“Mountains are agroecosystems for people”

eBook of Abstracts of the 1st Joint Conference of
EAAP Mountain Livestock Farming Working Group
& FAO-CIHEAM Mountain Pastures Sub-Network

Virtual meeting

Domžale - Slovenia, 7 – 9 June 2021
1st Joint Meeting of EAAP Mountain Livestock Farming & FAO-CIHEAM Mountain Pastures
“Mountains are agroecosystems for people” June 7th - 9th, 2021 – virtual

Publishers:
University of Ljubljana, Biotechnical Faculty, Department of Animal Science, Domžale, Slovenia
University of Torino, Department of Agricultural, Forest and Food Sciences, Torino, Italy
University of Padova, Department of Animal Medicine, Production and Health, Legnaro (PD), Italy

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Year of publication: 2021

All extented abstracts are reviewed by two independent reviewers selected from the Scientific Committee of the Conference

https://repozitorij.uni-lj.si/IzpisGradiva.php?id=127717

Kataložni zapis o publikaciji (CIP) pripravili v Narodni in univerzitetni knjižnici v Ljubljani
COBISS.SI-ID 72368387
ISBN 978-961-6204-78-1
(Biotechnical Faculty, Department of Animal Science, PDF)
Mountain dairy farming in North-West Italian Alps: comparing environmental, economic and social aspects

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Keywords: livestock farming systems; life cycle assessment; life cycle costing; human-edible feed conversion; mountain.

Introduction: Agriculture in general and livestock farming in particular are strategic to the economy. At the same time, they generate a growing debate for the social implications of resource use and food competition from livestock, which has one of the highest environmental impact amid productive activities in the European Union and leads to a reduction of edible crops for humans. Aim of this work is to analyse the three concepts of sustainability (environmental, social and economic) applied to different dairy farming scenarios of the Alpine environment. In order to do so, the production of a traditional cheese (Toma di Lanzo cheese) obtained in a mountainous regions of Piedmont - North-Western Italy - was analysed.

Materials and methods: The case study used refers to dairy farms and the derived Toma di Lanzo cheese. The farms were selected to be a representative sample of the dairy sector in the Lanzo Valley in North-Western Alps of Italy. The dairy farms studied are family-run, generally with less than 100 dairy cows, and lead the herd to alpine pastures in summer. The cows’ diet is based on pasture and conserved fodder, mainly hay, plus concentrates.

Four different scenarios were studied: Indoor Winter Feeding (IWF), Valley Bottom Grazing (VBG), Mountain Pasture Grazing (MPG) and Alpine Pasture Grazing (APG). For each scenario the grazing, milking, cheese making, and transport phases were analysed.

The methodologies used in the study were either the Life Cycle Assessment, to evaluate the environmental impact of each scenario and the Life Cycle Costing, to evaluate costs, profitability and human-edible feed conversion efficiency to evaluate feed-food competition.

Results: The study showed that the herd management systems mainly based on the use of summer pasture and exploitation of land resources (MPG and APG scenarios) guarantee a reduction of 47% of kg CO₂ equivalent emissions when compared to traditional high-input farming systems (IWF and VBG). Moreover, mountain farming systems guarantee a higher profitability of technical and economic factors used for the same output in the lowland environment (APG is 7 times more profitable than IWF).

With regard to food competition in livestock farming, which implies a reduction in the use of crops and feedstuffs edible by humans in the animals’ diet, pasture systems and grass-based feeding systems are ones of the most sustainable ways to produce milk.

Conclusion: Toma di Lanzo cheese is an example of a sustainable production system, thanks to the use of mountain resources and the maximisation of the food conversion index offered by grazing.

It is clear that the existence and survival of mountain livestock systems depends on these, preferably autochthonous breeds, which have a positive impact on sustainability aspects such as biodiversity conservation.

The economic results underline the importance of developing farming systems with a low percentage of off-farm inputs. Moreover, Toma di Lanzo cheese – which is highly dependent on alpine ecosystem resources - has a positive impact on the economic survival of these fragile areas, as well as on the maintenance of production traditions, clearly providing relevant ecosystem services.

In general, mountain livestock systems present several criticalities mainly linked to social factors and it's desirable an improvement in the quality of life of farmers and at the same time of the competitiveness of these enterprises.

Human indicators confirm that pasture and grass-based feeding systems are more sustainable in dairy production. Therefore, the reduction of concentrates, cereals and legumes, in the animal diets reduces food competition with humans and improves the sustainability of traditional dairy farming systems in the alpine regions.