Contribution of organic agriculture to in-situ conservation of plant and animal resources, and risk management in agro-ecosystems.

- Urs Niggli, Research Institute of Organic Agriculture FiBL, Frick, Switzerland

- Side-event „Growing genetic ressouces in organic agriculture“, FAA; Iran Room, October 20, 2009

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Species, crops, genetics

- **Diversity of species**
  - 13 million species of animals, crops and microorganisms.
  - 7000 plant species cultivated in agriculture.
  - 120 plant species important for production.
  - 30 crops provide 95 % of food.
- **Genetic diversity in agriculture**
  - 4’000 cultivars/varieties of potatoes.
  - 100’000 cultivars/varieties of rice.

Loss of genetic diversity in agriculture

- ¾ of all crop species lost (FAO).
- Rye production in Germany: 3 cultivars produce 95 % (*).
- Wheat production in Canada: 4 cultivars produce 75 % (*).
- Coffee production in Brazil: 1 major cultivar (*).

(*) Oppermann et al., 2001.

Organic farming and biodiversity

- Biodiversity is an important driver for the stability of agro-ecosystems (Altieri and Nicholls, 2006), and hence, for a continuously stable supply of food.
- In organic agriculture, biodiversity is both the **means** and the **end**.
- As organic farmers cannot use synthetic substances (e.g. mineral fertilizers, pesticides) they depend on carefully restoring the natural ecological balance.

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Multi-level biodiversity

Risk management of organic/low-input farms

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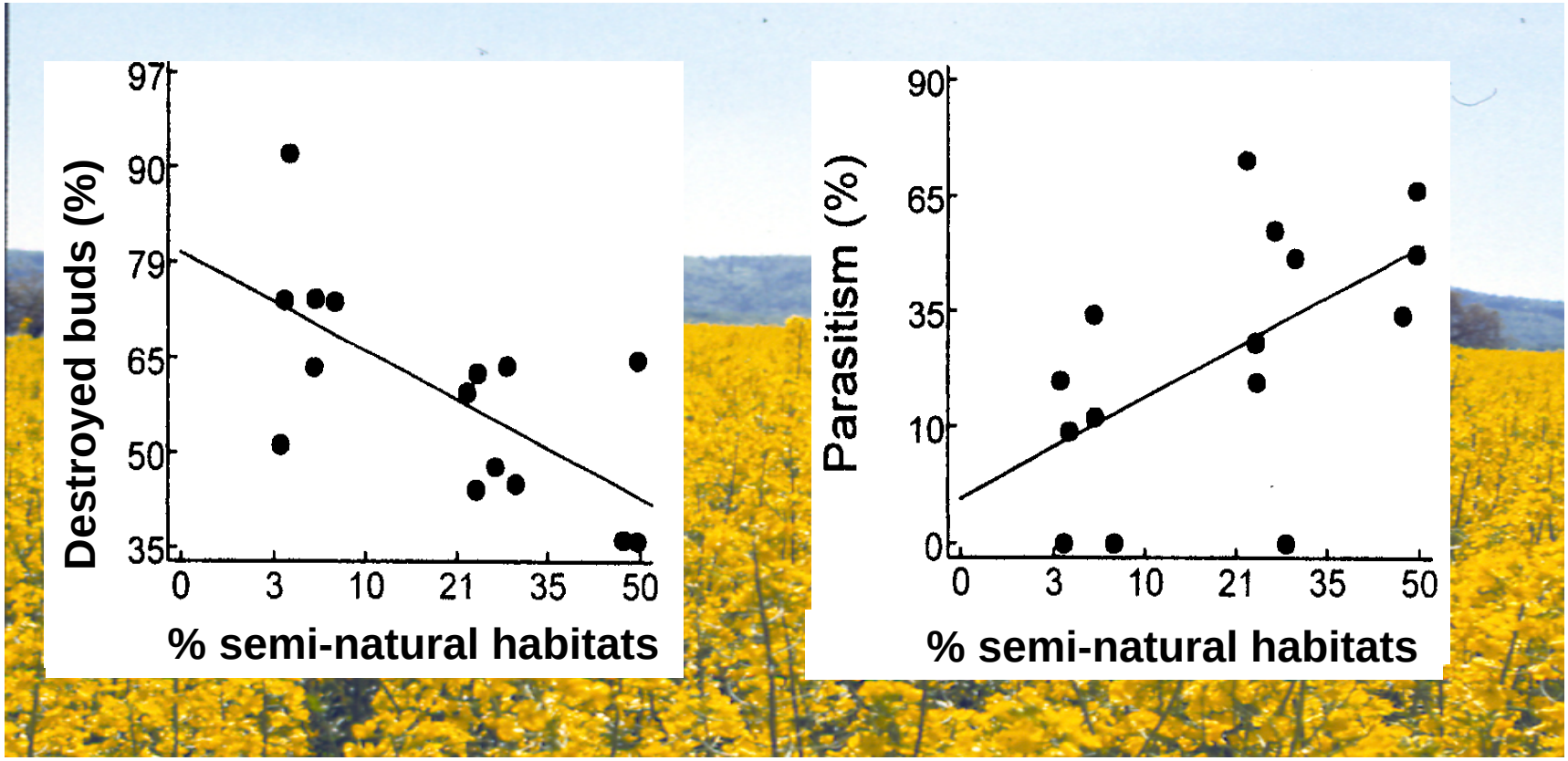
Diversity of landscapes and pest control

-> ***The regulation of the rape pollen beetle by parasitoids correlates with % of natural habitat.***



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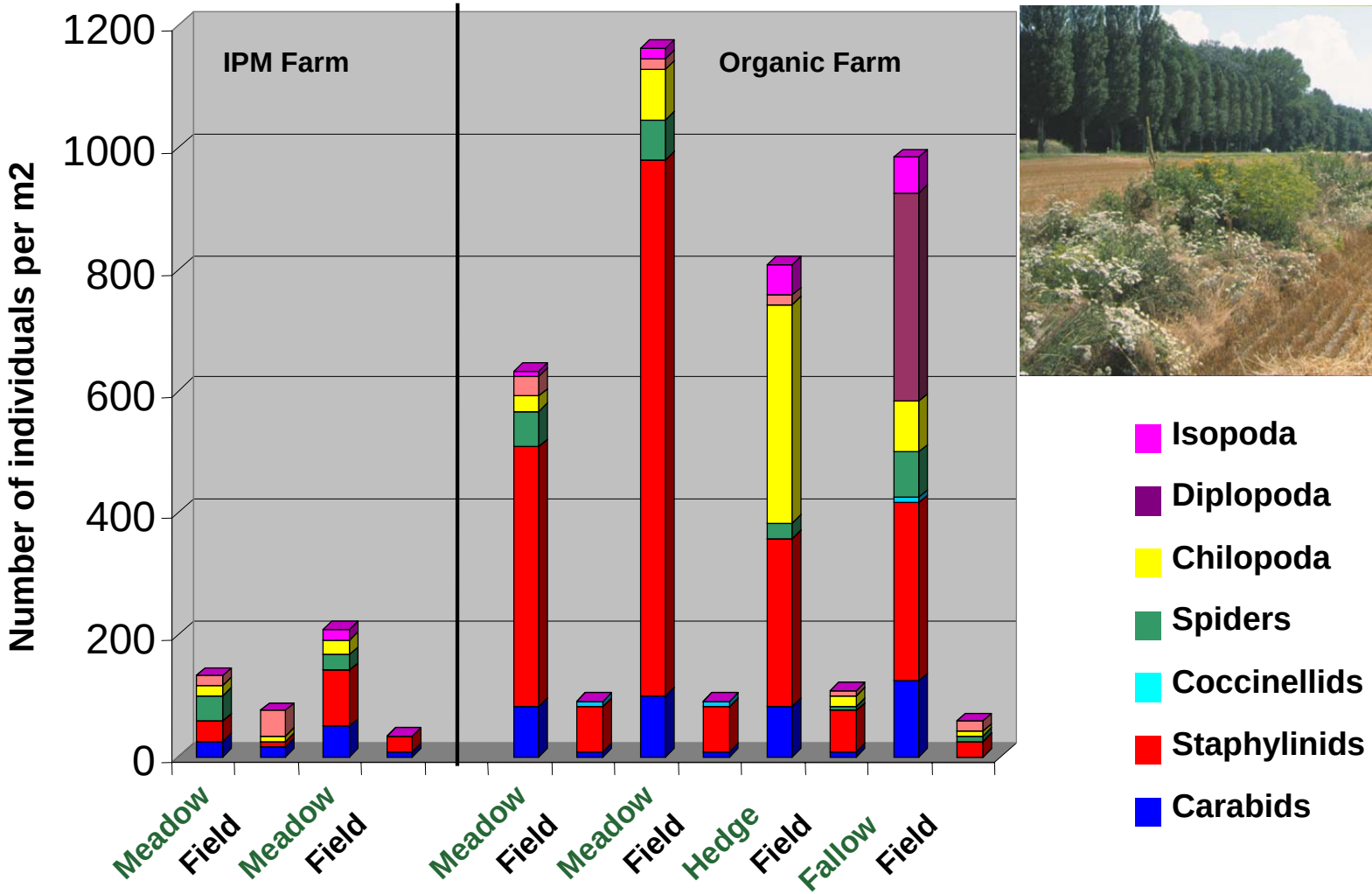
Thies & Tscharntke 1999, Science

Overwintering in ecological compensation areas plays a key role for beneficials



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FiBL IPM

Companion plants to enhance beneficials in the field

Companion plants serve as food sources within the crop to enhance longevity and oviposition of parasitoids

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Companion plants to enhance beneficials in the field








FiBL is actually testing different plant species to enhance parasitoids of cabbage pests

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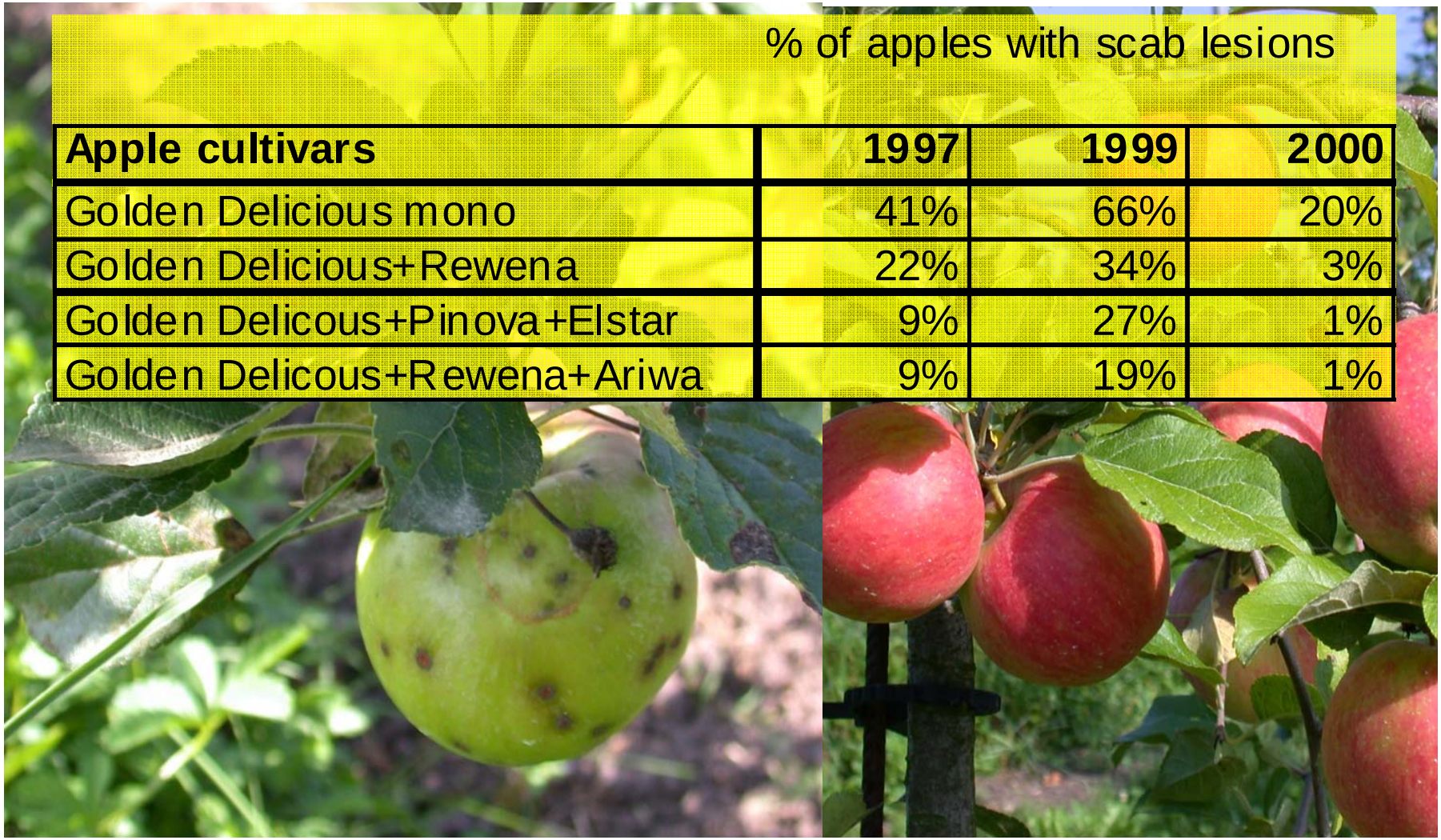
Cultivar mixtures and plant health



	% of apples with scab lesions		
Apple cultivars	**1997**	**1999**	**2000**
Golden Delicious mono	41%	66%	20%
Golden Delicious+Rewena	22%	34%	3%
Golden Delicous+Pinova+Elstar	9%	27%	1%
Golden Delicous+Rewena+Ariwa	9%	19%	1%

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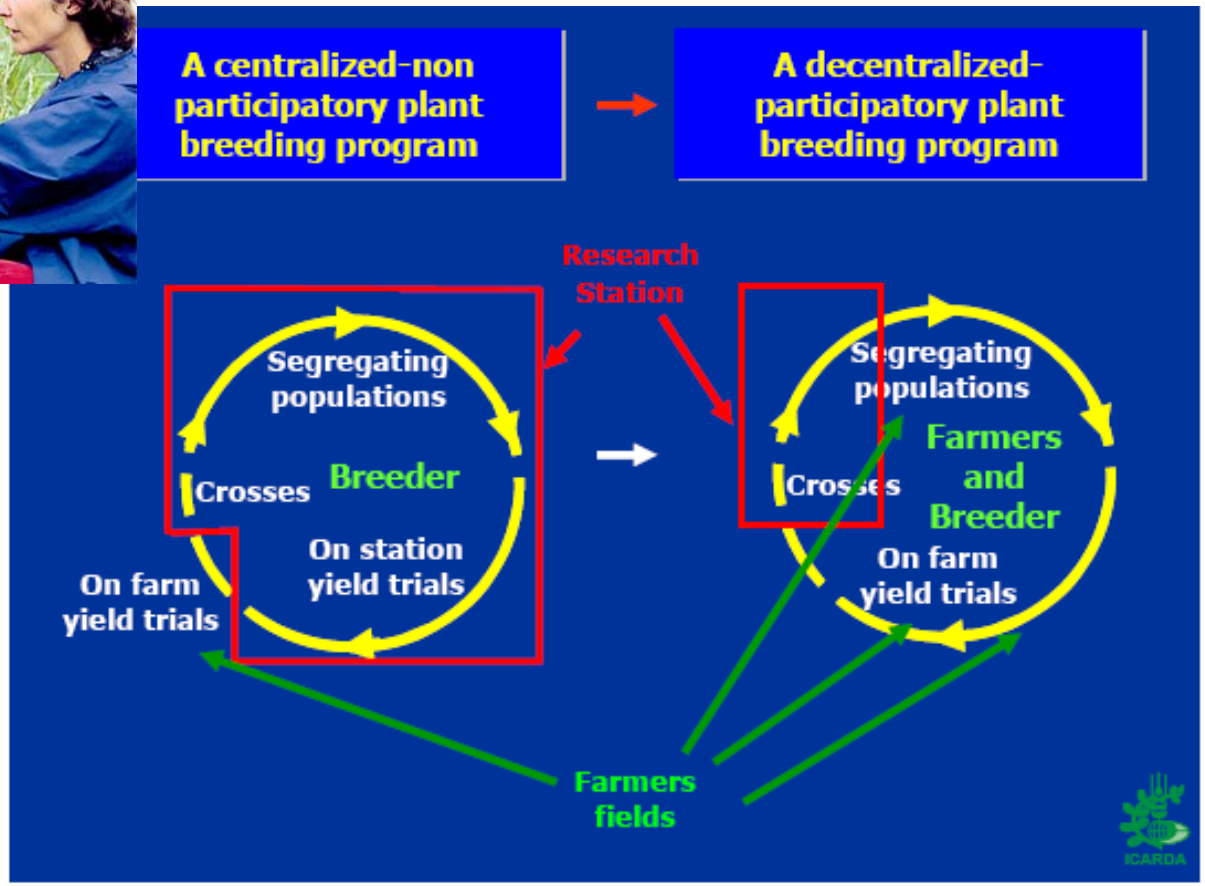
Gessler, *et al*., 2003

Especially suited for organic farming systems: participatory plant breeding programs



Source S. Ceccarelli. ICARDA

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www.farmseed.net

www.fibl.org

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High genetic diversity: risk management of farms

- Production under marginal site conditions.
- Extended ripening and harvest periods.
- Tolerance and resistance management (pests, diseases, drought, floods, temperature).
- Higher use efficiency of water, nutrients, light through heterogenic plant and livestock populations.
- Response to changing consumer demands.

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NGOs maintaining old varieties *in-situ*

- ProSpecieRara (Switzerland)
- Dreschflegl (Germany)
- Heirloom Seeds (USA)
- Seedsavers Network (Australia)
- Irish Seedsavers (Irland)
- Red Andaluza de Semillas (Spain)
- Seed Savers Exchange (UK)
- Arche Noah (Austria)
- Arche Austria (Austria)

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Why is in-situ (on-farm) conservation important?

- Maintain as many varieties/cultivars as possible as future needs are unknown.
- At the lowest possible costs.
- Exposure to environment is indispensible.
- Systematic selection under environmental stress (adaptation).
- Adaptation of seeds has a social dimension: knowledge on cultivars/varieties bound to farmers.

Johannes Kotschi, 2008

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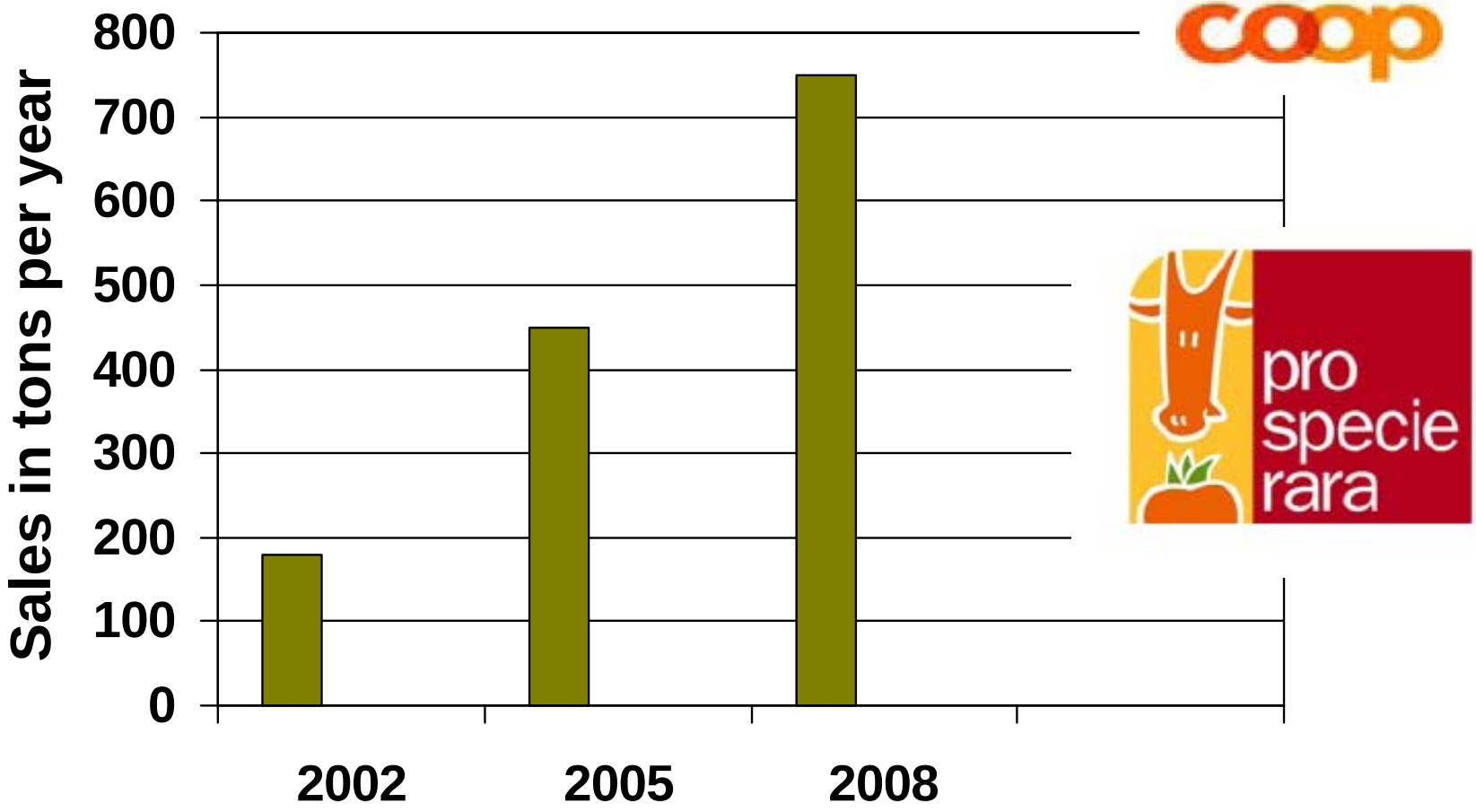
Successful marketing of organically grown heirloom cultivars in a Swiss supermarket



20 varieties of vegetables
6 varieties of apples

Some of the 26 heirloom cultivars successfully marketed in Switzerland

coop

pro specie rara

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Conclusions

- More research on functional biodiversity in order to improve productivity of organic farms.
- Proposing regulation scenarios that recognize and encourage on farm varietal innovation and selection.
- Look into genotype x environment interactions of heirloom varieties and breeds and start selection programs with them. Understand the mechanisms (farmers' practices, natural selection) that drive the evolution and adaptation of these varieties.
- Research on variety mixture and cross composites in order to increase yield stability and quality.
- Research on mixtures of cereals and grain legumes.

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