

Sustainability of organic grassland-based dairy production in Tyrol, Austria

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About the authors

Dr Wilhelm Knaus and Dr Werner Zollitsch are associate professors for animal nutrition in the Department of Sustainable Agricultural Systems, Division of Livestock Sciences at BOKU-University of Natural Resources and Life Sciences in Vienna, Austria. They both have more than 20 years of research experience, studying different feeding systems and strategies on various aspects of different animal production systems, with a focus on organic and low-input systems, including sustainability analysis.

Dr Thomas Drapela is a zoologist by training. During his PhD program in the Department of Integrative Biology and Biodiversity Research, Institute of Zoology at BOKU-University of Natural Resources and Life Sciences, he focused on biodiversity and agroecology. Since 2010, he has been a scientist at the Research Institute of Organic Agriculture (FiBL) Austria. As a member of the FiBL Austria working group on Sustainability Assessment, he works on biodiversity and its assessment on agricultural farms.

Dr Roswitha Weißensteiner received her doctorate degree for her research on feeding strategies in organic pigs and worked closely with stakeholders of the Hatzenstädt Dairy in the course of an EU-funded project, SOLID (Sustainable Organic Low-Input Dairying).

Heinz Gstir has been a dairy farmer since 1980. He farms 17 ha of permanent grassland, holds grazing rights on an Alpine pasture and owns 15 ha of forest. His farm was granted organic certification in 1990. He has been the chairman of the Cooperative Organic Dairy Hatzenstädt, in Niederndorferberg, Austria, since 1991.

Description: Organic dairy farming in the Alps

In Austria, grassland accounts for more than 50 percent of agricultural land and is mainly located in mountainous regions. Consequently, 70 percent of all Austrian dairy farms, producing two thirds of all milk, are located in these areas.

In the Alpine regions, organic farming has traditionally been very important and represents a significant share (more than 18 percent in Austria) of all farms and land areas. In mountainous regions, production can be restricted by climatic and geomorphological factors. Therefore, high-input farming systems are rare in the disadvantaged regions and many farms take part in the Austrian programme to promote agricultural production methods compatible with the requirements of the protection of the environment, extensive production, and the maintenance of the countryside (ÖPUL). In comparison to conventional farms, milk yield per cow per year and proportion of

concentrate and corn silage in the total ration are both lower, while the proportion of green fodder and grazing is higher.

The Cooperative Organic Dairy Hatzenstädt, which currently comprises 39 small dairy cattle farms, is located in Kufstein, Tyrol, an Alpine province in Western Austria. Established in 1937, this cooperative dairy plant started taking milk exclusively from organic farms in 1990. 1.7 million kg of milk are delivered to the cooperative annually, processed mostly into hard cheese (e.g. organic Emmental and Alpine cheeses) as well as other organic dairy products. The number of livestock units per hectare across all member farms, of which about 20 percent are run by full-time farmers, varies from 8 to 35. About 10 percent of the dairy products are sold directly in a local store owned by the Dairy Hatzenstädt, while the other 90 percent of all products are delivered to supermarkets and stores for natural or health-related foods or distributed via Marketing Cooperative Bio Alpin. The current average producers' milk price is € 0.55 per kg.

This study describes the results of EU research project SOLID (Sustainable Low Input Organic Dairying). 12 members of the Dairy Hatzenstädt were selected for a rapid sustainability assessment, and a biodiversity survey of grassland vegetation and non-crop habitats was conducted on 10 of the 12 farms. This study demonstrates that organic milk production can be viable with minimum supplementation strategies. Appropriate feeding strategies can contribute to improving the sustainability of Alpine farming systems.

Livestock operations and feeding strategies on selected farms

Following the guidelines of a protocol developed as part of the EU research project SOLID, 12 dairy farms, with cattle grazing on permanent Alpine grasslands, were selected for interviews. The farms primarily held Brown Swiss and dual-purpose Simmental dairy cattle, while one farm held Jersey cattle and two farms held Pinzgauer cattle. The farms have been in operation for more than 50 years. Table 1 shows some specific characteristics of Austrian organic dairy farms and those farms selected for the rapid sustainability assessment.

Table 1. Characteristics of average Austrian organic farms and of farms selected (n = 12) for the rapid sustainability assessment

Item	Austrian organic farms	Average of selected farms	Range of selected farms
Herd size (no. of adult cows)	10	13	10 - 17
Stocking rate (Livestock units/ha)	1.1	1.0	0.6 – 1.7
Yield (kg/cow/year)	6,200	5,122	4,500 – 7,000
Farm size (ha)	20.1	22.7	12.0 – 40.5
Level of input use:			
Mineral nitrogen (kg/ha)	0	0	0
Level of concentrate (kg/cow/year)	1,200	247	0 - 750

The average size of the selected farms was 22.7 ha, with a stocking rate of 1.0 livestock units/ha. The selected farms were managed by the farmer's family, which typically consisted of members of three

generations, with no additional staff employed. Average milk yield was 5,122 kg/cow/year and the amount of concentrate purchased was 247 kg/cow/year. These figures are indicative of a low-input dairy system with minimal concentrate use. The on-site conditions of Alpine grasslands are characterized by steep slopes, short growing seasons, and an annual precipitation of 1,200 to 1,800 mm. Since farms do not cultivate arable land, all forages come from permanent grassland, which is either cut and conserved exclusively as hay or used for pasture. The main source of income on all farms comes from dairy production, but farms supplement their income with forestry, direct marketing of meat, tourism and other off-farm incomes.

Sustainability assessment of organic dairy farming

None of the selected farms would suffer from feed shortages if they did not purchase any concentrates. By choosing these 12 farms the authors wanted to show the total range of concentrate input, from zero to 750 kg/cow/year (the most intensive farms). Usually the more intensive farms cut their grass earlier which results in higher protein contents of the hay. In order to make greater use of the forage protein, they try to balance animal diets by adding energy-rich concentrates.

The selected farms were reported to have relatively high farm business resilience, mainly based on the diversity of their sources of income. They all have several ways to generate extra income, such as forestry or tourism.

Animal health and welfare were also highly rated because of relatively long grazing periods and low veterinary expenses. During the winter, about 50 percent of all cows are kept in tie stalls but with access to an outdoor run at least twice a week.

Farms in this region are generally managed extensively, with trees and hedges making up an integral part of the landscape. Grasslands are usually cut only twice (some fields are cut three times), no mineral fertilizers are applied and hedges are well maintained, contributing to high levels of agricultural biodiversity. However, many farmers may not be aware of the level of biodiversity on their farms because farmers do not receive subsidies from ÖPUL for the maintenance of these elements.

The selected farms do not use fertilizers because of the strict legal constraints on organic farming. Moreover, none of the farms practice pronounced soil management, since there is low risk of soil erosion and nutrient leaching due to the low stocking rate and the exclusive use of all land as grasslands. Due to local climatic conditions, with high rainfall, there is no need for farmers to irrigate.

Biodiversity assessment and subsidies for vegetation diversity

In May and June 2013, an extensive field survey was conducted, which included mapping about 170 ha of the permanent grassland vegetation and landscape elements and conducting interviews with farmers on their grassland management. In addition to the vegetation survey, the 'biodiversity potential' of farms was calculated using a method assessing parameters such as farming measures, landscape elements, and biodiversity-friendly habitats (Schader *et al.*, 2014).

Low to moderate management intensity (fields are not cut more than three times per year, with moderate manure fertilization levels due to a stocking rate of 1 livestock unit per ha) was associated with a broad range and high diversity of grassland vegetation. In total, 48 different types and 293 species of vascular plants and mosses were recorded. Grassland types ranged from relatively intensively managed fields (*Arrhenatherum elatius* grassland) 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 magellanicum*) or fen vegetation (e.g. *Caricetum davallianae*).

The number of grassland vegetation types per farm ranged from 13 to a maximum of 29 (with a mean of 20). The most frequently found grassland vegetation type on fields with moderately intensive management (cut three times per year) was found on all farms, with an average species number of 29. Species-rich fields (e.g. *Arrhenatheretum elatius* with an average of 44 species) were found relatively frequently on 9 out of 10 farms.

Subsidies in organic farming

Subsidies are paid for:

- 1) Organic farming: this should prevent a maximization of production (e.g. milk production in dairy cows, by limiting daily concentrate use);
- 2) Steep hillside meadows that are mown only once a year: this should keep these meadows in use and at the same time maintain a high level of biodiversity;
- 3) Silage-free feeding: grass from meadows can only be conserved as hay. This measure is intended to maintain plant and animal biodiversity on grassland (by reducing the number of times grass is mowed per year);
- 4) Moorland (this is the case on one farm): moorland plants can be used as bedding material if they are cut after September 1;
- 5) Special areas (sections of meadows) that are within a "nature protection/conservation project": none of the 39 farms is affected by this measure.

Challenges faced in organic dairy farming

One major challenge for a small dairy like Hatzenstädt is harmonizing milk production and demand for dairy products on the market. In the past, there was often a shortage of milk in autumn and a surplus in spring.

There is an increasing awareness of the high levels of biodiversity and the important role it plays in enhancing the sustainability of low-input dairy production systems. Farmers are becoming more aware of available landscape elements and hedges and their contribution to a well-structured and diverse landscape. Farmers have been encouraged to consider the effects of intensification on farm biodiversity. There is scope to improve feeding management, but major changes could threaten the functionality and sustainability of the farming system.

Lessons learnt

This form of traditional, small-scale, low-input, low-intensity (with low stocking rates and only using fresh forage and hay for feeding) dairy farming system maintains a high level of biodiversity. It is highly valued by society in general and particularly by a segment of consumers that are willing to pay price premiums for quality organic products. The management of Dairy Hatzenstädt has been successful in communicating the message of environmental integrity to retailers and consumers. As a grassland-based system, using minimal concentrates, their farms do not exacerbate the competition for crops from arable land between animal feed and human food utilization.

There is room for improvement in pasture management (e.g. when to start pasturing in spring, adequate pasture allowance and stocking density, when to switch to another paddock, how to cope with rainy periods, etc.) and hay quality without using more concentrates or endangering biodiversity.

Traditional dairy production systems that have developed under a careful adoption of modern farming methods should not be abandoned because of economic pressures. For that reason the connection between local producers and local consumers, including tourists, who are willing to pay a higher price needs to be maintained and further strengthened.

In the future, approaches need to be developed that ensure an adequate quality and quantity of nutrient supply to animals, even when external factors that cannot be controlled (such as periods of extended rain) make it impossible to harvest hay at its proper vegetative stage.

References

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