Interactions between soil tillage and weed control in practice

Data of surveys in Germany

Nelia Aeckerle and Nicol Stockfisch

Institute of Sugar Beet Research

Introduction:

A reliable and representative database from farming reality is available for sugar beet cultivation from 2010 - 2014 by a nationwide survey. Amongst others the database includes details about soil tillage, occurrence of weeds and application of herbicides (quantity*ha^{-1} and date of application).

Material and methods:

The treatment index (TI) describes the intensity of pesticide use in the period from harvest of the preceding crop till harvest of the sugar beet (Rossberg et al., 2002). In this study, the TI_H refers to herbicides only.

Results:

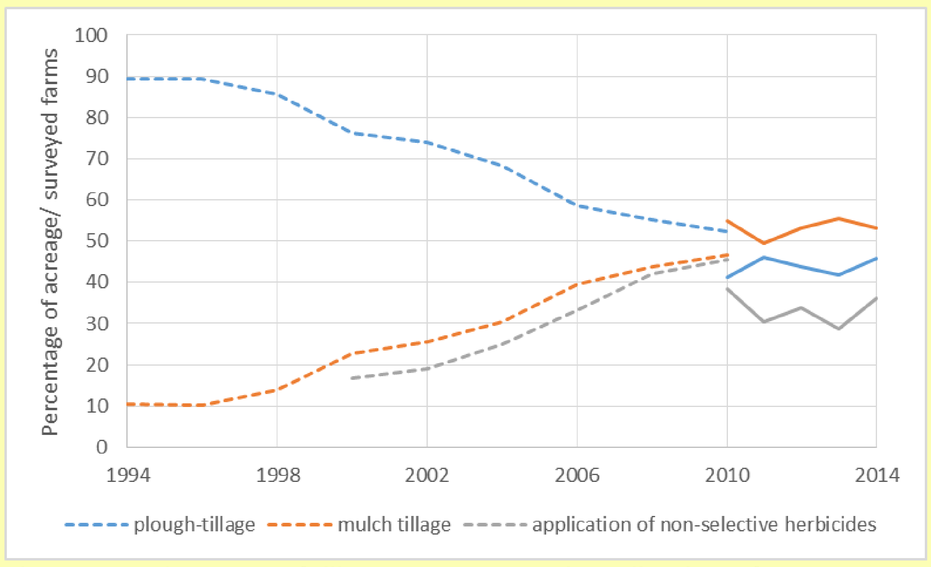

Fig. 1: Development of tillage systems and application of non-selective herbicides

In the course of erosion control, the acreage of plough tillage systems decreased within the last two decades, while the acreage of mulch tillage systems increased. Correspondingly, the use of non-selective herbicides increased over the years (Fig. 1, dotted lines, data from Vasel et al., 2012). Data of this study (Fig. 1, solid lines) show that these trends seem to stabilize during the surveyed period. Both tillage systems were applied approximately in equal parts.

Roughly 30% of all farms used non-selective herbicides. In 2014, plough tillage was used in 45.8% of surveyed farms, while mulch tillage was applied in 53.3% (Fig. 2). 46% of ploughless working farms and 11% of ploughing farms applied a non-selective herbicide (mostly one application/field). Additionally, selective herbicides were applied with a higher intensity at farms using mulch tillage: In the mean, the TI_H is significantly lower if the field was ploughed (Fig. 3). This indicates a modified occurrence of weeds. However, obviously the quantity of weeds is higher with mulch tillage but the spectrum of variety of weeds did not alter (Fig. 4). An exception is the incidence of rapeseed which is referred to as “hardly treatable” more often after mulch tillage (191) compared to plough tillage (122).

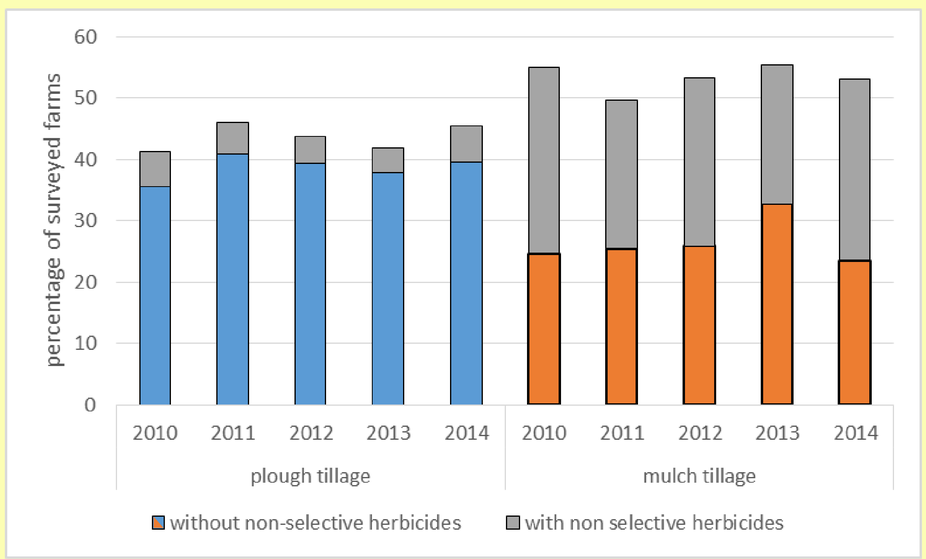

Fig. 2: Interrelationship of tillage system and application of non-selective herbicides

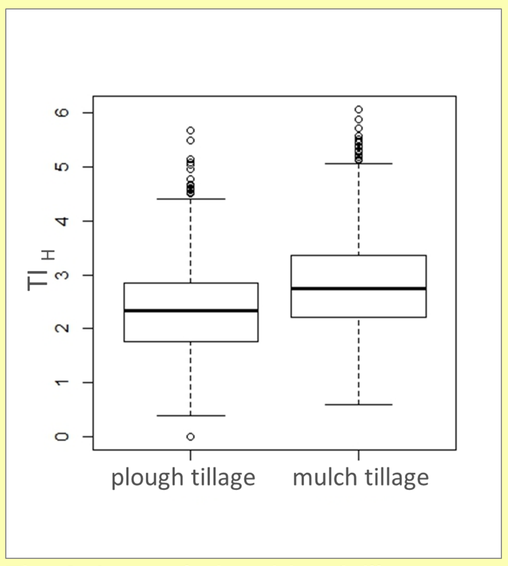

Fig. 3: Interrelationship of tillage system and TI_H (mean 2010-2014)

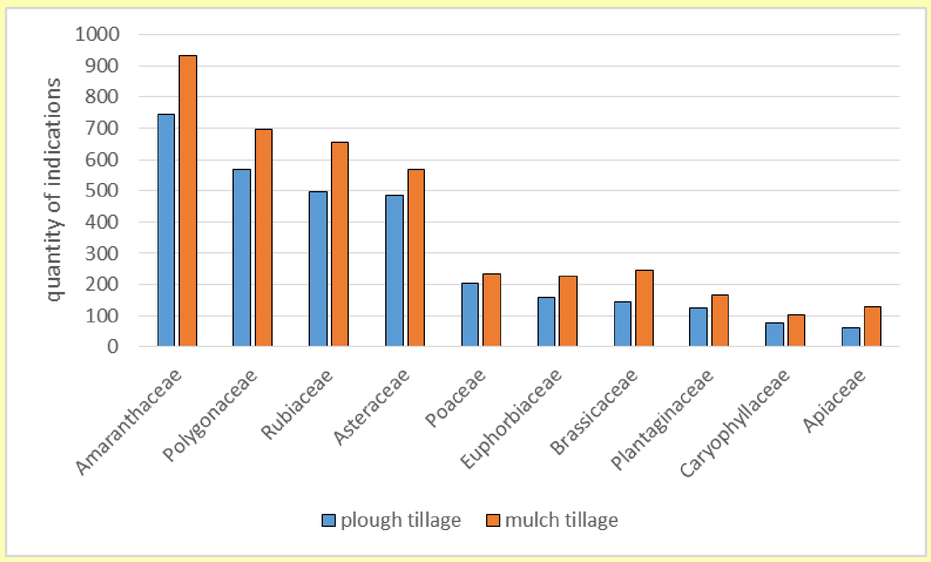

Fig. 4: Interrelationship of tillage system and weed occurence (mean 2010-2014)

Discussion:

Generally, it is expected that the occurrence of weeds increases in absence of plough tillage making an adaption of the herbicide strategy indispensable. Our study confirms this expectation for increased TI_H and more frequent glyphosate application. In contrast, the farmers did not document changes in weed varieties. The conflict of erosion control vs. pesticide reduction illustrates importance of the adaption of the cultivation management to the location.

aeckerle@ifz-goettingen.de