

Weed response to long-term cultivation practices

Long-term effect of soil tillage and straw management on weeds in spring barley monoculture
An experiment with monoculture of spring barley was established in 1970 on the field experimental station in Zabcice (Czech Republic) to compare two types of soil tillage:

- 1) conventional tillage with plough (depth 0.22 m, CT)
- 2) minimum tillage without soil inversion (depth 0.12 m, MT)

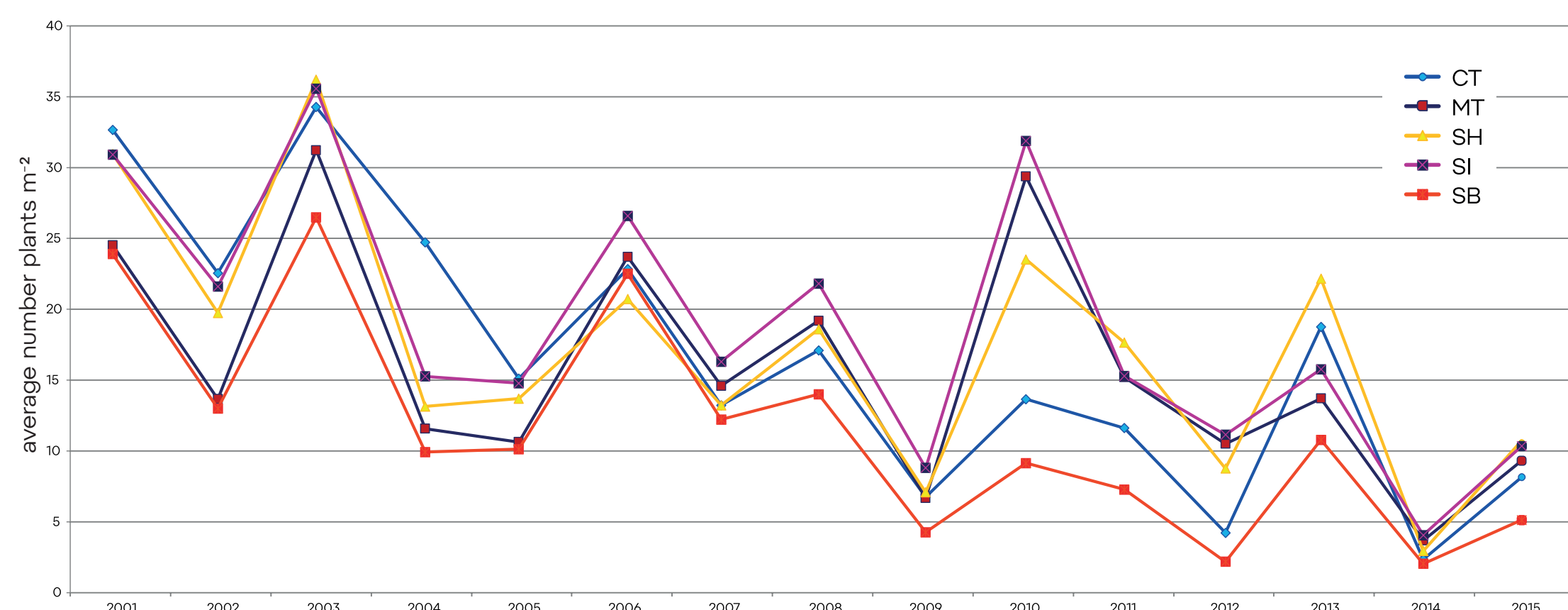
and three straw managements:

- 1) straw harvest (SH),
- 2) straw incorporation into the soil (SI)
- 3) straw burning (SB)

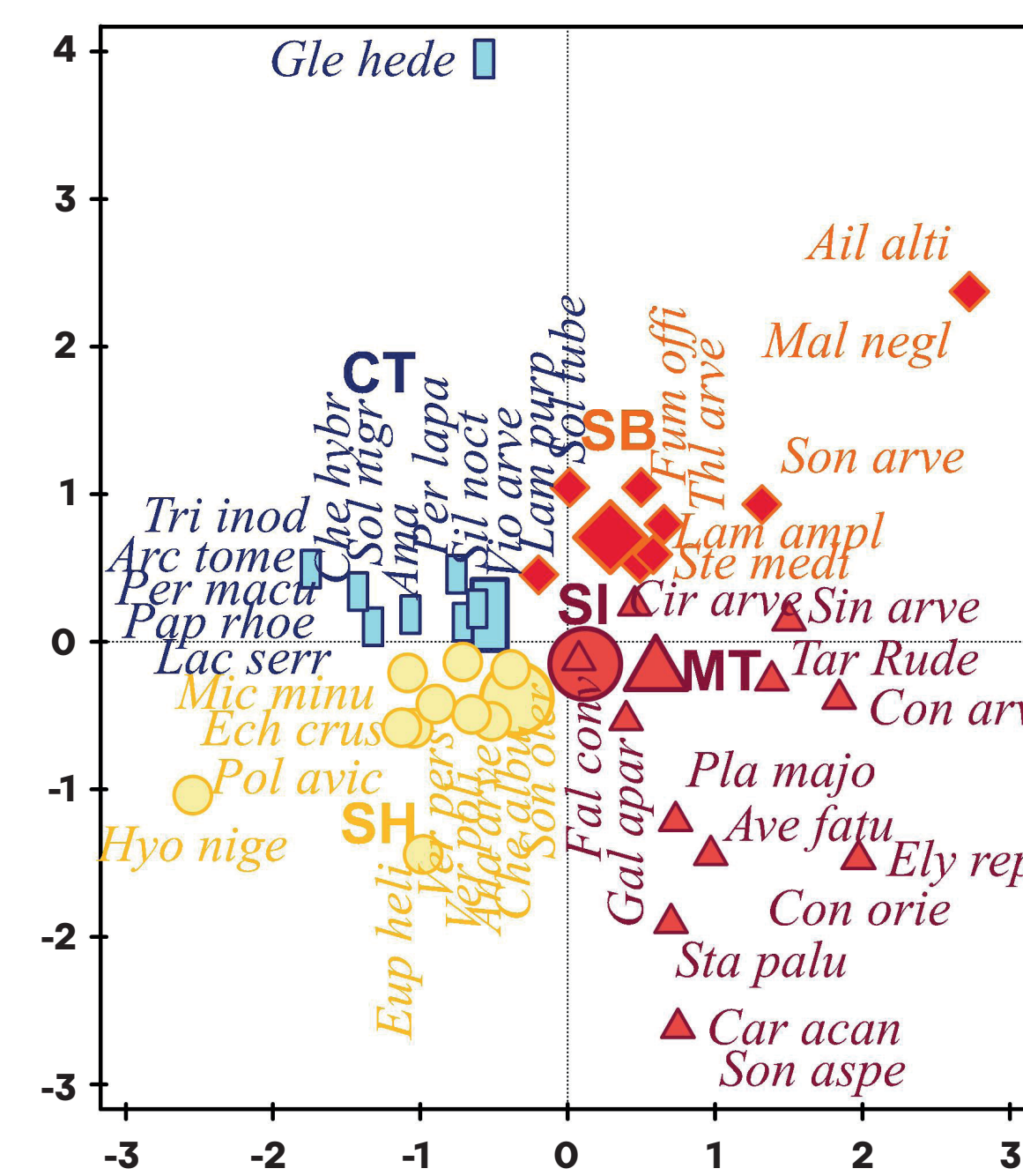
The evaluation of actual weed infestation was done from 2001 to 2015 in spring barley. Each year, the number of weeds was counted on 1 m² area, in 24 replications for each treatment of soil tillage and straw management. The obtained results were analyzed using multidimensional analysis of ecological data.



Development of weed infestation in the spring barley monoculture



Ordination Diagram Expressing the Effect of Different Soil Treatment and Straw Management on Weeds

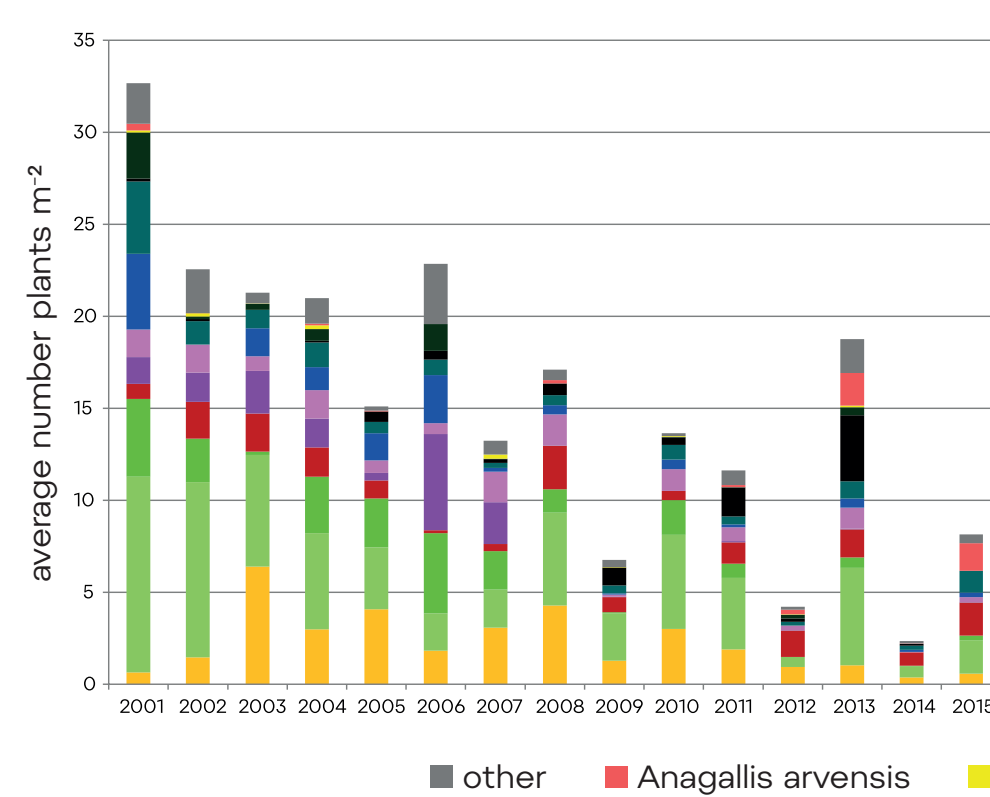


Abbreviation of weed species

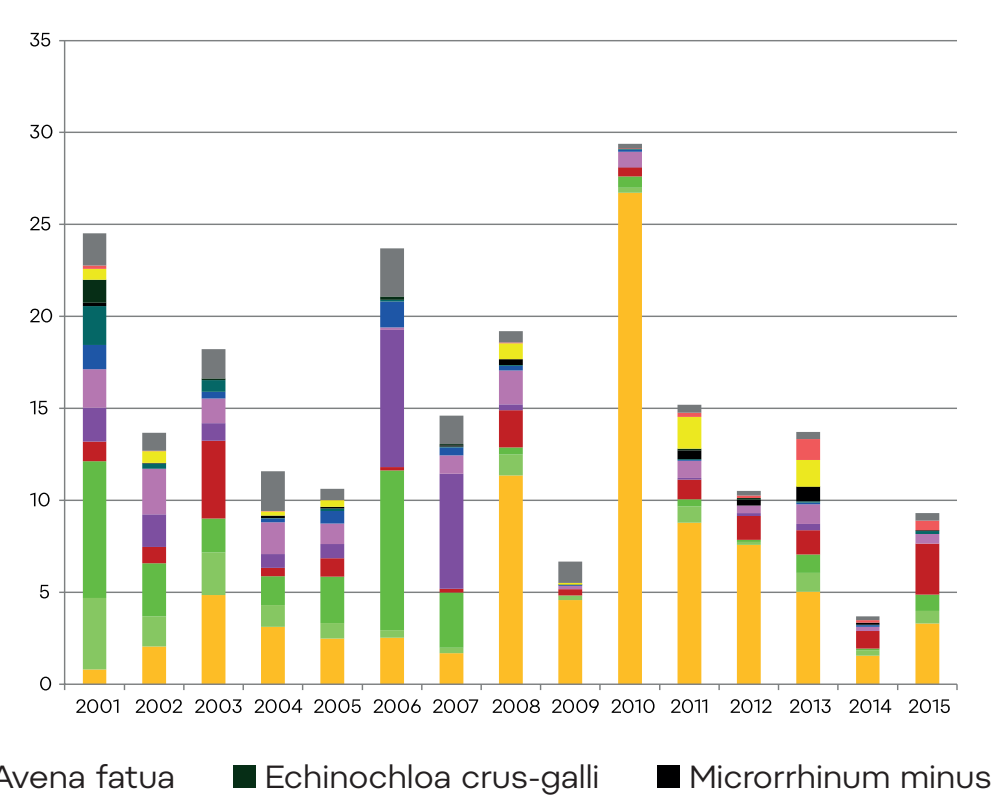
| | | | |
|----------|------------------------|----------|---------------------------|
| Ail alti | Ailanthus altissima | Mal negl | Malva neglecta |
| Ama | Amaranthus | Mic minu | Microrrhinum minus |
| Ana arve | Anagallis arvensis | Pap rhoe | Papaver rhoeas |
| Arc tome | Arctium tomentosum | Per lapa | Persicaria lapathifolia |
| Ave fatu | Avena fatua | Per macu | Persicaria maculosa |
| Car acan | Carduus acanthoides | Pla majo | Plantago major |
| Cir arve | Cirsium arvense | Pol avic | Polygonum aviculare |
| Con orie | Consolidia orientalis | Sil noct | Silene noctiflora |
| Con arve | Convolvulus arvensis | Sin arve | Sinapis arvensis |
| Dat stra | Datura stramonium | Sol nigr | Solanum nigrum |
| Ech crus | Echinochloa crus-galli | Sol tube | Solanum tuberosum |
| Ely repe | Elytrigia repens | Son arve | Sonchus arvensis |
| Eup heli | Euphorbia helioscopia | Son aspe | Sonchus asper |
| Fal conv | Fallopia convolvulus | Son oler | Sonchus oleraceus |
| Fum offi | Fumaria officinalis | Sta palu | Stachys palustris |
| Gal apar | Galium aparine | Ste medi | Stellaria media |
| Gle hede | Glechoma hederacea | Tar Rude | Taraxacum sect Ruderalia |
| Hyo nige | Hyoscyomus niger | Thl arve | Thlaspi arvense |
| Che albu | Chenopodium album | Tri inod | Tripleurospermum inodorum |
| Che hybr | Chenopodium hybridum | Ver pers | Veronica persica |
| Lac serr | Lactuca serriola | Ver poli | Veronica polita |
| Lam ampl | Lamium amplexicaule | Vio arve | Viola arvensis |
| Lam purp | Lamium purpureum | | |



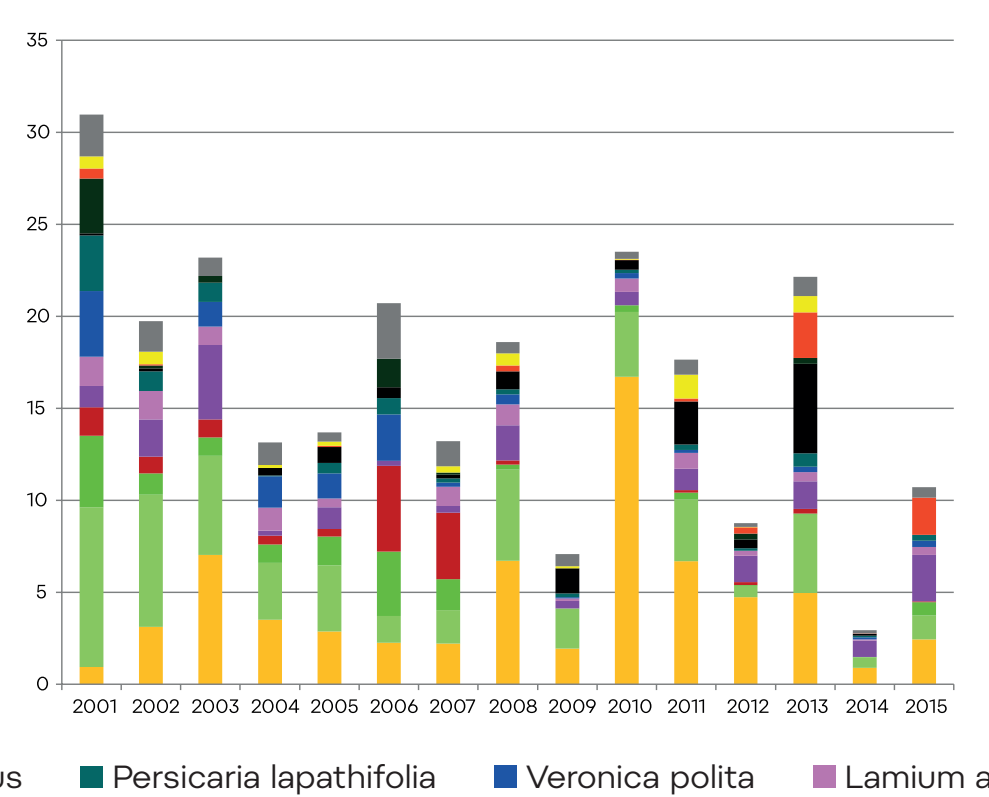
Development of weed infestation in the conventional tillage



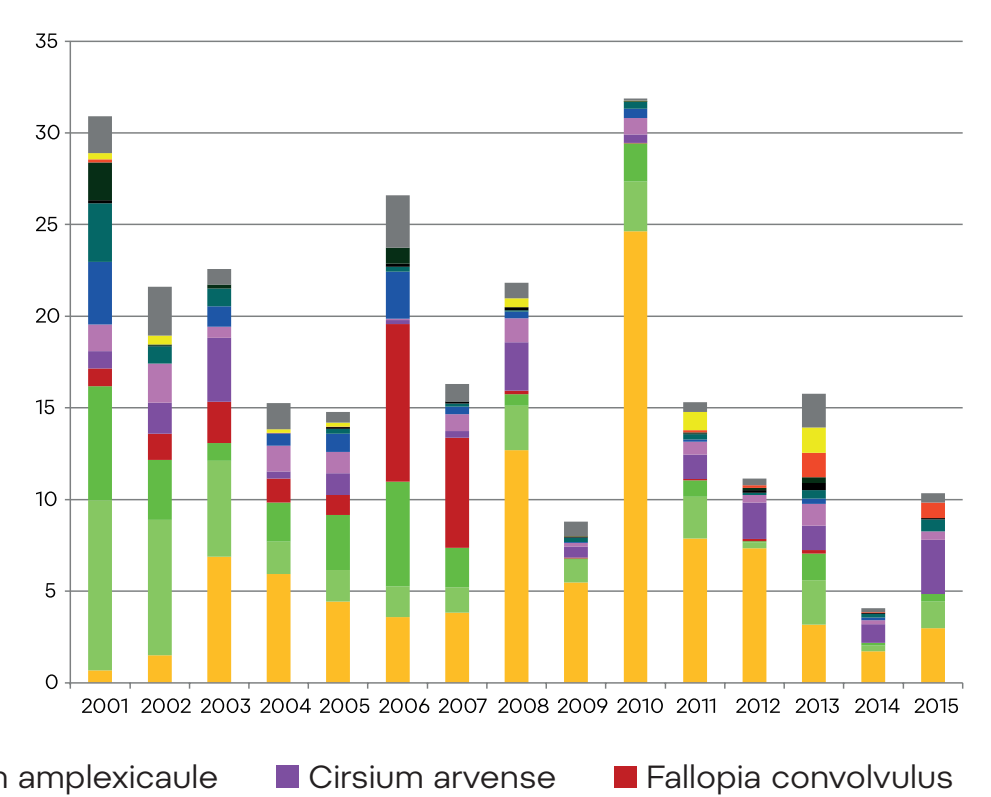
Development of weed infestation in the minimum tillage



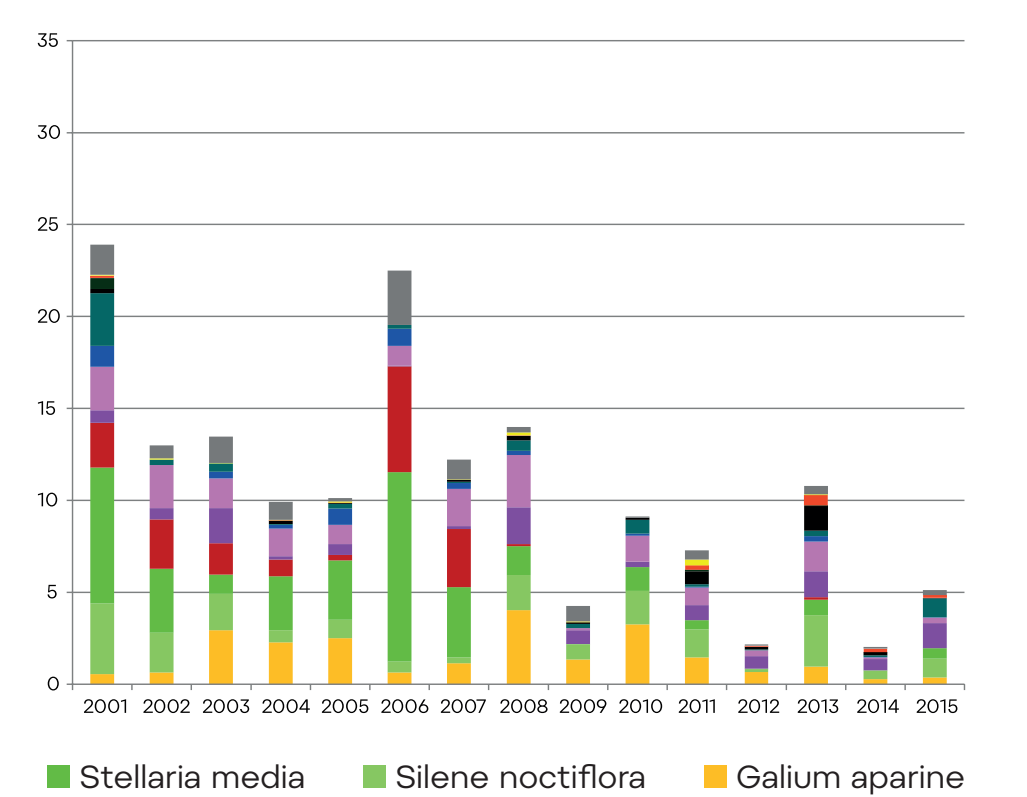
Development of weed infestation in the straw harvest



Development of weed infestation in the straw incorporation into the soil



Development of weed infestation in the straw burning



Several studies have shown that management practices can be combined and work synergistically to reduce weeds. Using a combination of management practices to control weeds provides some protection against potential herbicide failure. This makes control more effective under changing environmental conditions. Straw management and tillage affect the soil environment (nutrient dynamics, C:N ratio, physical properties, light conditions, etc.), which also affects weeds. Straw and post-harvest residues can have an allelopathic effect on the germination of some weed species.

In the future, we can expect a change in the species composition of weeds even in spring barley stands. The occurrence of typical species such as *Avena fatua*, *Fallopia convolvulus* will probably decrease and, on the contrary, the occurrence of invasive species (*Echinochloa crus-galli* or *Amaranthus* spp.) will increase. The established weed community in spring barley monocultures consists mainly of native and domesticated species (apophytes and archaeophytes). Barley stands, regardless of the cultivation methods used, do not allow the spread of new invasive weeds. However, even here there are changes in the species composition of weeds caused, among other things, by climate change.

