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Organic farming and biodiversity – how to create a viable farm business including conservation issues

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Abstract

The extension of organic farming (OF), the increasing recognition of the advantages for improving agro-biodiversity, and the fact that the protection of nature and natural species cannot be taken for granted, has resulted in several interdisciplinary activities. The first of these was the Brodowin Nature Conservation Farm project. Conflicts between nature conservation and modern, large-scale OF, focusing on arable land use systems, were identified, evaluated and solved. Suggestions for adequate financial reward for ecological performance were worked out. The tested optimisation strategies were implemented in a second project: preparing a whole farm management plan based on maps marked with fields having a high potential for specific target species. The aim was to achieve the highest benefit for nature conservation issues with the least expenditure by the farm. A manual is being produced as a third project, with a series of examples for the integration of nature conservation measures, based on the results of our own projects and data sourced in literature, along with different experts. The manual will allow the user to see immediately either how target species/groups can be directly promoted or how measures can be selected, and what effects these have on the business.

Introduction

Agri-environmental programmes as well as nature conservation by contract are expected to improve biodiversity and wildlife quality on farms on a voluntary basis. OF plays a central role in agri-environment policy (e.g. KULAP in the State of Brandenburg) due to the positive environmental effects it has demonstrated in a number of investigations in the past (e.g. Hole et al. 2005). However, it is also well-known and accepted that special requirements for the improvement of the habitat of specific target species cannot be taken for granted. Conserving biodiversity in arable farming systems requires specialist knowledge and money (e.g. Noe et al. 2005, Flade et al. 2006, Stein-Bachinger et al. 2005). In the future, the shortage of funds will lead to a concentration on valuable areas (Flade et al. 2006) and the effectiveness and efficiency of the agri-environmental programmes has to be improved on the road to more result-oriented schemes (e.g. Matzdorf et al. 2007).

In organic farming systems three facts can be postulated: (i) the potential to improve biodiversity is often higher on organic farms (Flade et al. 2006), (ii) agri-environmental measures specifically designed for arable systems in OF have been in short supply and are not sufficiently aligned with OF-requirements (e.g. weed pressure versus

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enhancing segetal flora, internal fodder production versus promotion of ground-breeding birds in forage (Stein-Bachinger et al. 2005), (iii) there is a lack of well-structured materials which concentrate on proved and recommended nature conservation measures, taking the agronomic and economic consequences into account as well as offering alternatives and compromises. In order to work out solutions for these issues, three projects focusing on the optimisation of nature conservation in large-scale OF in North-East Germany were initiated and still are being operated.

Materials and methods

Between 2001 and 2006, the Brodowin Nature Conservation Farm project focused on maintaining or creating habitat conditions for the flora and fauna of open and half-open agricultural areas, that garantuee a sufficient reproductive success to keep vital populations in the long-term (Stein-Bachinger et al. in prep.). Investigations were carried out in close cooperation with a large organic farm in North-East Germany (1200 ha). The recommended optimisation measures based on the effects on the target species and on agriculture were used in a second project. In 2007, we (biologists and agronomists) prepared a whole farm management plan for Brodowin, in cooperation with the farmer and the administration, based on maps marked with fields having a high potential for specific target species (arable measures as well as perennial or permanent structural measures). As a third project (2007-2008), a manual is being produced for the integration of nature conservation measures into organic farming systems, based on our own results and data sourced in literature, along with experts recruited among farmers, advisors, the administration, and scientists.

Results and discussion

Within the framework of the Brodowin Nature Conservation Farm project, recommendations for the protection of farmland birds, brown hare, amphibians, insects and segetal flora were made concerning arable and structural measures. The effects of modified farming systems were investigated with regard to their agronomic and economic aspects. The interdisciplinary character allowed for a detailed evaluation and recommendation of more than 20 different production measures which promote biodiversity in legume-grass forage, cereals, pulses and field margins taking the whole farm organisation into account (Stein-Bachinger et al. in prep.). Table 1 shows selected measures in cereals and pulses and their efficiency for target species.

Table 1: Modified production measures in cereals and pulses and their efficiency for nature conservation goals

Measure	Description	Efficiency for nature conservation			
		Farm-land birds	Brown hare	Amphi-bians	Sege-tal flora
Reduce intensity of weed control	No harrowing/hoeing	+*	+		+
Reduce sowing density	Half the sowing density, no harrowing/hoeing	+	+		++
Reduce soil tillage operations	Stubble breaking after mid-September		+	+	++

* Efficiency: + = high, ++ = very high

Figure 1 shows that the reduction of weed control and sowing density leads to a decrease in yields of spring and winter cereals. These three years' data, along with results from literature and expert knowledge, were used for economic calculations (e.g. partical analysis, cross margins). The modified measures have to be awarded 50 to 150 €/ha/year to compensate for the reductions in yield and potential problems with undesirable weeds. For farmland birds and brown hare, the measures should be carried out upon the whole field; for amphibians and segetal flora, small-scale implementation, preferably on 'hot spots', is recommended. Further criteria have to be considered for a goal-oriented field selection e.g. for farmland birds: no or only a small area of forest around the fields (< 20 %) and a field size of 5 - 20 ha.

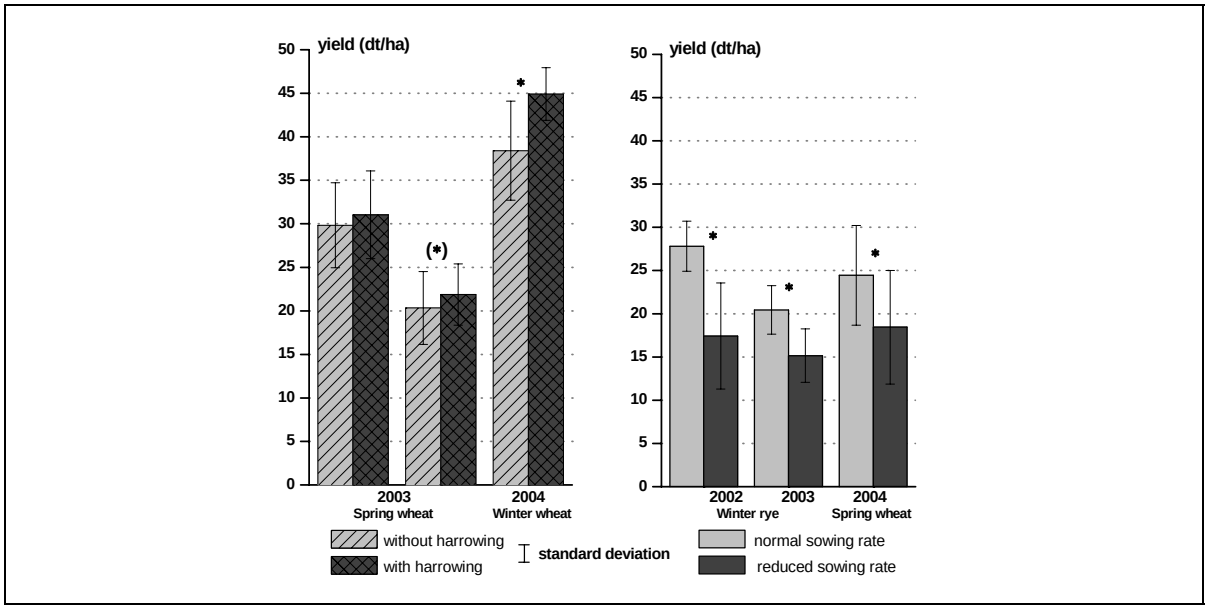

Figure 1: Effects of a reduction in the intensity of weed control and sowing density on the yield of spring wheat, winter wheat and winter rye in Brodowin, significant differences with α=5% are marked ∗, with α=10% (∗), Wilcoxon-Test)

The proved optimisation strategies were used in a subsequent step to prepare a whole farm management plan. The farm consists of 85 arable fields. Fields with a high potential (e.g. high territory densities or reproductive success) for farmland birds, brown hare, segetal flora and amphibians were identified. For example, on 16 of these 85 fields the effects of nature conservation measures for farmland birds will be above average, and thus the implementation will concentrate on these locations. The aim is to achieve the highest benefit for nature conservation with the least expenditure of effort by the farm. In 2008, seven measures will be implemented; in subsequent years, the preparation of a catalogue of measures with selection and expansion possibilities is planned. The farm will promote itself with information boards for visitors as well as on the farms' website and with newsletters for 1700 subscribers of the vegetable box scheme.

According to our experience and that of other authors (Noe et al. 2005), a lot of farmers do not necessarily disagree with conservation criteria, but they often do not know what to look for and how to integrate modified production measures into their farm business. Therefore the compilation of all of the above-mentioned results and experi-

ence will lead in a third step to a manual that allows the user (farmers, advisors and the administration) to see immediately either how target species/groups can be promoted directly or how measures can be selected, and what consequences they can have on the business. Experts recruited among the user group and scientists with different expertise are involved to discuss and evaluate the profiles of nature conservation-friendly production measures and target species in order to integrate a broad range of aspects and knowledge.

Conclusions

The success of increasing biodiversity on the farm and landscape level depends essentially on the availability of suitable and proved information, as well as on practical examples which open the view for developing organic farming within the conservation movement and achieve a balance between the objectives of all stakeholders. The foundation of 'Nature Conservation Farms' can be a step towards reflecting one's own values in relation to the wild flora and fauna and to providing examples of multifunctional agriculture.

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