Neglected and underutilised crop species (NUCS):

Grass pea (*Lathyrus sativus*)

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What are NUCS?

- Wild or semi-domesticated varieties adapted to particular environments
- Mainly traditional knowledge about their cultivation and use
- Little attention paid to by agricultural researchers, plant breeders, policymakers
- Typically not traded as commodities
- Tremendous potential to diversify agricultural production systems and to make them more resilient to climate change

Padulosi et al. 2013

Grass pea (*Lathyrus sativus*)

- Cultivated on 1.5 Mio hectares (Ethiopia, Mediterranean, South- and West Asia)
- Cultivated for grains (animal feed, human nutrition) & whole plant (fodder, green manure)
- Climate smart insurance crop (high resistance to drought, heat stress, water stagnation)
- Less susceptible to diseases/pests
- Very high nitrogen fixaton, resistant and penetrating root system
- High protein content (18 – 34%)
- High content of essential amino acids (L-homoarginine)

Campbell 1997, Kumar et al. 2011, Lambein et al. 2019, Mitiku et al. 2015

Why is Grass pea a NUCS?

- Grass pea contains small amounts of the neurotoxic substance oxalyldiaminopropionic acid (ODAP)
  - Overconsumption (4+ month, exclusively grass pea) can cause nervous disease lathyrism
  - Today, grass pea lines with low ODAP contents are known and approved for cultivation in various countries.
  - Processing can further reduce the ODAP content
- Yield fluctuation / lodging

Lambein et al. 2019, Mitiku et al. 2015

Why grass pea in Switzerland?

- Demand for Swiss grain legumes expected to grow
  - as of 2022 domestic protein feed required for ruminants in CH organic sector
  - Demand for meat substitutes is increasing (sales increased from CHF 60 million in 2016 to CHF 117 million in 2020)
  - Currently, almost all plant-based proteins for domestic meat substitute production are imported
- FOAG predicts more doughts and heatwaves for Switzerland
- One goal of the strategy plant breeding 2050 is to support the adaptation of agriculture to CC
- Grass pea is considered one of the most climate-resilient crops
- Diversification of Swiss grain legumes important in light of Climate Change

BLW 2016, 2021

Central questions of the project (2021 – 2025)

Agronomy/breeding	Nutritional physiology and processing	Socioeconomy
Is grass pea suitable for agricultural production in Switzerland?	How high is the protein and ODAP content of selected genotypes? How does the protein pattern and amino acid spectrum of selected genotypes look like?	Is growing grass pea in Switzerland profitable?
Which form of cultivation is best suited for grass pea (pure culture/intercropping)?	Is grass pea suitable as a food in Switzerland?	What processing possibilities exist in Switzerland for mixtures with grass peas?
Which genotypes are best suited for which type of use (food, fodder, green manure)?	To what extent can antinutritive substances (especially ODAP) be reduced in processing?	Where is grass pea offered/consumed in Europe today? In what form? Where do these grass peas come from?
Which mixture partners are best suited for mixed cultivation with grass pea ?	What is the nutritional quality and processability of grass pea? How high is the protein yield? How is the quality of the protein powder?	How do experts assess the market potential in Switzerland? Which specific products could be promising here?

Genotype screening 2021

- 532 Genotypes were screened at different sites
  - 254 IPK Gatersleben/Germany
  - 200 ICARDA/Libanon
  - 50 National Centre for Plant Genetic Resources: Polish Genebank/Polen;
  - rest from seed savers, seed producers, personal contacts
- Difficulties: extremely wet summer with multiple hail storms
- 100 Genotypes were selected based on qualitative phenotypic traits (including field emergence, soil cover, stability, beginning of flowering, height etc.) and harvest data

Intercropping and lab trials 2022

- Genotype screening (100 genotypes, 2 reps.)
- Different mixtures of grasspea with oat, triticale and lupine in different ratios will be compared (3 sites, 3 repetitions)
- Reference genotypes will be analysed for composition (protein patterns, amino acid spectrum, tannins, phytic acid, polyphenols, ODAP content before and after processing)
- Reference genotypes will be characterised with regard to industrial processability (Protein yield, production of protein powders, extrusion tests)

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