Adaptation processes need a base on-farm and in-garden as broad as possible

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I have spent most of my life in a rich, densely populated and industrialized country. Crop failure is no matter of life or death, landraces are scarce and the seed industry supplies most of the demand. Hybrid varieties are much in use and their share in the seed trade is increasing. I was brought up in a backyard garden for self supply, ran a market garden for organic vegetable seed production and got a PhD in plant breeding. My main topics in research are site specific adaptation and strategies in organic breeding.

Farms and gardens can (again) be centres of crop biodiversity and crop adaptation to a changing environment. The following examples highlight some aspects of the important work done by farmers and gardeners.

1) **Screening for interesting genotypes in a changed environment**
During the past four decades outdoor tomato cropping has almost come to an end in Central Europe due to increasing virulence of the fungus disease late blight (*Phytophthora infestans*). In four years of screening for *Phytophthora*-tolerant varieties it became obvious, that most of the interesting varieties originated from NGOs and individual seed savers and were maintained in organic agriculture. Commercial varieties were of limited use. Collections and (hybrid-) breeding-lines of breeding companies are not accessible for public use.

2) **Adaptation by selection within existing varieties**

Seed production and selection in practical agriculture and horticulture frequently starts with seed lots from colleagues, gene banks, and (older) commercial varieties. Segregating populations, for instance composite crosses, are difficult to obtain. Additionally they would be of limited use to farmers.
There is strong experimental evidence, that the selection within varieties of lettuce (*Lactuca sativa*) and lentil (*Lens culinaris*) can lead to improved varieties and / or site specific adaptation. The lentil project gave evidence of divergent populations as the result of natural and conscious selection on three farms. The performance of some populations was superior at the farm where they had been selected.
Both lettuce and lentil are self-pollinating species with restricted potential for recombination and selection. Still we could demonstrate the adaptive properties of selection on-farm.

3) **New plant types for changing needs**

Observant farmers and gardeners can find and develop new types of cultivated plants if they have sufficient knowledge of selection and seed production. Farmers in Northwestern Germany selected local types of kale (*Brassica oleracea*) that can show distinct morphological differences even within one village. These ‘Eastfriesian Palms’ are very tall and were traditionally of triple or even fourfold use for animal and human consumption and as fuel. The populations were handed from generation to generation. Most of them were at the brink of extinction.

Scorzonera hispanica is an underused root crop. Its preparation for cooking is laborious due to the black bark of the taproot and its resinous juice. Selection in a market garden has resulted in an almost barkless root.

How can we broaden the base for adaptation processes on-farm and in-garden?

Developing strategies for outcrossing crops.

Empoverment of farmers and gardeners to work with seed production and selection within the concept of food sovereignty.

The workshop ‘On-farm and in-garden seed conservation and education’ will deal with practical knowledge, marketing and education on Wednesday.

The workshop ‘Seeds: Community commons, private control and public domain’ will deal with legal restrictions on Thursday.

Literature

Horneburg, B., Becker, H.C. 2008: Crop adaptation in on-farm management by natural and conscious selection. A case study with lentil. Crop Science 48: 203-212.

Horneburg B.; Becker, H.C. 2007: Organic outdoor tomatoes – regional screening and breeding in Germany. Book of abstracts of the EUCARPIA symposium ‘Plant breeding for organic and sustainable, low-input agriculture’. 7.-9.11., Wageningen, The Netherlands: 58.