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Ethnobotany as an interdisciplinary method for the study of the management of agrobiodiversity in home gardens of alpine farmers in Eastern Tyrol, Austria

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Abstract Species diversity in home gardens in Eastern Tyrol (Austria) has increased during recent decades. Now, 587 species are cultivated, including 75 endangered species. Species were introduced from natural ecosystems, agroecosystems and the market. Use and management of species respond to local needs and reflect co-evolutionary bio-cultural management. Gardens are important in a dynamic concept of *in-situ* conservation of traditional knowledge of agrobiodiversity and endangered species or local cultivars.

Keywords ethnoecology, ethnobiology, traditional ecological knowledge, biodiversity, mountain agriculture, in-situ conservation

INTRODUCTION

Agrobiodiversity in alpine agroecosystems depends on the respective form of land-use (JUNGMEIER 1997, BITTERLICH & CERNUSCA 1999). Farmers' home gardens in alpine mountainous areas are a typical element of land-use within the mosaic of agroecosystems managed by farmers (VOGL-LUKASSER 2000). However, this kind of land-use is small in area, not market-oriented, and managed by women. It may be that these factors are responsible for the fact that home gardens have been neglected (IPGRI 2000) and that scientific research on farmers' home gardens - despite recent increased popularity of gardening - has not been realized, neither in Austria nor at the European level, with only few exceptions (BRUN-HOOL 1980, AGELET *et al.* 2000, VOGL-LUKASSER 2000).

In contrast, much ethnobotanical research, including the topics of home gardens and agrobiodiversity, is carried out among the indigenous peoples of the developing world. This research has led to interesting results and new insights into composition, management, and importance of these agroecosystems for subsistence and conservation of agrobiodiversity (see review

for literature on ethnobotany of home gardens in VOGL 1998 and LANDAUER & BRAZIL 1990). Interest in the scientific assessment of the knowledge of “farmers nearby” and of the value and potential of temperate gardening on farms has led to a research project (VOGL-LUKASSER 2000) during 1997 and 1998.

MATERIALS AND METHODS

Ethnobotany as an interdisciplinary method for the study of agrobiodiversity management

Plant use and plant-human interrelationships are shaped by history, by physical, and social environments. The roles played by plants reflect the biological and physical properties of the plants, the biological and perceived needs of humans, the natural and anthropogenic environments of which the plants are a part, and the genetically limited responses of plants to human disturbance. Ethnobotany is the study of these plant-human interrelationships embedded in dynamic ecosystems of natural and social components (ALCORN 1997).

This modern concept of ethnobotany, where the tasks of ethnobotanists change from cataloguing taxa and their uses to the understanding and evaluation of plant-human interactions, leads to an integrative, interdisciplinary focus (DAVIS 1997). Complementary tools from botany, anthropology, social sciences, and participatory rural development together constitute the interdisciplinary methodology of Ethnobotany (MARTIN 1995). In this context the term interdisciplinarity refers explicitly to the fact that tools and methods from different disciplines merge in the hands of scientists to answer a certain research question. In the present case, a combination of botanical, social science and anthropological tools has been used.

Method

In 1997 and 1998, 196 home gardens on farms from 12 communities in Eastern Tyrol were investigated. Each year, cultivated plant species (occurrence and abundance) were surveyed on each of three separate dates. Voucher specimens were taken according to MARTIN (1995) and species identified according to recent botanical references (VOGL-LUKASSER 2000).

Structured interviews were carried out with each of the women responsible for these home gardens. The interviews collected information on the use of the different plants and on characteristics describing the location, management, layout and importance of the garden. Semi-structured interviews about the management of farms over the last 70 years with special

focus on home gardens were carried out with 27 elderly women. Results of these interviews serve as a historic baseline for the description of changes in floristic composition and management in recent years (BORTZ & DÖRING 1995, MARTIN 1995).

Material

The terms *home garden* or *garden* (in earlier times called *herbal garden*) refer in this paper to the small (size ranged between 12 and 220 m²), fenced plot close to the farmers' homestead, where annual, biannual and perennial cultivated species (except trees) are grown in beds for the purpose of immediate subsistence.

Annual precipitation in the district of LIENZ (Eastern Tyrol) is 850 - 1150 mm and mean annual temperature 4.8 - 6.9°C (WASCHGLER 1993). The farms surveyed are situated between 600 and 1641 m above sea level. The average area of agricultural land located near the homestead is 7 hectares, and mainly consists of hay meadow. 47% of the surveyed farms have small plots (average size 0.01 hectares) of field vegetables (mainly potatoes, *Solanum tuberosum*) grown on moderate slopes, and 79% have orchards.

RESULTS

Floristic change

Until the 1970s, Alpine subsistence farming in Eastern Tyrol was primarily based on cultivation of cereals, field vegetables, fibre crops, hay meadows near the homestead, alpine hay meadows, alpine summer grazing grounds and a wide array of animal species. *Herb gardens* provided a small number of species (Tab. 1) used as spices (e.g. *Allium fistulosum*, *Levisticum officinale*), medical herbs (e.g. *Althaea officinalis*, *Artemisia absinthium*), plants used in customs (e.g. *Lilium candidum*, *Paeonia officinalis* ssp. *officinalis*) and scent plants (e.g. *Artemisia abrotanum*, *Rosa centifolia*).

Farming systems in Eastern Tyrol have been in a process of change in the last few decades. Cultivation of cereals (e.g. *Secale cereale*, *Triticum aestivum*), fibre crops (e.g. *Linum usitatissimum*, *Cannabis sativa*) and field vegetables (e.g. *Pisum sativum*, *Vicia faba*) has been declining. As an adaptive response to these dynamics, the women responsible for gardening have actively enriched species diversity in their gardens. Species have been introduced into gardens, not only from the surrounding agroecosystems where biodiversity is eroding, but also from natural ecosystems or other geographic regions (via retailers and wholesalers). As a consequence, a remarkable increase of the number of species grown in the gardens can be observed (Tab. 1).

Tab. 1: Occurrence, source and use of plant species (n = 587) in East-Tyrolean home gardens (n=196) before and after the 1970s.

Occurrence	Number of species	
	until 1970s	nowadays
Number of species across the region	+/- 51	587
Mean occurrence per garden	+/- 10	42
Source	until 1970s	nowadays
Surrounding natural ecosystems and agroecosystems	+/- 3	46
Predecessor, neighbours, friends (barter, gift)	+/- 25	74
Other geographic regions via retailers and whole-salers	+/- 2	133
A mix of the above mentioned sources	+/- 19	334
Main Uses	until 1970s	nowadays
Ornamental species (incl. species with symbolic value)	+/- 20	420
Food crops (Vegetables, Spices etc.)	+/- 16	147
Medical herbs	+/- 12	79
Tools	+/- 4	58
Customs	+/- 25	43
Fodder	0	37

Introduction of species from surrounding ecosystems

Women are increasingly introducing new species from surrounding ecosystems into the home gardens. This is due to new patterns of seasonal mobility with reduced visits to remote areas, which reduces their opportunity to collect species they need (e.g. *Rubus idaeus*, *Hypericum perforatum*). Secondly, these women have become aware that, unless introduced into gardens, the above described change of land-use would lead to the loss of certain species related to special forms of land-use (e.g. *Primula farinosa*, *Lilium bulbiferum ssp. bulbiferum*).

For some wild species that have been introduced from natural ecosystems, a process of domestication can be observed (e.g. *Lilium martagon*, *Arnica montana*). These wild plants can be relatives of commonly cultivated plant species (e.g. *Allium schoenoprasum ssp. alpinum*, *Artemisia umbelliformis*) native to the region. Of the wild plants, some have a status of endangered species. 75 cultivated species in the studied gardens have some kind of endangered status and are registered on the Austrian *Red List* of endangered ferns and flowering plants (as defined in NIKLFELD & SCHRATT-EHRENDORFER 1999). These plants (Tab. 2) can have regional origins, but may also be introduced from the market (or a mix of both). 16 endangered species grow naturally in other

Tab. 2: Examples of species of the red list, found in the studied home gardens (n=196 home gardens and n = 75 species of the red list).

Species	Status	Nr. of gardens
<i>Agrostemma githago</i>	1	3
<i>Marrubium vulgare</i>	1	1
<i>Iris sibirica</i>	2	8
<i>Centaurea cyanus</i>	3	35
<i>Achillea ptarmica</i>	3	67
<i>Lilium bulbiferum</i> ssp. <i>bulbiferum</i>	3	28
<i>Malva moschata</i>	3	10
<i>Omphalodes verna</i>	4	3
<i>Dianthus barbatus</i>	- r	99
<i>Gentiana verna</i>	- r	1
<i>Primula veris</i> ssp. <i>veris</i>	- r	4
<i>Verbascum phlomoides</i>	- r	2

1 = close to extinction; 2 = highly endangered; 3 = endangered; 4 = potentially endangered;
- r = regionally endangered.

regions of Austria with different ecological conditions (e.g. *Xeranthemum annuum*, *Silene conica*, *Sagina subulata*).

As a response to the decline in cultivation of field vegetables, farm women have introduced local varieties of field vegetables into gardens. These varieties, propagated and grown in gardens, are passed on as seeds at only 21% of the farms examined. The most common are *Vicia faba*, *Solanum tuberosum* and *Brassica rapa* ssp. *rapa*. Women propagate and cultivate certain local species and varieties, because they want to be more independent from the external economic market, and because local species or varieties a) respond better to site-specific conditions; b) encode personal history or events which should be remembered; c) are needed in festivities, customs or in social organisations; d) are needed for common and beloved dishes; e) are not available at the market in the needed specification; and f) have “always been grown”.

Species traditionally grown in gardens

In addition to species recently introduced into gardens, species traditionally grown in *herb gardens* can still be found in Eastern Tyrol. *Traditional* garden species are almost exclusively perennial species with a few annual or biannual species. Perennials were passed on by predecessors in 77% of the gardens (at an occurrence between 1 and 22 species/garden). Of those species,

12 are popular today and these are found in more than one third of the gardens. They include species such as chives (*Allium schoenoprasum* ssp. *schoenoprasum*) and garden phlox (*Phlox paniculata*). 29 other traditional perennial species are grown in a few gardens (e.g. *Rosa centifolia*, *Mentha x gentilis*, *Allium fistulosum*).

Five traditional annual or biannual species with spontaneous reproduction (*Calendula officinalis*, *Chamomilla recutita*, *Dianthus barbatus*, *Tanacetum parthenium*, *Satureja hortensis*) and one biannual species which is proactively propagated in gardens (*Brassica rapa* ssp. *rapa*) have survived over a long period in the region. The *Brassica*-species was traditionally grown in gardens only to produce seeds for further cultivation in fields.

Nowadays, in addition to local propagation, plantlets or seeds of traditional perennial, annual or biannual species might also be bought from retailers. Four traditional species (*Lactuca sativa* var. *capitata*, *Origanum majorana*, *Allium cepa* var. *cepa*, *Brassica oleraceae* var. *capitata alba*) are purchased only from retailers today.

Introduction of species new to the region

Attractive properties of new species from the market, changing diets and culinary habits, developments in processing and storage, new information and knowledge on gardening, curiosity and the pleasure of experimentation have led to the introduction of species new to the region (*Brassica oleracea* var. *gemmifera*, *Brassica oleracea* var. *sabauda*, *Brassica oleracea* var. *italica*, *Capsicum annuum*, *Cucurbita pepo* convar. *giromontiina*).

Proactive replanting and propagation is not limited to traditional species. Women are replanting recently adopted and newly introduced species in 181 gardens, which in some cases has been going on for between 10 and 20 years. Often, farm women end up at the fence of the garden talking, bartering, or giving a gift to passers-by (in approx. 1/4 of all cases, the source for a certain species in a certain garden has been a barter or a gift).

Use of plants

The major part of species has ornamental use (Tab. 1), but abundance data (not presented here) shows that these are grown only with few individuals per species and the area for ornamentals amounts to approximately only 15% of the garden. Plants grown in home gardens are used in a variety of different ways and 27% of all species show multiple use. The major area of gardens is used to grow species that have a certain purpose for human consumption (VOGL-LUKASSER 2000).

DISCUSSION

In many alpine regions, land-use already shows “a devastating break-down” (BÄTZING 1996a & 1996b). This includes loss in agrobiodiversity (PENZ 1996). Eastern Tyrol is no exception. As an example, cultivation of field vegetables, cereals, and fibre crops is in decline (this paper), as also discussed for other regions by NETTING (1981), PENZ (1996) and CERNUSCA (1999).

Floristic composition and management of home gardens in Eastern Tyrol show a different trend. Not only in Eastern Tyrol are farmers’ home gardens highly diverse. In many countries of the world, these gardens are living gene banks where landraces, obsolete cultivars, rare species and endangered species are preserved (NAZAREA 1998, IPGRI 2000).

In the laboratory of adaptive response, farm women manage home gardens as an area of experimentation and innovation. Local varieties of traditional and recently introduced species are still being developed today through the selective replanting of those plants that better address the needs of the farm family and the local culture.

Home gardens therefore serve as valuable sites for the dynamic concept of conservation of agrobiodiversity (complementary to the static concepts of *ex-situ* conservation, HAMMER 1998), where the continuation of a kind of “evolutionary process” takes place. This “evolutionary” process is not seen as purely natural, but as a process, where the genotype is placed into the interaction between natural and cultural environment (NAZAREA 1998).

The data in this paper and of AGELET *et al.* (2000) support the suggestion that it is not only in heavily explored tropical regions that hot spots of bio-cultural management of agrobiodiversity can be found, but also in industrialized and “developed” Europe, which has a lower natural and cultural diversity than the tropics.

Science and policy can empower the local people who still maintain agroecosystems that conserve agrobiodiversity as part of their culture, life-style, or practice. This paper shows, that farm women play an important role in this process. But other counterparts do exist, as for example, organic farmers who have proven to protect and enhance agrobiodiversity (LINDENTHAL *et al.* 1996, MCNEELY & SCHERR 2001).

CONCLUSION

Traditional ecological knowledge of local people in the Alps is probably not limited to management of useful plants in home gardens, but extends to a wide array of elements in the agroecosystem that have key functions for

the survival and welfare of rural people. Further ethnobotanical or ethnoecological studies need to focus on traditional ecological knowledge in the management of all plots of the mosaic managed by farmers, not only home gardens, and on all farming activities that include the management or use of natural resources (e.g. veterinary medicine, management of waters, prevention of natural disasters, etc.). Not only farmers, but also other members of the rural society (alpinists, hunters, gatherers, artisans, etc.) might hold valuable knowledge and should be addressed in further studies as well.

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