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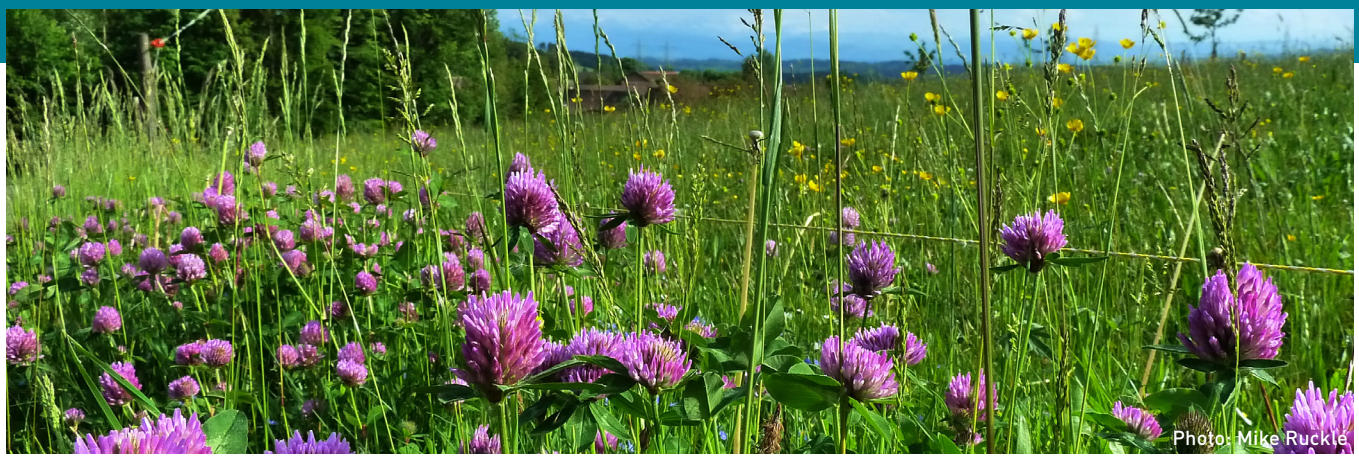
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Coop Research Program | Call 2

High energy red clover for sustainable ruminant livestock production

Background

For centuries, ruminant livestock based agriculture has provided a sustainable source of high quality protein for the human diet, and in many areas of the world ruminant livestock are a cornerstone of cultural heritages and food traditions. In Switzerland, livestock-based agriculture embodies the picturesque landscape and supplies the Swiss economy with high value products such as cheese and meat. Internationally, to meet production demands of a growing global population, ruminant livestock diets are increasingly being supplemented with high energy grains such as cereals and corn. Unlike managed high-quality pastures and meadows, which readily coexist with natural ecosystems and maintain natural nutrient cycles, high energy grain production uncouples natural cycles, which can lead to nitrogen and phosphorus water pollution and excess greenhouse gas emission.

Objective

This project aims to make sustainable pastures and grasslands more economically feasible by breeding a red clover variety with a higher energy content, thus reducing the need for supplementation of ruminant livestock diets with high energy grains. Because red clover is the most widely grown forage legume in Switzerland, a high energy variety can be readily integrated in to modern livestock production.

Research Approach

We are combining traditional and modern breeding practices to increase red clover's leaf starch content. Our understanding of the genes, enzymes, and biochemistry required to synthesize leaf starch will be used to guide a TILLING (Targeted Induced Local Lesions in Genomes) approach, which will generate beneficial alleles for red clover breeding.

Relevance and Expected Outcomes

The goal of the project is to increase red clover's leaf starch to supply more energy for healthy rumen fermentation and efficient conversation of feed into milk and meat. The envisioned red clover trait will maintain livestock productivity, reducing the need for high energy grain supplementation, and ultimately providing farmers with an inherent monetary incentive to plant biodiversity-rich red clover based pastures.

Food System Challenges Addressed

Sustainable production of healthy proteins, advanced crop breeding for sustainable intensification, conservation of biodiversity in agricultural systems.

www.worldfoodsystem.ethz.ch/research/CRP →

Principal Investigator Prof. Bruno Studer, Forage Crop Genetics

Co-Investigator Prof. Sam Zeeman

Postdoctoral Researchers Dr. Mike Ruckle

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Project Duration 2015-2017

Project Cost 234'000 CHF (with additional co-funding from the Swiss Federal Office for Agriculture)

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