Challenges to the use and conservation of pollinators in Germany, Jordan and Kenya

Institute of Agricultural Zoology and Bee Biology

Bonn, Germany

Challenges to the use and conservation of pollinators

Germany

- Decline of beekeepers and colonies
- Natural Habitats
- Management of orchards
- Features of varieti
- Pollinators in green houses

Jordan

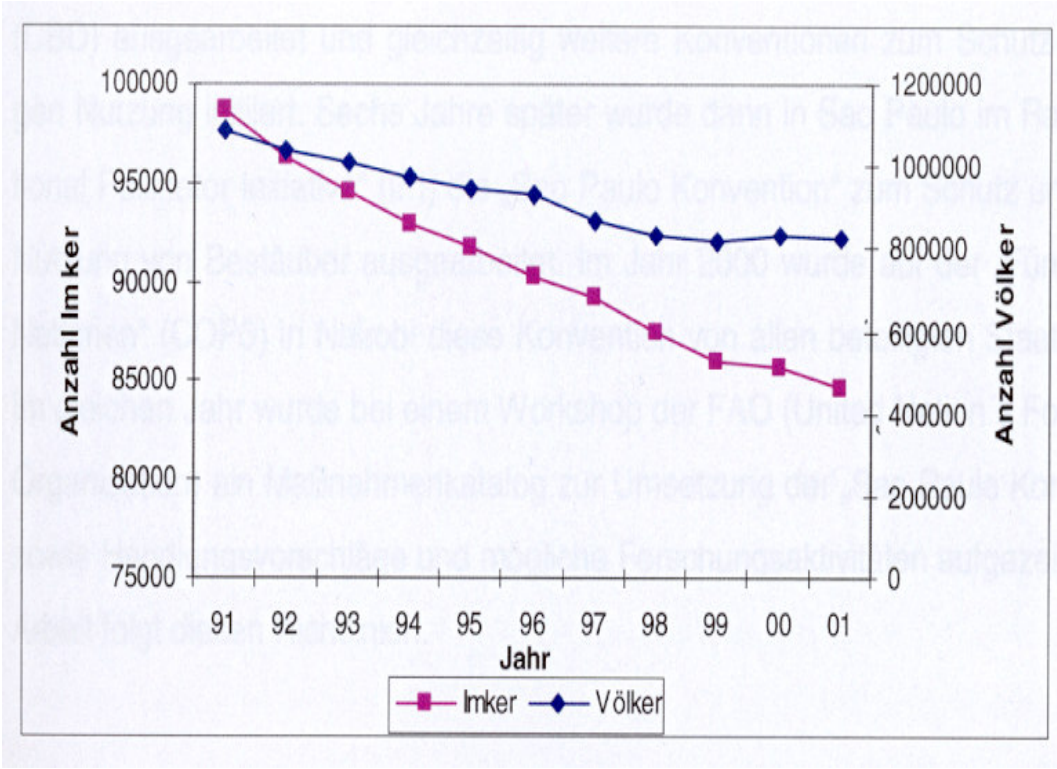
- ? Who are the pollinators?
- Managing pollinators in Jordan Valley
- Managing pollinators in the desert

Kenya

- Tea and Passionfruit at Mt. Kenya
- Bee habitats

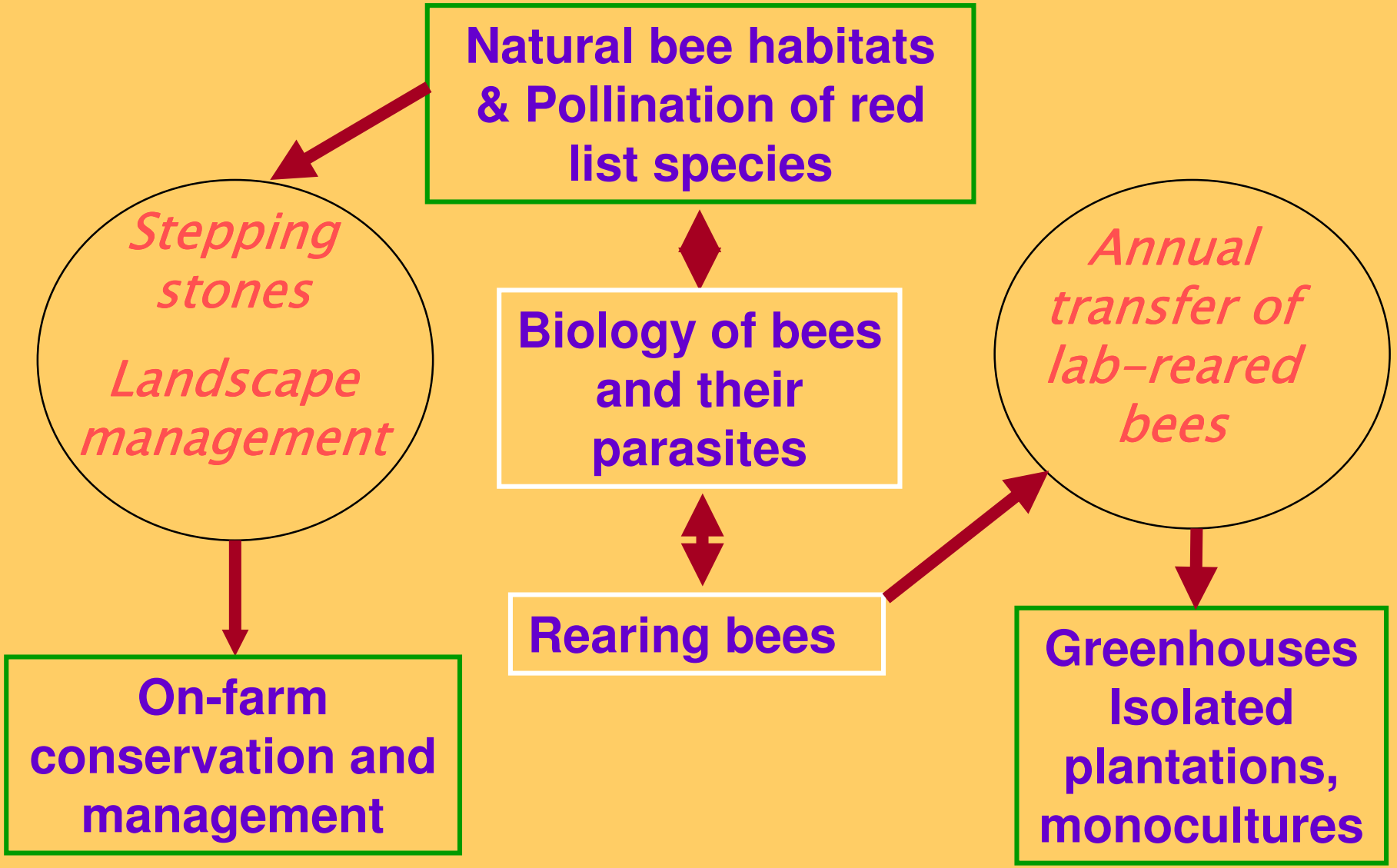
Conclusions

- On-farm conservation
- Rearing workaholic bees
- ? Convincing economy?



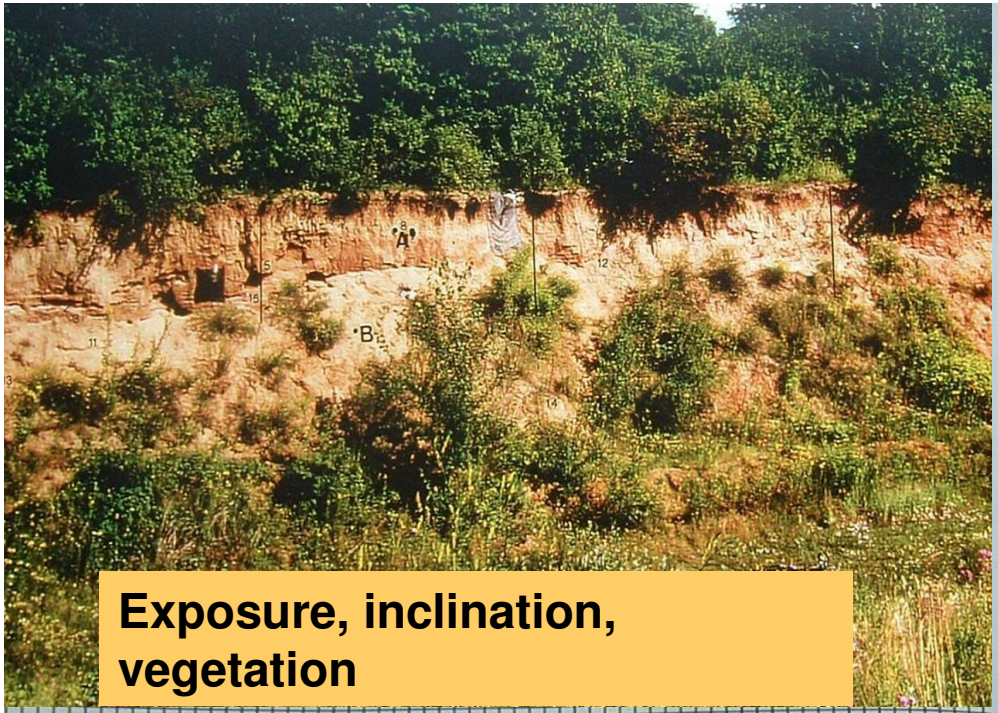
Decline of beekeepers and honeybees

Conservation and sustainable use of bees

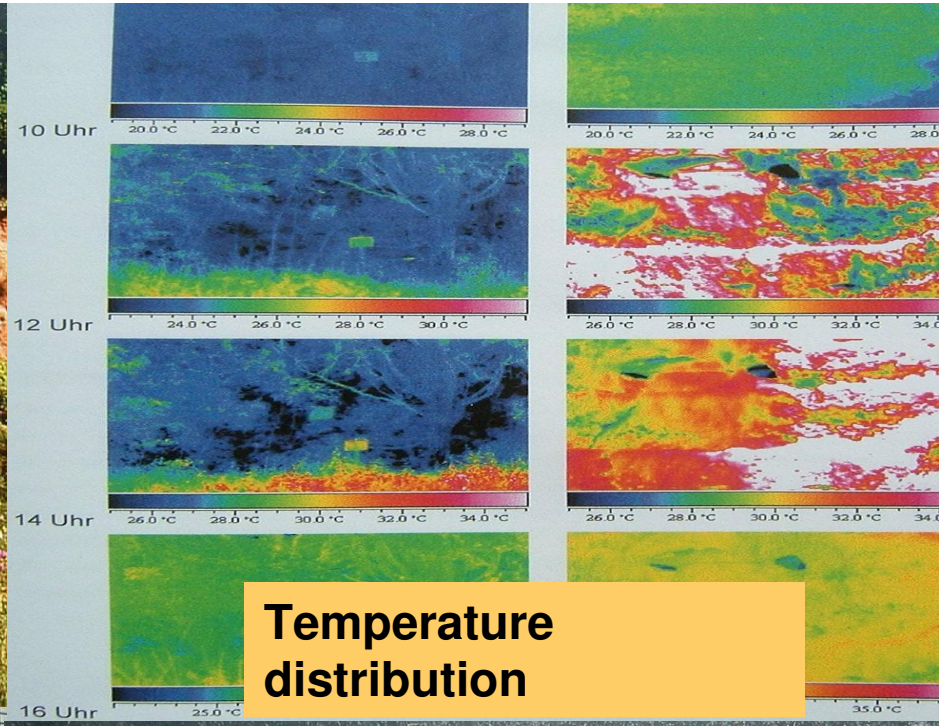


Studying natural habitats

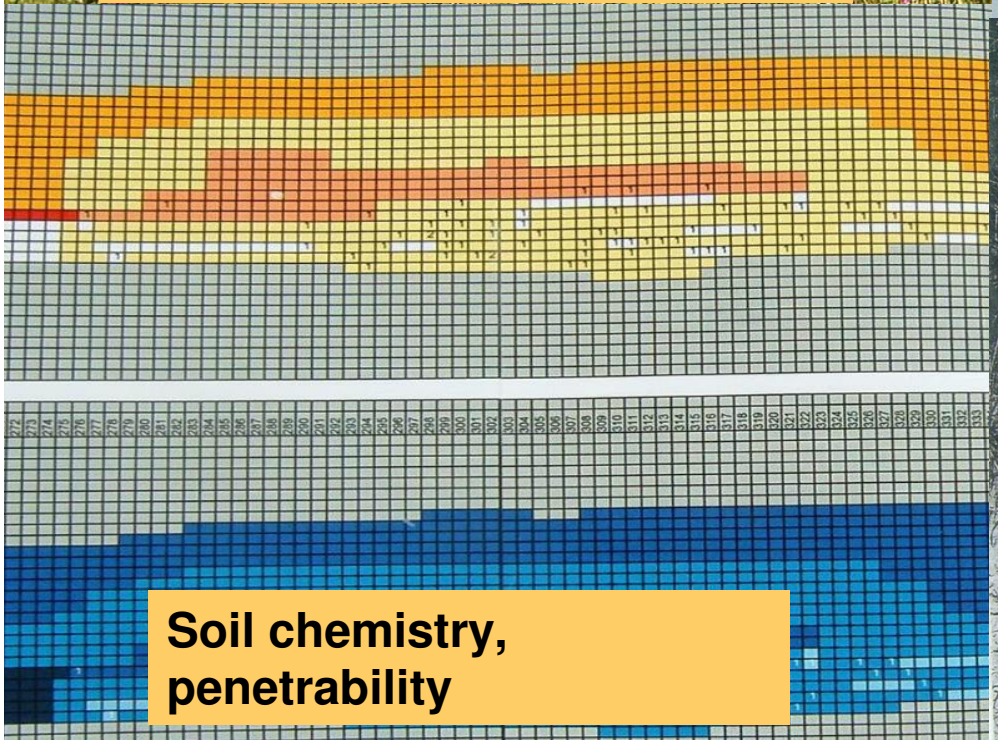
Characteristics of cliffs as nesting habitats



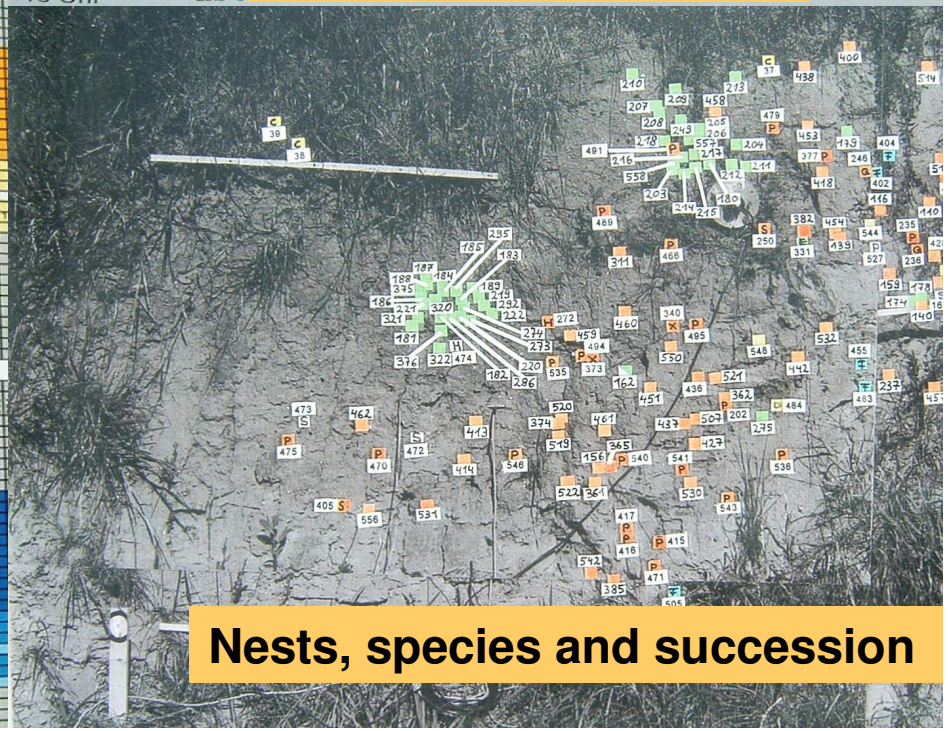
Exposure, inclination, vegetation



Temperature distribution



Soil chemistry, penetrability



Nests, species and succession

Candidates for pollination in orchards

Osmia cornuta **prefers pollen from Rosaceae like apple and cherry trees**

Candidates for pollination in orchards

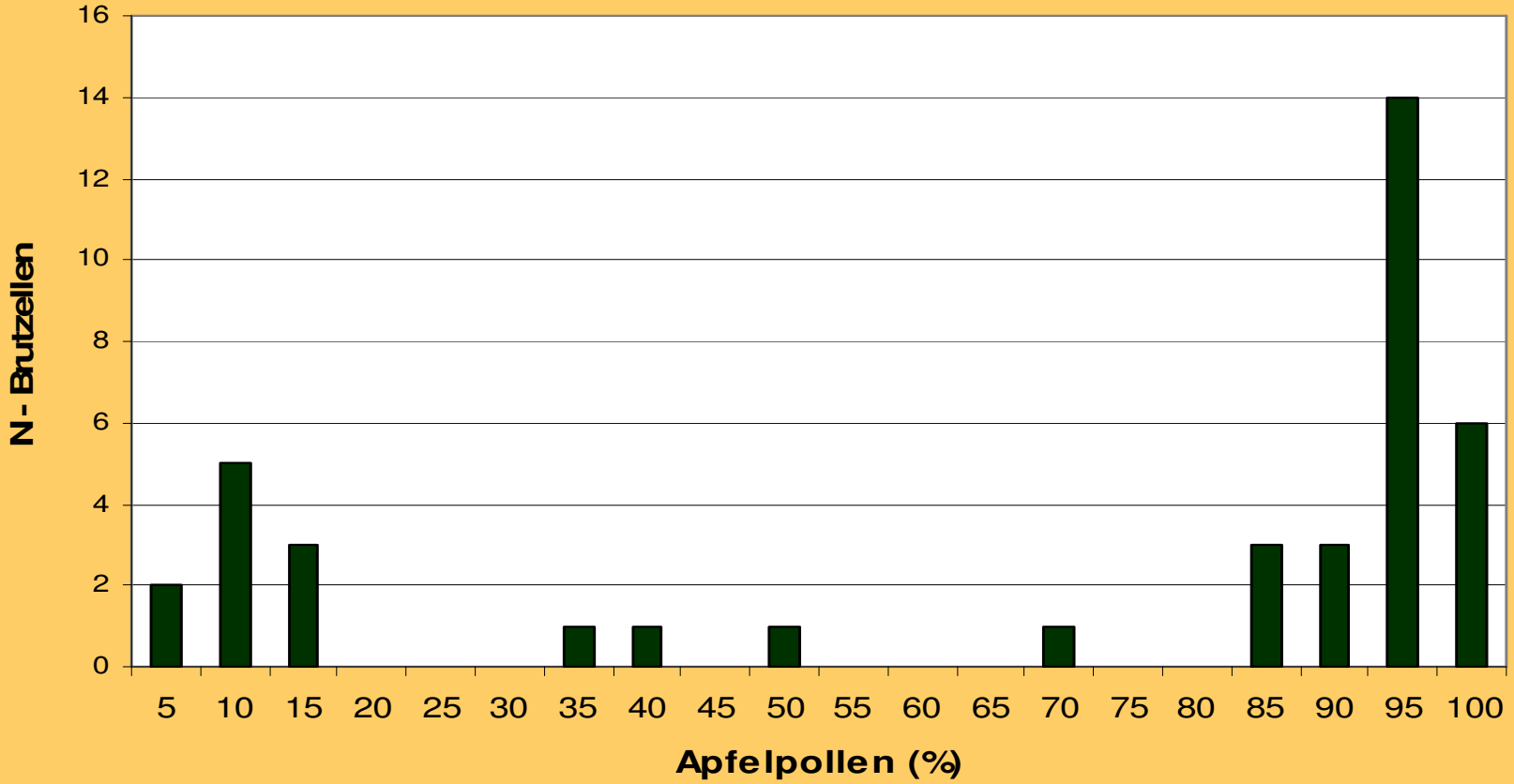
Osmia rufa accepts trap nests and collects pollen from Rosaceae like apple- and cherry trees

Andrena haemorrhoa **collects pollen from apple and cherry trees. It nists in sandy soil, sparcely covered with vegetation.**

Characterizing pollinators

Population size, frequency at flower, anther & stigma contact, pollen deposition, quanti. & quali. composition of pollen load, cross pollinating

Characterizing pollinators



Proportions of apple pollen in brood cells of Osmia rufa

Characterizing pollinators

Behaviour of bees on apple flowers

	Apis mellifera	Osmia cornuta	Bombus terrestris
flower visits n	116	564	217
stigma contacts n	87	517	211
stigma contacts [%]	75%	92%	97%

On-farm management of pollinators

Characterizing orchards and their surroundings as bee habitats

März	April	Mai	Juni	Juli	August	September
Salix spec.						
	Taraxacum officinalis-Gruppe					
	Prunus domestica					
	Prunus avium					
	Pyrus communis					
	Malus domestica					
			Trifolium repens			
				Crepis biennis		
				Crepis capillaris		

Phaenogram of dominant melittophilous plants in the plantation

Surroundings of Plantations

Type of biotope	area [ha]	area [%]
Acre	165,2	52,1
Fruit plantation	77,2	24,4
Plantation of trees	32,7	10,3
Roads	26,7	8,4
Strawberry plantation	5,6	1,8
Water	3,4	1,1
Forest	1,5	0,5
Area temporarily out of use	1,5	0,5
Settlement	1,3	0,4
Fruit plantation out of use	1,2	0,4
Pasture	0,5	0,2
Total area	316,8	100

März	April	Mai	Juni	Juli	August	September

Malus domestica

Crataegus monogyna

Fragaria x ananassa

Vicia sepium

Galium mollugo

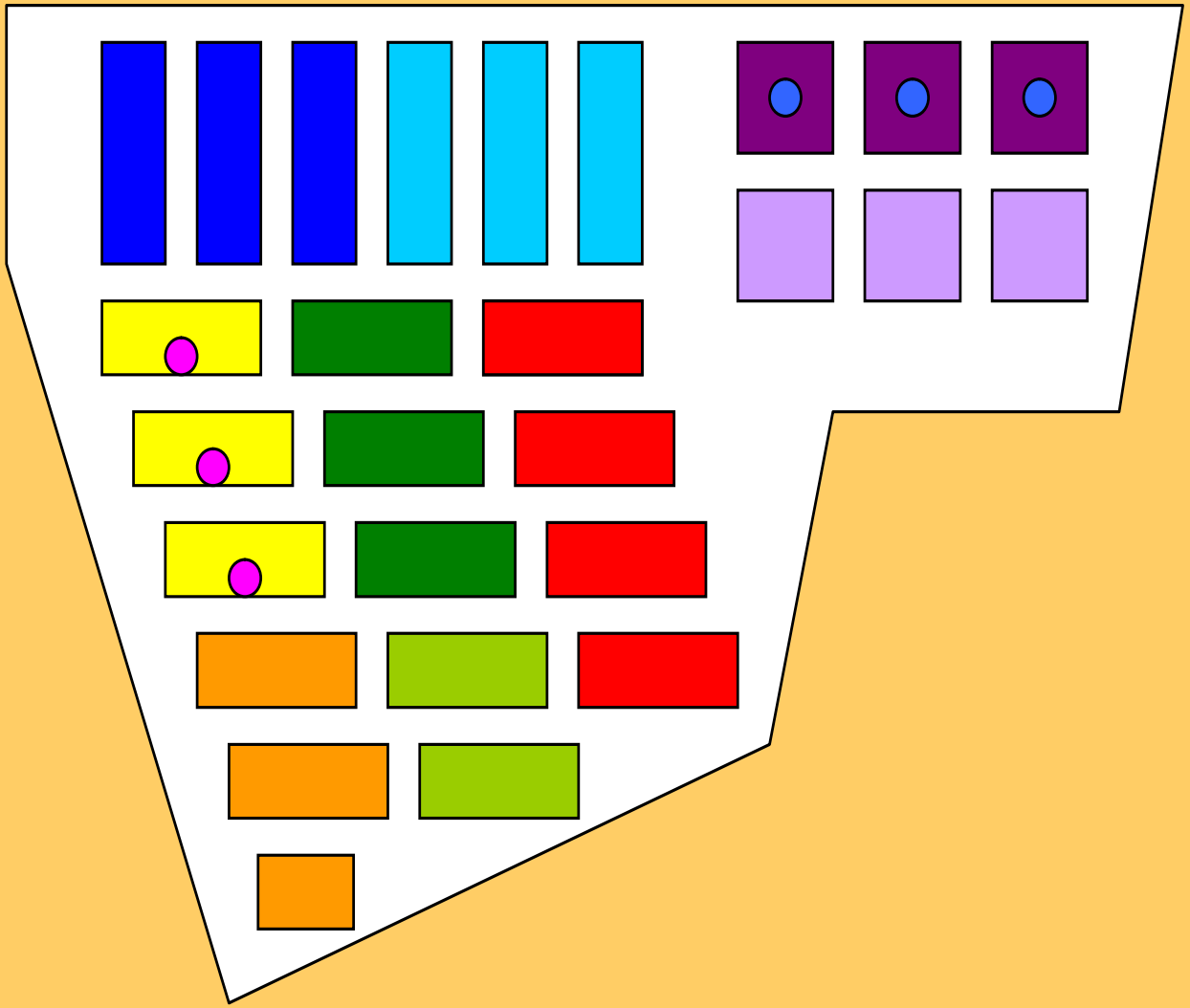
Epilobium hirsutum

Achillea millefolium

Chrysanthemum vulgare

Heracleum sphondylium

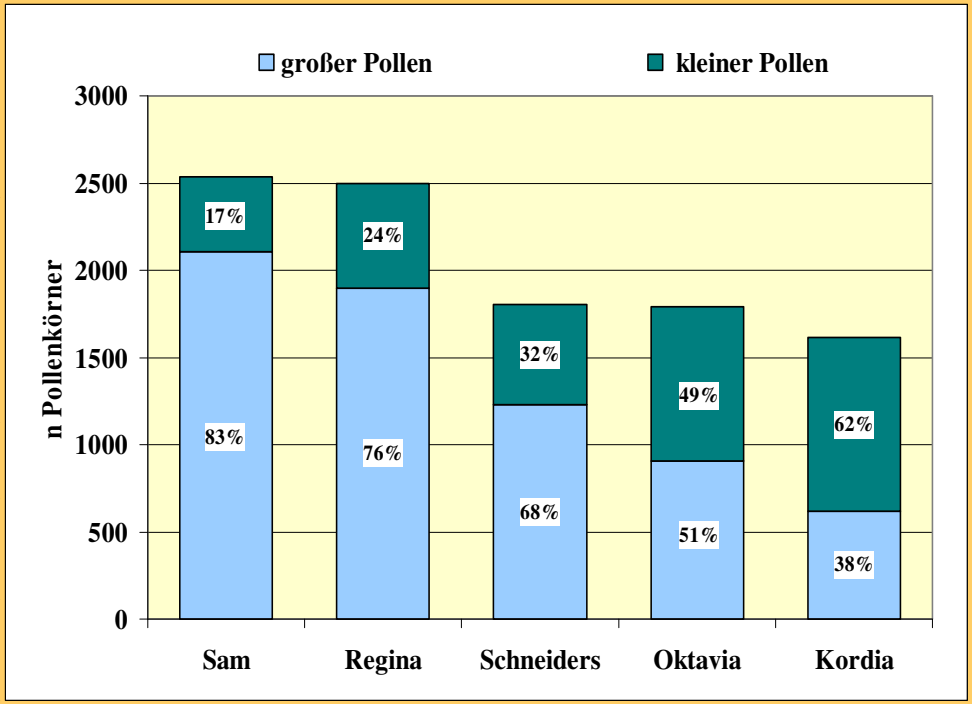
Characterizing crop varieties



Characterizing crop varieties

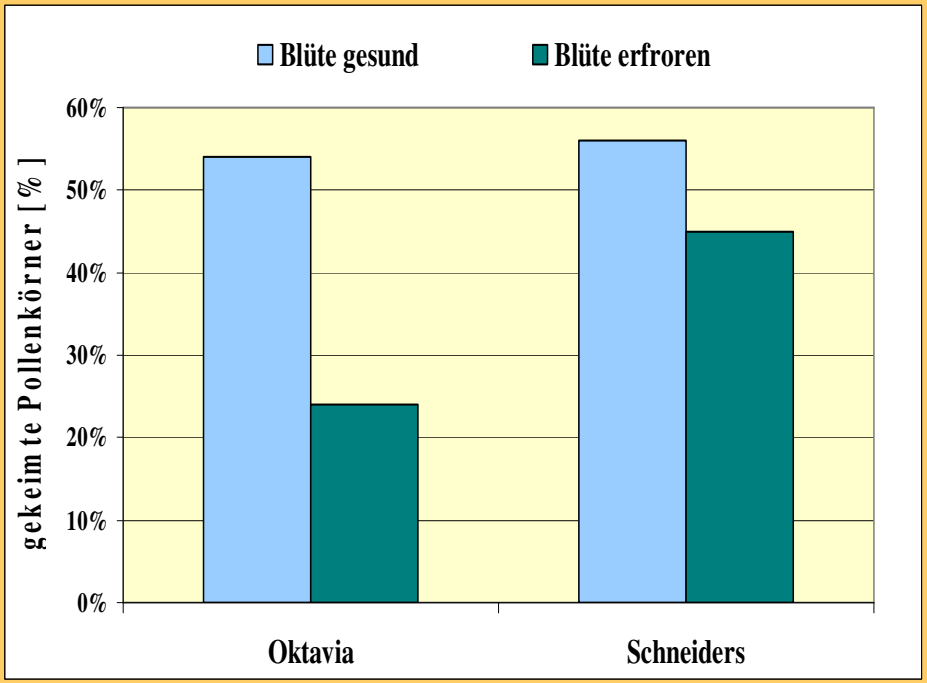
Fruit set in cherries after manual pollination with different varieties

	Donor Schneider fruit set [%]	Donor Octavia fruit set [%]
autopollination	0	74
same variety cross	73	No data
other variety	72	56



Number and percent of fertile and sterile pollen per anther in varieties of sweet cherries

Characterizing crop varieties

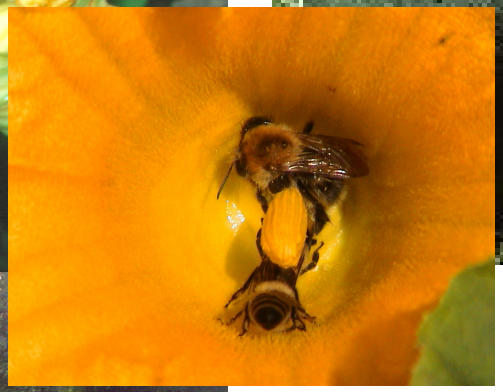


Percent of viable pollen from healthy and frozen blossoms of two varieties of sweet cherry (Oktavia: n=3698, Schneiders: n=4256)

Resources from sweet cherries per ha

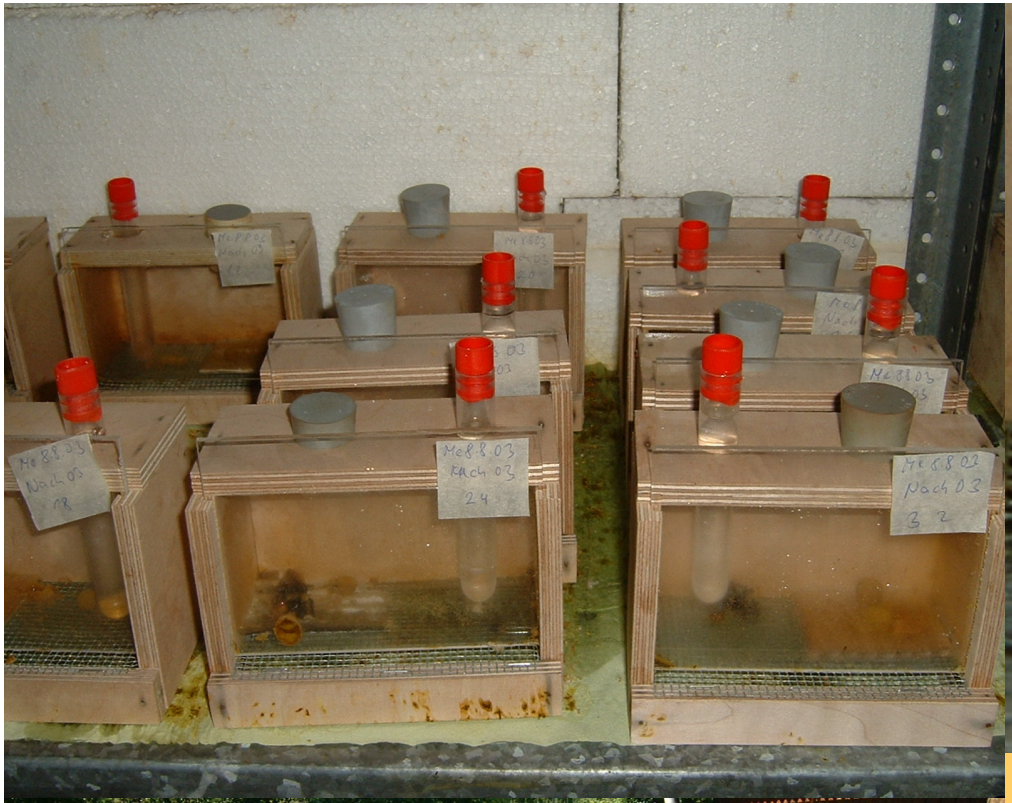
variety	nectar l /ha	pollen grains n/ha
Sam	629	$3,9 * 10^{12}$
Oktavia	493	$2,5 * 10^{12}$
Regina	484	$3,4 * 10^{12}$
Schneiders	403	$2,5 * 10^{12}$

Do aliens need no or new partners ?



In Germany squash varieties are cultivated since the 60ties.

Which breeding system?



Rearing Bombus „with a little help of their friends“

Know-how transfer to:
Mexico, Colombia

Best management practicies?

Sustainability?

Not habitat conservation but animal protection?

Costs of pollination management

Comparing colony sizes, honey yields, working hours and fruit yields (Apis : Bombus)

„Fuit-Oases“ in Jordan

Who and where are the pollinators?

Aliens in Jordan Valley:

No water and space for bee habitats

Hanging gardens above the desert

Getting lost in repetitive landmarks

Bee shuttle to pollinator prisions

Limits of pollinator management?
Not sustainable
High cost
Alternatives:
Plant breeding

autocompatability

Tea and passion fruit at Mt. Kenya

Only the wrong bee is available

No bee habitats available

Obstacles to sustainable use

- Socio-economic situation
- No space
- No water
- Bees do not reproduce at working site
- Depletion of natural populations

Thank you

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Pollination of exotic crops

Who does the job?