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SOLID participatory research from Austria: Biodiversity on dairy farms of Sennerei Hatzenstädt – assessing the current status and future scenarios

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Summary

This case study within WP1 assessed the biodiversity situation on ten farms of the Cooperative Organic Dairy Hatzenstädt in Tyrol (Austria). The study was conducted in two parts. At first we conducted an extensive field survey of the grassland vegetation and landscape elements as well as interviews with the farmers on these ten study farms. In addition, we calculated the so-called biodiversity potential using an assessment method which takes into account a set of parameters concerning farming measures, landscape elements and habitats promoting biodiversity to estimate how biodiversity friendly or biodiversity promoting a farm is managed (Schader et al. 2014).

In accordance with the aims of WP1 participation of farmers was central in both parts of this study. Two workshops – in April 201 3and in January 2014 – offered the opportunity for a dialogue between farmers and scientists. Results were presented to and discussed with the farmers and a report was provided to every farmer.

There was generally low management intensity : meadows used for hay production were cut not more often than three times per year, moderate fertilisation levels and mean stocking rates of 1 livestock unit per ha. This was reflected by a broad range and high diversity of grassland vegetation. In total, 48 different types and 293 species of vascular plants and mosses were recorded. The number of grassland vegetation types per farm ranged from 13 to a maximum of 24 (mean: 20).

With a mean biodiversity potential of 40% all study farms achieved good results. This outcome is based on the fact that the studied farms are organically managed in combination with a generally low intensity level. Besides that, this assessment method allows to identify improvement potential for biodiversity management.

The farms assessed in this case study demonstrate in which way a traditional, small-scale, low-input, low-intensity dairy farming system can maintain high levels of biodiversity.

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1 Aims and Research question

This study addressed three topics and was conducted in two parts:

(1) Survey, assessment and description of the biodiversity situation on ten farms (Part 1).

(2) Identifying possible scenarios for a moderate intensification of dairy production on the participating farms and describing their possible effects on biodiversity (Part 2).

(3) Dialogue with farmers on biodiversity (raise the awareness for the relevance of biodiversity; discussion about biodiversity promoting measures on farms) (Part 2).

According to the aims of SOLID-WP 1, participation of farmers was a core aspect of this study.

2 Background

2.1 Research Background

Biodiversity is of growing importance within the Common Agricultural Policy (CAP) of the European Union. Farmers might receive higher subsidies in the future if they provide services to the general public such as superior farmland biodiversity.

It was hypothesised that the permanent grassland of the member farms of the Cooperative Organic Dairy Hatzenstädt would exhibit a superior plant and grassland diversity as compared to the average organic dairy farm within the county/region. Results from a preceding assessment with a RAT (Rapid Assessment Tool) within SOLID-WP 1 did not provide evidence that biodiversity is of particular value on these farms. Thus, the main aim of one of the farmers' workshop was to investigate the current state of plant biodiversity on their fields and to predict the effects of an intensification of dairy production in this regard.

2.2 Farm Background

Farmers who participated in the RAT within WP 1 were all members of the small Cooperative Organic Dairy "Sennerei Hatzenstädt". For these farmers' economic survival it is essential to develop special dairy marketing concepts for the future. They have to be particularly able to differentiate their traditional production system from others, more intensively managed production systems in the Alpine regions. Biodiversity is one important indicator, demonstrating to consumers and society that low-input/organic dairy systems such as practised by the farmers of Sennerei Hatzenstädt have a high benefit for the environment and the traditional landscape. Performing well in terms of biodiversity is not only advantageous in marketing, it will very likely become an essential precondition for receiving subsidies for ecosystem services in the future which are crucial for the economic survival of Alpine farms.

However, the outcome of the RAT showed that even the farmers by themselves did not perceive the potential for biodiversity of their farms. Because of the relatively low score for biodiversity they

requested an improved assessment, which addresses the specific regional conditions and a scientific confirmation of their performance in this respect. They expressed a strong need for learning about grassland biodiversity and for research analysing biodiversity as a core element of the process quality which should be inherent in low-input/organic dairying. Farmers also wanted to explore the consequences of an optimisation of production (eventually including intensification) to their farms' biodiversity.

3 Methodology and data collection

3.1 Location of the farms

The organic dairy cooperative „Sennerei Hatzenstädt" is situated near Kufstein, Tyrol, an Alpine province in the West of Austria. It has about 40 members, which deliver their milk to the cooperative dairy plant where it is processed to hard cheese and other dairy products.

The 12 farms selected for the rapid sustainability assessment are relatively homogenous in their structures, small in size and they are managed as typical low input systems with moderate milk yield, but also with a very low use of concentrates (see table 1).

Table 1. Characteristics of farms selected for research (n=12).

	Average of farms selected	**Range of farms selected**
Herd size (no. of adult cows)	13	10 - 17
Stocking rate (Livestock units/ha)	1.0	0.6 – 1.7
Milk yield (l/cow/year)	5122	4500 - 7000
Farm size (ha)	22.7	12.0 – 40.5
Level of input use:		
Mineral nitrogen fertilizer (kg/ha)	0	0
Level of concentrate (kg/cow)	247	0 - 750

A future scenario for the participating dairy farms which includes intensification of production was assessed in terms of its consequences on biodiversity by means of exemplary fields and scenario calculations of the biodiversity potential of all ten farms.

3.2 Field survey on grassland diversity and biodiversity assessment (Part 1)

The current state of biodiversity was assessed and documented for 10 of the 12 selected farms. This was primarily done by an extensive field survey covering grassland vegetation, landscape elements and semi-natural habitats.

In addition, we calculated the so-called biodiversity potential using an assessment method developed at FiBL Austria and FiBL Switzerland which uses a set of parameters concerning farming measures, and landscape elements and habitats promoting biodiversity to estimate how biodiversity friendly or biodiversity promoting a farm is managed (Schader et al. 2014). The participating farmers were interviewed in order to collect data for these analyses.

Results of the field surveys and biodiversity assessment (biodiversity potential) were provided to the farmers as written reports (aggregated results and characterization of the respective farm). In addition to the current status of biodiversity (vegetation and biodiversity potential) on the farms, farmers received suggestions and recommendations on how to conserve and promote biodiversity. A workshop with the participating farmers offered the opportunity to discuss strengths and potentials for improvement concerning on-farm biodiversity conservation and promotion.

In April 2013 the interviews were conducted which covered information on agricultural practices and non-crop habitat (incl. a detailled field list). These data served as the basis for the vegetation survey and were used for calculating the biodiversity potential. In addition, farmers were asked about their plans and willingness to intensify. One interview took about two hours. Farmers were asked to provide a map of their farm which was used for the vegetation survey.

As far as possible the vegetation survey was conducted before the meadows were cut for the first time. The surveyors compiled a local grassland typology based on 83 sample plots representing the range of grassland types found on the participating farms (Braun-Blanquet method). Subsequently, all grassland fields (in total about 170 ha) of the participating farms were surveyed and mapped according to this grassland typology. The recorded grassland types were characterized based on species composition, phytosociology, farming practices and dynamic. In addition, semi-natural habitats and landscape elements were also mapped. Vegetation in these habitats was not surveyed in detail but the type of habitat and dominating woody plant species were recorded.

3.3 Future scenarios and discussion workshop (Part 2)

Based on information gathered from the farmers in the course of the interviews, we tried to identify possible future scenarios for a moderate intensification of dairy production on the participating farms. We targeted the following questions: On which meadows would a moderate intensification have little (negative) effects on biodiversity and which meadows should be definitely excluded from intensification for the sake of maintenance of biodiversity? Which measures should be implemented in order to prevent negative effects on biodiversity? How would the intensification affect the biodiversity potential?

A scientist from the Agricultural Research and Education Centre (AREC) Raumberg-Gumpenstein was invited as expert to analyse and discuss probable effects of intensification on grassland vegetation. Using the data from the vegetation survey, a number of meadows and pastures were selected and the potential for intensification and management optimisation, as well as limitations and risks linked to management changes were analysed and discussed with the farmers during the workshop in January 2014. The results from these analyses were provided to the farmers as individual, farm-specific reports, including suggested consequences of changes in grassland management.

As mentioned above, participation of the farmers is an important aspect of this study. Two workshops – in April 2013 and in January 2014 – offered the opportunity for a dialogue between farmers and scientists. These workshops aimed at raising the farmers‘ awareness towards the relevance of biodiversity for their own farming practices. Further, such a dialogue should reveal where agricultural practice and scientific approaches match or may identify possible conflicts.

In addition, we organized a field walk for the farmers of the Cooperative Dairy Hatzenstädt led by the grassland expert Dr. Walter Dietl (formerly affiliated with Agroscope Reckenholz-Tänikon ART in Zurich) on May 16, 2013.

3.4 Time scale

April 2013	Starting workshop
March/April 2013	Farmer interviews
May-June 2013	Field survey
May 2013	Field walk for farmers with Dr. Walter Dietl
July-October 2013	Analyses of field survey, calculation of biodiversity potential, analyses of future scenarios
January 2014	Second, closing workshop (presentation and discussion of results)
December 2014	Farm reports sent to participating farmers
October 2015	Oral presentation at 5th International Conference on Organic Agriculture Sciences, ICOAS, Bratislave, Slovakia
December 2015	Scheduled submission of manuscript to Organic Farming

4 Results and Discussion

4.1 Field survey on grassland diversity (Part 1)

The generally low management intensity (hay meadows cut at a maximum frequency of three times per year, moderate fertilisation levels and mean stocking rate of 1 livestock unit per ha), was reflected by a broad range and high diversity of grassland vegetation.

In total, 48 different types and 259 species of vascular plants were recorded. Grassland types ranged from meadows with relatively intensive management (hay meadows of the *Arrhenatheretalia*) with an average of 24 plant species to species-rich types with more than 60 plant species (*Ranunculo bulbosi-Arrhenatheretum* or *Carlino-Caricetum sempervirentis*). Less species-rich but ecologically valuable vegetation types were also recorded. These consist mostly of vegetation types that flourish in very moist to wet habitats, like peat bogs (*Sphagnetum magellanici*) or fern vegetation (e.g. *Caricetum davallianae*).

The number of grassland vegetation types per farm ranged from 13 to a maximum of 24 (mean: 20). The most frequently found grassland vegetation type on fields with moderately intensive management (three cuts per year) was present on all farms, with an average species number of 29. Species-rich fields (e.g. *Arrhenatheretum elatioris*-hay meadows with an average of 44 species) were found relatively frequently on 9 out of 10 farms. Though the ten study farms are relatively homogenous concerning management intensity, a certain degree of differentiation regarding grassland diversity could be observed. The number of plant species per farm (derived from the plant species used to characterise the grassland vegetation types) was negatively correlated with livestock rate (Fig. 1B), indicating that the rather short gradient in management intensity is reflected in grassland diversity. Yet the diversity of grassland types was primarily depending on the farm size. Larger farms had more grassland types (Fig. 1A).

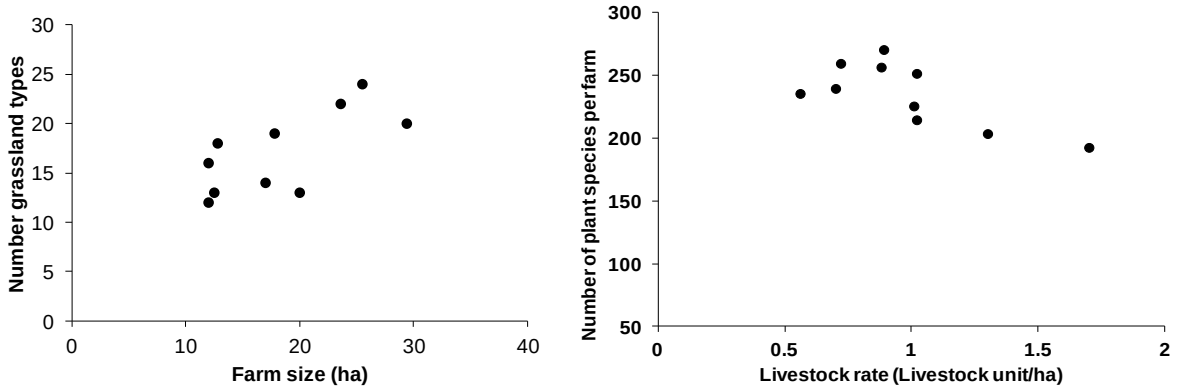

Fig. 1: Relation between (A) farm size (ha) and the number of grassland types recorded during the field survey in 2013 and (B) Livestock rate (LU/ha) and the number of plant species derived from grassland types recorded on a farm.

4.2 Biodiversity potential (Part 1)

With a mean biodiversity potential of 42% all study farms achieved good results. This can be explaind by the fact that the studied farms are organically managed in combination with a generally low intensity level. When the results are differentiated by subcategories (Fig. 2), it is notable that the farms reach consistently good results for management measures concerning the whole farm (mean 47.2±8.2%) or farm branches (mean 50.4±4.9%) but perform rather unsatisfactory in the subcategory semi-natural habitats (mean 17.0±8.0%). The assessment method allowed to identify improvement potential for biodiversity management: e.g., meadows cut only once a year are almost inexistent, ecological infrastructure (e.g. heap of branches) could be improved or refuge strips that are excluded from mowing for one year could be established. The latter highlights the dependency on the framework of agri-environmental schemes. Such refuge strips would be very valuable for conserving and promoting biodiversity on farmland, but the acceptance among farmers is very low. That is not only low because there are no subsidies for refuge strips but the farmers also risk to loose subsidies if parts of a field are not cut at least once a year. Furthermore, such strips often collide with farmers' attitude ("working properly").

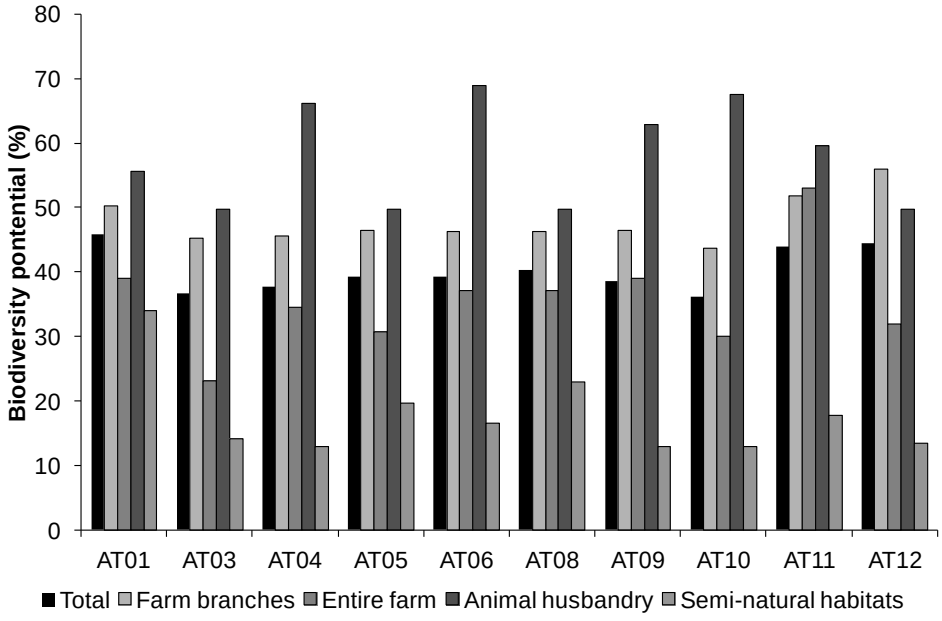

Fig. 2: Biodiversity potential of the ten study farms expressed as total biodiversity potential and differentiated by subcategories.

The good biodiversity potential results support the hypotheses that the biodiversity situation on studied farms of the cooperative Hatzenstädt is superior to other dairy farms in Austria. The mean biodiversity potential of 42% is clearly above the mean biodiversity potential of dairy farms on seven regions in Austria analysed in another study (Fig. 3, from Schader et al 2014).

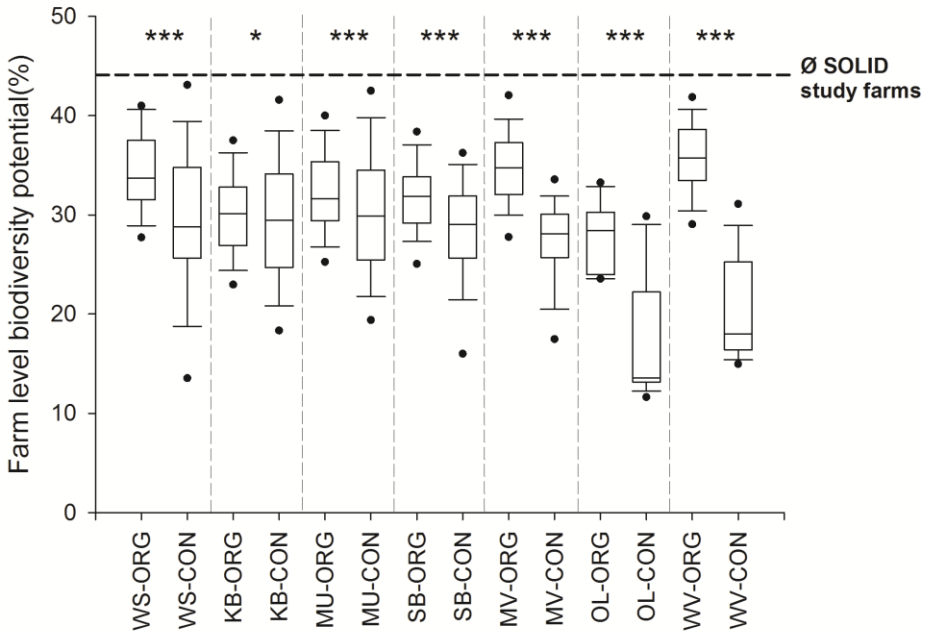

Fig. 3 (adapted from Schader et al. 2014). Mean biodiversity potential of study farms in the SOLID-project compared to biodiversity potentials at the farm level for organic and conventional farms in seven other study regions in Austria (WS – Walchsee, KB – Kitzbühel, MU – Murau, SB – Steirisches Bergland, MV – Mühlviertel, OL – Ötscherland,WV – Waldviertel).

4.3 Intensification scenario (Part 2)

It turned out that none of the ten interviewed farmers considered intensifying dairy production on their farms as a possible step in the nearer future. Consequently, we set up a moderate intensification scenario that can be considered plausible under the specific circumstances for the ten farms of the dairy cooperative Hatzenstädt. For recalculating biodiversity potential based on these modified management data we changed the input data for four parameters: Total stocking rate, reduced N-input due to reduced feeding of concentrates to cattle, conservation of traditional meadow orchards, and mowing steep grasslands. Stocking rate was increased by 15%, i.e. it changed from 0.56 – 1.7 livestock units/ha (LU; mean 0.98±0.33 LU/ha) to 0.64 – 1.96 LU/ha (1.13±0.38 LU/ha). Consequently, the scores for reduced N input were reduced since the farmers would have to increase the proportion of concentrates in the cattle feed. Farmers who did not feed concentrates and got the maximum score were reduced to 75% of the maximum score (scores for this parameter are allocated in 25% point steps. Farmes who fed concentrates got 50% instead of 75% of the maximum score. Furthermore, the area of mowed steep grasslands in the highest slope category (≥50% inclination) was reduced by 10 percent points where the proportion of these areas was ≥ 10% of the total farm area, and was set to zero were the proportion was <10% of the total farm area. The area of meadow orchards was reduced by 50%. Values for other landscape elements and semi-natural habitats were not changed because we assumed such changes to be very unlikely. For example, we assumed that management on rather marginal meadows would neither be intensified

(because it would not pay off economically or the available amount of manure would be mainly used on more fertile fields) nor would management be abandoned (because the farmers generally depend on the forage from these fields, too).

The moderate intensification scenario resulted only in marginal changes in total biodiversity potential. On average total biodiversity potential was reduced by 1.7% points. Considerable changes occured only in those subcategories to which the four parameters changed in the intensification scenario belong, i.e. the subcategories ‚animal husbandry' and ‚entire farm'.

We can conclude that a moderate intensification as it was used in our analyses would have only little effect on the biodiversity situation on the studied farms as long as landscape elements and semi-natural habitats are spared out.

5 Conclusions/Recommendations

The farms assessed in this case study demonstrate how a traditional, small-scale, low-input, organic dairy farming system can contribute to maintaining biodiversity.

The study confirmed that the awareness and attitudes of farmers towards biodiversity and biodiversity promoting farm management but also the framework of agri-environmental schemes are crucial for conserving and promoting on-farm biodiversity.

References

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