

## **Genetische Ressourcen und Züchtung vernachlässigter Kulturpflanzen - ohne Einsatz der Gesellschaft chancenlos!**



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## **Aims and structure**

1. Securing crop and cultivar diversity
2. Present situation
3. Alternative crops, a task for the state
4. Some interesting candidates
5. Switzerland, a pioneer!

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## Multifunctional agriculture, yes But BREAD first



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## "Alternative"/"New" Crops

- Wider crop rotations
  - Pesticide use and pesticide resistances
  - Fertilizer use and nutrient balances
  - Soil fertility
- Multifunctional impacts
  - New markets and diversification
  - Increased holiday value of rural areas
  - Biodiverse agro-ecosystems

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## Why the difficulties to integrate Alternative Crops?

- All important crops in cultivation since millennia
- Basic needs satisfied by cheap major crops
- New needs satisfied by transforming cheap primary products or by import
- Alternative crops decades behind in basic breeding

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## Dilemma

- Private breeding must concentrate on a few successful commercial crops
- The state has no long-term visions
- How to harness the horses into one motivated team?

## But history teaches hope for economic establishments of Alternative Crops

- Success stories sugar beets, rape seed and sunflowers
- What can we learn from them?

## From zero to two major oil crops for Central Europe

### Rape seed

Turn-around in product quality



### Sunflower

Turn-around in agronomic quality



<http://www.nies.ch/>

<http://www.landwirtschaft.gvs.ch>

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## Sugar from Europe

- Sugar beet:
  - A child of science and war
  - 200 years ago



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## Ongoing decline in arable cereals diversity in Switzerland

- Situation for cereals:
  - Bye Bye **oats** and **rye**
  - They joined **spelt wheat** as a minor niche crop within 20 years!
  - Au revoir?

## Private money goes to leading crops

Top 10 Seed Companies 2007 seed sales (Mill. \$)

1. Monsanto (US)	4,964 (23%)
2. DuPont (US)	3,300 (15%)
3. Syngenta (CH)	2,018 (9%)

Top 10 Total: 14,785 (67%)

None breeds alternative crops!

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## Direct payments EU Reallocate them to future needs?

- Rice (169 Mill Euro)
- Durum wheat (54 Mill Euro)
- Potato starch (111 Mill Euro)
- Grain legumes (67 Mill Euro),

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## The state of the art in Europe

- Productivity neglected in Europe for alternative crops.
- Good climates and good soils demand a global responsibility
- Neglected crops are neglected in research and development as well.

Aus: EASAC: PLANT GENETIC RESOURCES FOR FOOD AND AGRICULTURE, Rome 2009

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## Some alternative crops for Central Europe

- Amaranth, buckwheat, quinoa
- Hemp, flax, burning nettle
- Miscanthus, phalaris arundinaceae
- Oil poppy, cuphea
- Lupine, lentil
- Hop, tobacco,

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## Who breeds these crops in Europe?

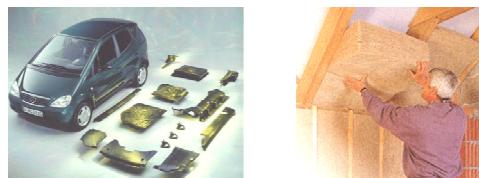
- None of the big companies
- Small companies release some varieties now and then
- But lacking means mean lacking behind in real progress

## Where to focus?

- Depending on crop and product a chain is needed
- This chain must cover all needs from seeds to marketing
- Rape seed and soybean were easy to implement as machines and oil mills existed
- This is different for fiber crops

## Example: hemp

- Short fiber hemp for car and construction industry
- Normal machinery required, low needs for plant protection
- Special machinery for processing needed
- Problem: long fibers for textiles still extracted with manual assistance



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## Hemp breeding demands

- **Variety situation:**
- Six varieties on the Swiss list, 49 in the EU Catalogue
- **Major breeding requirements**
  - Low THC content
  - Stable monoeciousness
  - Increasing fiber quality
  - Increasing biomass yield

Polish cultivars and perspective lines of industrial hemp, Małgorzata Strybę EIHA 2010

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## Example: (Blue) Lupine

- White lupine already established for warm temperate climates
- Blue lupine, a young crop for cool temperate climates
- Alternative to soybean concentrates



Julius Kühn Institut, Bundesanstalt für Züchtungsforschung, Gross Lüsewitz, Deutschland

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## The blue lupine chain

- 40% high value protein, but no double use like soy bean
- Normal machinery suitable
- Problem: Inhomogeneous maturation:
  - Single stem types are higher-yielding
  - Mutant "mirus" with simultaneously mature pods

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## Blue lupine

- Agronomic adaptation still too low
- Modern tools needed to close breeding gap
- Genetic base must be widened

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## Example: Buckwheat

- A former main crop for short hot seasons
- Old local dishes like "Black Polenta"
- Promising niche crop due to distinct taste
- Agronomic traits insufficient

- **New chance:**

**Second season crop**

After barley, making use  
of hotter summers



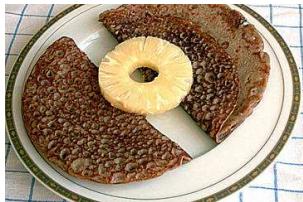
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## Buckwheat dishes

- Bread, pancakes, pizokels, black polenta etc.



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## Buckwheat

- No varieties on the Swiss list
- Some older ones in Austria and Germany
- Buckwheat not in the Common Catalogue of Varieties of Agricultural Plant Species, 2009

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## Buckwheat: Breeding demands

- Higher yield by self fertility and determinate growth
- Synchronized flowering and maturation
- Less antinutrients

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## **NAP**

- National Action Plan (NAP) to maintain and to use genetic resources
- Additional strong focus on Alternative Crops?
- Breeding must be a part of necessary change!

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## **Soybean** **A major global crop** **An alternative crop north of the ALPS**

- Switzerland took a pioneering role
- Financed by the Swiss public

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## Soybean CH

### History

- 1962 Physiology and genetics of soybean at ETHZ (E.R. Keller, A. Soldati).
- 1981 Breeding started at Agroscope ACW.
- 1988 First introduction of Swiss cultivars: Alvia, Silvia, and Ceresia
- Today triple Zero cultivars!

### Why Soybean?

- In the early 80ies, rape-seed the only oil crop in CH
- Good for crop rotation
- Reduce protein dependence in Europe



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## Soybean CH

- US yield 2009 : 2.96 t/ha
- CH yield 2009 : 3.33 t/ha

### Attained results

- Yield stability
- Added value (food, not feed)
- Swiss contribution of a diversification crop in EU



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## **Outlook to Action**

### **Reestablish alternative crop by breeding**

- We need a definite commitment by the state
- Outsourcing to and cooperation with private companies advisable
- Switzerland has shown the feasibility
- Use of genetic resources are just hollow words without doing it sustainably!

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## **Coordinated action needed on a European level for a long-term breeding program**

- State commitments to 25 years efficient breeding to close the gap
- Promising candidates must be adopted in a step-wise approach
- Private companies involved by special contracts
- Assessment of achievements in five years intervals
- The finances can be secured from direct payments, securing diverse crop choices for the future

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