships. As the nowadays agricultural and environmental demands converge to certain extent, the contemporary situation makes a challenge to reassess some functions of so far single purpose drainage systems and/ or land use of the drained land in order to empower the supporting and regulating ES.

The aim of this paper is to review solutions and approaches related to management of drainage water quality and quantity and to show the results of a seven-year field experiment with targeted grassingsituated in a drained catchment´s recharge zoneand denitrifying bioreactors to minimize nitrate burden in drainage waters.