



National Research Programme NRP 69

**Healthy Nutrition and
Sustainable Food Production**

**ECON'ENTAL – for more sustainable
dairy farms**

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Local and global environmental performance are two different dimensions

Researchers of NRP 69 have developed an approach for assessing farm environmental performance and applied it to a small sample of dairy farms in mountain regions. Based on their work, they recommend that a distinction be made between the local and global environmental performance of farms, but always taking account of both. In fact, a high global eco-efficiency is often associated with a low local environmental performance, and vice versa. The results show the danger of the one-sided farm environmental performance assessment approaches that are frequently used. The findings also highlight the factors capable of improving both the local and global environmental performance, as well as the economic performance of dairy farms in mountain regions.

Since farms are closely linked to their surrounding natural ecosystems, they play a crucial role in the sustainability of the agri-food chain. In the dairy industry – the most important sector of Swiss agriculture – a substantial proportion of the environmental impacts is generated from the production of farm inputs (e.g. machinery, fertilisers and animal feed) up to the point where the products leave the farm. In order to better understand the sustainability of Swiss alpine dairy farming, scientists involved in NRP 69 analysed the environmental impacts of dairy farms, from the production of farm inputs up to the farm gate. They also investigated the relationship between farm environmental and economic performance.

As a first step, the scientists developed an approach for assessing environmental performance at farm level. This approach relies on life cycle assessments, which assess the environmental impacts of farms – from the production of farm inputs up to the farm gate (i.e. to the point where the products leave the farm). The special feature of this approach is the distinction made between global environmental performance (calories produced per unit of global environmental impact) and local environmental performance (inverse of the local environmental impact per hectare of farm agricultural area).

The challenge of sustainable intensification

The concept of sustainable intensification was proposed as a solution to the food and agri-environmental challenges resulting from the increase in world's population and in its standard of living. Sustainable intensification aims to produce more calories while generating less environmental impacts. By definition, it therefore focuses primarily on the global environmental performance of food production. In the project, the scientists found a negative relationship between the global and local environmental performance of dairy farms in mountain regions. They also showed that a high farming intensity is associated with a high global environmental performance but, at the same time, with a low local environmental performance. The researchers therefore call for the definition of the concept of sustainable intensification to be extended to explicitly include local environmental performance. The challenge of sustainable intensification is to produce as many calories as possible per unit of global environmental impact while, at the same time, ensuring that the local environmental impacts remain below the carrying capacity of the local ecosystem.

The global environmental performance, often also referred to as global eco-efficiency, encompasses the environmental impacts that affect the ecosystem at the local farm level, as well as those generated in the upstream stages and arising from the production of farm inputs. At the global level, all environmental impact categories are taken into account, for example the demand for non-renewable energy resources, the aquatic eco-toxicity or the global warming potential.

The local environmental performance only considers those environmental impacts that arise at the local farm level and that are primarily influential on the local ecosystem scale. It only takes account of environmental impact categories that are primarily of local relevance, such as human toxicity, aquatic and terrestrial ecotoxicity.

During slurry spreading, environmental impacts are generated at the level of the farm's local ecosystem. A farmer in the Prealps of the Canton of Fribourg using drip hose boom to apply slurry.

In the case of global environmental performance, the sustainability goal is to produce as many calories as possible with minimal global environmental impacts. As regards farm local environmental performance, the objective is to minimise the local environmental impacts per hectare of agricultural area. In both cases, the ultimate goal is to comply with the ecosystem's carrying capacity – i.e. the environmental impact threshold above which the long-term ecosystem's health is threatened.

A high global eco-efficiency is often associated with a low local environmental performance, and vice versa.

The researchers applied this approach for dairy farms in mountain regions. They observed that the relationship between the two environmental performance dimensions is complex and depends on the environmental impact categories considered. A high global eco-efficiency is often associated with a low local environmental performance, and vice versa. This result highlights a



trade-off between the two dimensions of environmental performance and calls into question the approaches assuming that these two dimensions go hand in hand. The case study also shows the existence of synergies between the global eco-efficiency and the economic performance of a farm. These synergies, however, do not appear to occur for the local environmental performance.

The research group also identified factors with the potential to simultaneously improve both the global and local environmental performance and the economic performance of dairy farms in mountain regions. These factors are organic farming, a high educational level of the farm manager, a low intensity of cattle concentrates use, the production of milk without silage feeding, and also, to a lesser extent, a larger farm size as well as full-time farming.

Further information:
www.nrp69.ch

Recommendation

Consider both dimensions of environmental sustainability

The project showed a negative relationship between the global and local environmental performance of dairy farms in mountain regions. However, many scientific approaches and most existing farm-level agri-environmental policy measures focus only on one of these two dimensions, assuming that both facets go hand in hand. The researchers therefore recommend considering both the local and global environmental performance of farms, while making a clear distinction

between the two. They also suggest that similar analyses should be conducted for other types of farms (e.g. arable crops) and other regions (e.g. lowland areas) and the conclusions compared. Finally, in terms of agricultural policy, they recommend to promote those factors that can improve both the local and global environmental performance as well as the economic performance of farms.