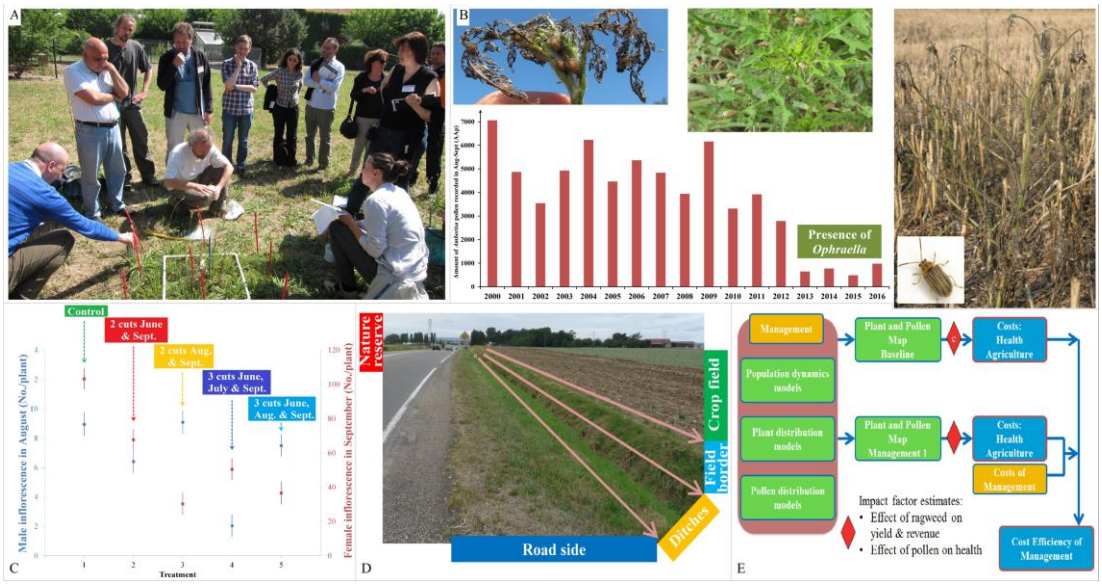
Appendix A: Fig. 1. Achievements from inter-linking "Weed Science" with "Plant invasion science", and from interdisciplinary and/or international cooperation



(A) We monitored 50 natural populations of *Ambrosia artemisiifolia* across Europe in 2014-2016, covering different climatic and habitat conditions, to assess environmental drivers underlying spatial variation in its demographic performance. The resulting demographic models allow the identification of optimal habitat- and region-specific management interventions. This is our workshop on demographic research. Capacity-building in the field of understanding, monitoring and managing noxious plants constitutes a sustainable output of our SMARTER approach.

(B) We quantified the impact of the accidentally introduced ragweed leaf beetle *Ophraella communa*, first recorded in Europe in 2013, on pollen and seed production of ragweed. Aerial pollen concentrations dropped by 80% in the area of Milan, with regional savings in health costs of millions of Euros per year (graph adapted from Bonini et al. 2015).

(C) We developed management options that overcome conflicting management objectives. The traditional two cutting interventions reduce either pollen or seed output of the monoecious ragweed Thus, managing ragweed as a crop weed with minimum cuts might help the farmer, but could extend health problems. Three cutting interventions are needed to significantly reduce both pollen and seeds. Combining cutting with biological control is needed to achieve cost-effective control (graph redrawn from Milakovic et al 2014).

(D) We discovered that reconciling management activities of the various stakeholders is needed to achieve efficient management at the regional scale. Here, five different stakeholders are concerned. Investments by one (e.g. road service) might greatly benefit another stakeholder (e.g. farmer), and failing management by one affects all. Monitoring of the weed dynamics therefore needs to be extended from the local to a larger spatial scale.

(E) Our economic framework for the evaluation of the management of *Ambrosia*. The 'management module' produces maps of the distribution of *Ambrosia* plants and pollen in a baseline scenario, including a basic set of current management practices. The economic evaluation of the baseline and alternative management scenarios computes the costs for agriculture, health and management (e.g. FADN 2015; Soliman et al. 2010). Cost-efficient management scenarios are those where impact savings outweigh the costs of the management practices.

References

FADN. (2015). Farm Accountancy Data Network. http://ec.europa.eu/agriculture/rica/; accessed on 20 October, 2015.

Soliman, T., Mourits, M., Lansink, A.O., & Van der Werf, W. (2010). Economic impact assessment in pest risk analysis. *Crop Protection, 29*, 517-524.

Appendix A: Table 1. Old World (Afro-Eurasian) noxious plants that impact various sectors and regions making them suitable targets for future interdisciplinary management

Plant species	status	Sectors affected	Input from weed science	Input from plant invasion science	Expected benefits from synthesis *
Ageratum conyzoides L.	IAP	agriculture, environment, human/ animal health	practical advice for managing at crop field level; management by soil tillage/mulching/herbicide	natural and anthropogenic habitats; knowledge on invasion history and impacts	1, 10
Parthenium hysterophorus L.	IAP	agriculture, human/animal health,environment	practical advice for management at field scale to end-users	present and invasive in a variety of habitats; classical biological control	1, 2, 3, 4, 5, 7,8,10,12,13
Reynoutria japonica Houtt.	IAP	environment, engineering, agriculture (forage crops)	knowledge of species biology/herbicide efficacy; practical advice for handling of contaminated soil	knowledge on genetics, ecology and species interactions; policy support regarding IAS management in Europe (biocontrol)	1, 4, 5, 8, 12, 13
Eichhornia crassipes (Mart.) Solms	IAP	agriculture (rice), environment, trade	Management at crop field level	management at water body level, classical biological control	1, 3, 4, 5, 6, 8, 12, 13
Datura stramonium L.	crop weed/ IAP	agriculture, human/animal health	crop competition/rotation management at field crop and vegetable crop level	natural and anthropogenic habitats	10
Echinochloa crus-galli (L.) P. Beauv.	crop weed/ IAP	agriculture, environment	practical advice for management at crop field level; paddy rice, maize and summer crop fields	impacts on communities/ ecosystems in wetlands	10
Cyperus esculentus L.	crop weed/ IAP	agriculture, environment	green manure to increase competition and shading, with early and repeated tillage	coordinated management interventions across habitats and stakeholders	1, 3, 4, 5, 11
Cirsium arvense (L.) Scop.	crop weed	agriculture, environment	long tradition of management in native range, research at national research institutions	knowledge of species interactions, research at universities	1, 7, 9

Rumex spp.	crop weed	agriculture, environment, human health	local management; long tradition of management in native range, research at national research institutions	knowledge of species interactions, research at universities; classical biological control	2, 7, 9, 11, 12, 13

***** **1** Developing habitat-specific management recommendations/solutions, based on various tools, **2** Considering the regional and local societal and economic environment, **3** Trans-national and trans-sectoral coordination, **4** Trade regulation and legal and regulatory aspects to support policy, **5** Interdisciplinary, **6** Reconciling different stakeholder interests, **7** Reconciling different management objectives, **8** Develop classical biological control options for a sustainable management, **9** Develop biocontrol products together with industry, **10** Develop horizontal integration of control across different weed species, **11** Develop vertical integration by combining different control measures against a specific target species (e.g. low herbicide dosage with a biocontrol product), **12** Efficient knowledge and technology transfer, **13** Economic assessment of weed impact and management evaluation;