Energy crops and pesticide contamination

Katja Bunzel[1], Mira Kattwinkel[2], Daniela Thrän[1,3,4]

[1] Helmholtz-Centre for Environmental Research, Department Bioenergy, Leipzig, Germany, katja.bunzel@ufz.de

[2] Eawag, Swiss Federal Institute of Aquatic Science and Technology, Ueberlandstrasse 133, CH-8600 Duebendorf, Switzerland

[3] DBFZ - Deutsches Biomasseforschungszentrum, Department Bioenergy Systems, Leipzig, Germany

[4] University Leipzig, Institute for Infrastructure and Resources Management, Leipzig, Germany

Biomass is the major renewable energy source in Europe, providing two thirds of the total energy produced from renewables. The share of bioenergy from energy crops is growing rapidly. Given the environmental pressures arising from pesticide pollution from current agricultural food production, a substantial increase in energy crop cultivation might put additional pressure on farmland biodiversity and on soil and water resources. Based on a case study of Germany, the leading European country in the cultivation of energy crops, we examined the potential of energy crops for pesticide contamination and developed general conclusions and recommendations for the future large-scale expansion of agricultural bioenergy.

Our findings reveal that there will not necessary be an increase or decrease in the amounts of pesticides released into the environment as a result of the increased cultivation of energy crops. Due to the great variety of such crops, the potential effects will depend rather on the future design of the agricultural systems and whether the energy crops can be successfully integrated into the existing food production systems. Possible risks are associated with the increased cultivation of pesticide-intensive energy crops, such as rapeseed, especially when grown in monocultures or on formerly set-aside land or converted grassland. Possible opportunities are associated with perennial energy crops (e.g., fast-growing trees and perennial grasses) and innovative cropping systems (such as mixed cultivation), which may add to crop diversity and generate lower pesticide demands than intensive food farming systems. In addition, a further extension of the cultivation of energy crops should be accompanied by mandatory restrictions to protect the remaining permanent grassland. Optimised cultivation systems with diverse crop rotations that integrate food and energy crops could help to improve monotonous agricultural landscapes, increase agricultural biodiversity and minimise pesticide exposure.