

**ASSESSMENT OF CROP DIVERSITY IN HUNGARY: POSSIBLE
INDICATORS FOR GENETIC VARIATION**

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-- Parallel Session --

Group 1-C. Plant Genetic Resource Diversity

Monday 5 November 2001

Paper presented to the:

**OECD Expert Meeting on Agri-Biodiversity Indicators
5-8 November 2001
Zürich, Switzerland**

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ASSESSMENT OF CROP DIVERSITY IN HUNGARY: POSSIBLE INDICATORS FOR GENETIC VARIATION

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ABSTRACT

The tendency of changes in number of registered cultivars has recently been assessed in Hungary for the last 40 years. It appears that the figures are continuously increasing and speeding up especially during the last 10 years. The number of registered cultivars of field and vegetable crops was 268 in 1960 compared with their number of 2342 in 1999. It is anticipated that the number of cultivars available for crop production will dramatically increase (up to about 25-30,000) after Hungary will have become a member state of the European Union. Changes in the proportion of cultivars developed from native germplasms vs. introduced foreign varieties have also been analysed for the main crops.

During the last ten years, efforts have been made to establish a central database and national base collection for native genetic resources in Hungary. This database serves as a basic reference for allocation of specific funds made available for the preservation, maintenance, and evaluation of existing crop gene resource accessions maintained in „ex situ” collections. A total of 103,423 accessions are maintained in 69 collections from field crops, vegetables, fruits, table and vine grapes, medicinal and ornamental plants, and micro-organisms.

Since 1996, a special project deals with the „on farm” conservation of Hungarian landraces. The project forms part of the global programme co-ordinated by IPGRI aiming the establishment of a scientific base for „on farm” conservation and participatory plant breeding. Research has been extended to reveal the role of home gardens and small farms predominantly growing crops for self-consumption and family needs in the maintenance of crop genetic diversity. The project also intends to study economic aspects of on farm conservation including private and public benefit/price analyses.

It is concluded that the development of indicators for the genetic component of diversity is essential to obtain a clear picture on the current status of the extent and maintenance of native diversity in agricultural production. The use of suitable indicators will greatly enhance the effectiveness of policy measures in safeguarding existing diversity.

Background information

Plant breeders have used native landraces and ecotypes since the beginning of scientifically based crop improvement programmes at the end of the 19th century. Breeders collected and evaluated local materials and improved them by mass and single plant selection. At a varying degree, depending on the crop species, such lines are still used in ongoing crop improvement programmes (wheat, green pepper, Phaseolus bean, onion, forage legumes and grasses, cherry, apricot, grape etc).

The first ex situ crop variety collection was established at Tápiószele, in 1950. Later when the Institute for Agrobotany was founded in 1958, collections were extended with the inclusion of accessions from breeding stations and universities. Following the recommendations of the first UN Conference on the Environment (Stockholm, 1972), two cold storage rooms were built and a programme was initiated for updating collections to meet the requirements for genetic resources conservation. The Institute has been maintaining collections of field and vegetable crops and act as a co-ordination centre for crop genetic resources activities in Hungary.

Legislation

Hungary signed the Convention on Biological Diversity, and The Parliament approved CBD in the Act No. 1955/LXXXI. The registration of plant cultivars and the production and certification of sowing seeds and reproductive material are regulated by the Act No. 1996/CXXXI in accordance with UPOV. This Act also declares the need for the conservation of PGRFA as a state-funded activity (§ 29).

The Ministry of Agriculture issued a Decree on the conservation and utilisation of plant genetic materials in 1997 (92/1997 (XI. 28.)). In the same year decrees were also issued on State registration of crop varieties (88/1997), on Certification of sowing seeds (89/1997), on Certification of horticultural plants (90/1997) and on the Certification of forest reproductive material (91/1997).

The Ministry of Agriculture established a National Gene Bank Council as a technical and scientific advisory body, and provides fund for the conservation, regeneration and characterisation of PGR accessions included into the National Genetic Resources Database. A National Base Collection was also created for safety duplication of accessions of seed propagated crops.

Registered cultivars and species available for cultivation

As part of the efforts made to develop a National Biodiversity Strategy and Action Plan, an attempt to assess the biological diversity in the Agri-ecosystem was made (Heszky et al. 2000).

This study intended to assess changes and tendencies in the following components of agri-biodiversity:

1. Number of species cultivated
2. Number of registered cultivars
3. Variation within cultivars

In Hungary, the number of species used in plant production is around 350. The number of species in cultivation has not changed significantly during the last 50 years. At the same time, the number of registered cultivars considerably increased. The total number of registered cultivars was 258 in 1950 contrasting their number of 3651 in 1998 (Fig. 1.). It is expected that the number of registered cultivars will continue to grow, but the average life span of individual variety decreases. In parallel with the increase of registered cultivars, landraces and traditional varieties started to disappear from cultivation. Genetic vulnerability of main field crops was the highest in the early seventies when only a few, genetically related cultivars were grown in the case of wheat, barley and maize. The situation has been improved since that time, for example the number of registered wheat cultivars increased from 3 to 108 in 2000. Nevertheless only 11 of them (10%) are used in more than 80% of the total wheat growing area.

Crop genetic resources

Collection and conservation of crop genetic resources has a long history in Hungary. Collecting missions have been organised and undertaken since 1960 in all parts of the country resulting more than 10,000 accessions of landraces, ecotypes and other locally adapted plant material. Traditional cultivars have also been included into PGR collections after they were removed from the national list of registered cultivars. The status of genetic resources collections was summarised in the Country Report for Hungary in 1995.

Ex situ collections

During last years, the current status of state funded germplasm collections has been assessed and basic passport information incorporated into the National PGR Database at the Institute for Agrobotany. At present, the total number of PGR accessions held at different collections exceeds 100,000 (see tables).

On farm conservation

In 1959, Andor Jánossy, first director of the Institute for Agrobotany initiated a programme for the multiplication of landraces under iso-climatic conditions near the places where they were first collected. The principal purpose of this programme was to conserve the original genetic composition and integrity of landraces and local varieties by minimising directional selection pressures. A network of farmers has been developed in several districts and contracted to multiply about 4-500 accessions each year.

Recently, several former collection sites have been re-visited to assess the changes in the locally grown species and populations. It was found that a considerable number of local populations are still grown especially in home gardens and backyards. While assessing crop diversity this hidden part of diversity should not be overlooked.

Based on earlier experiences, an on farm project was developed in Hungary to study the technical and scientific bases of dynamic maintenance of locally adapted populations. The project linked with IPGRI's global programme and has recently been extended to study some economical aspects of on farm conservation. Three sites were selected from environmentally sensitive areas where shifting towards low input agricultural practices is essential. Sites include Tiszahát, Dévaványa and Örség. A complex approach is applied including the assessment of diversity at land use, species, cultivar, and genetic level, complemented with social-economic evaluation of farms involved into the study. It is expected that the information to be obtained will be successfully utilised in the development of economically sound on farm conservation programmes.

Exploration of wild relatives of crops and wild species with potential for agricultural production has also been undertaken in Hungary. Special attention is paid to close relatives of cultivated species like *Aegilops cylindrica*, *Secale sylvestre*, *Daucus carota* and *Lactuca serriola*. So far no evidence for serious extent of genetic erosion has been found in these species. Some of these species are even spreading (*Secale sylvestre* and *Lactuca serriola*) and considered as dangerous weeds. More detailed study is needed, however, to reveal the status and changes in genetic variability in such cases. In situ conservation of such species raises specific problems since they grow predominantly in disturbed habitats where traditional nature protection measures are not effective.

Conclusions

It is considered that a complex approach is necessary to assess and monitor diversity of crop plants and related wild species. Diversity at the ecosystem level needs special considerations different from the ones applied for natural flora. Land use diversity and socio-economic evaluation should receive high priority and genetic diversity be given special attention as the inherited part of biological diversity.

Table 1. Number of accessions in „in situ” collections in Hungary

I. Field crops

Institute	Location	No. of accessions
Institute for Agrobotany	H-2766 Tápiószele	44238
Agricultural Sciences Center, University of Debrecen Research Station Nyíregyháza-Kisvárd	H-	635
Agricultural Research and Development Public Utility Company	H-5540, Szarvas	304
Agricultural Research Institute of the Hungarian Academy of Science	H-2462, Martonvásár	2942
AGROTAB Breeding and Seed Ltd.	H-4014 Debrecen	134
Faculty of Husbandry and Agriculture, Saint Stephan University	H-3356 Kompolt	1970
West-Hungarian University	H-9200 Mosonmagyaróvár	951
Cereal Research Public Utility Company	H-6726 Szeged	5540
Research Institute of Agricultural Sciences Center, University of Debrecen	H-5301 Karcag	989
Agricultural Sciences Center, University of Debrecen	H-4032 Debrecen	1860
Georgikon Faculty of Agricultural Sciences, University of Veszprém	H-8360 Keszthely	298
Total		59861

II. Vegetables

Institute	Location	No. of accessions
Institute for Agrobotany	H-2766 Tápiószele	8224
Red pepper Research and Development Public Utility Company	H-6300 Kalocsa	306
Cereal Research Public Utility Company	H-6726 Szeged	896
Vegetable Production Research Institute	H-1224 Budapest	2511
Saint Stephan University	Gödöllő	460
Dr. Géczi László	H-4400 Nyíregyháza	112
Center of Agricultural Sciences, University of Debrecen	H-4032 Debrecen	472
Georgikon Faculty of Agricultural Sciences, University of Veszprém	H-8360 Keszthely	1429
Total		14410

III. Medicinal and aromatic plants

Institute	Location	No. of accessions
Institute for Agrobotany	H-2766 Tápiószele	3706
Medicinal Plant Research Institute	H-2011 Budakalász	1709
Saint Stephan University, Faculty of Horticultural Sciences, Department of Medicinal and Aromatic Plants	H-1118 Budapest	1572
Ökoherba Ltd.	H-2766 Herencsény	52
Total		7039

IV. Fruits

Institute	Location	No. of accessions
Fruit Growing Research and Development Institute, Cegléd	H-2700 Cegléd	496
Fruit Growing Research Institute, Újfehértó	H-4244 Újfehértó	1782
Fruit Growing Research and Development Institute, Fertőd	H-9435 Sarród	453
Dr. Szentiványi Péter	H-1126 Budapest	89
Highschool of Horticulture, Kecskemét	H-6000 Kecskemét	210
West Hungarian University, Faculty of Agricultural Sciences	H-9200 Mosonmagyaróvár	133
Mátra-Tan Research and Education Public Utility Company	H-3200 Gyöngyös	170
Fruit and Ornamental Plant Production, Research and Development Institute, Érd	H-1223 Érd	2978
Saint Stephan University, Department of Fruit Yielding Plants	H-1118 Budapest	674
Saint Stephan University	Gödöllő	300
Agricultural Centre, University of Debrecen	H-4032 Debrecen	148
Georgikon Faculty of Agricultural Sciences University	H-8360 Keszthely	498
Total		7931

V. Grapes

Institute	Location	No. of accessions
Research Institute of Grape Growing and Viticulture	H-7634 Pécs	914
Szőlőskert Viticultural and Cooling Industrial Company	H-3214 Nagyréde	99
Research Institute of Grape Growing and Viticulture	H-6001 Kecskemét	1428
Research Institute of Grape Growing and Viticulture	H-3301 Eger	490
Saint Stephan University, Department of Horticultural Sciences	H-1238 Budapest	50
Saint Stephan University, Genetics and Breeding Department	Gödöllő	319
University of Debrecen, Centre of Agricultural Sciences	H-4032 Debrecen	157
University of Veszprém, Faculty of Agricultural Sciences Georgikon	H-8360 Keszthely	859
Total		4316

VI. Ornamental plants

Institute	Location	No. of accessions
Institute for Agrobotany	H-2766 Tápiószele	36
Ecological and Botanical Research Institute of the Hungarian Academy of Sciences	Vácrátót	2297
Saint Stephan University, Faculty of Horticulture, Botanical Garden, Soroksár	H-1238 Budapest	448
National Park of Bükk	H-3300 Eger	134
Saint Stephan University, Faculty of Horticulture	Gödöllő	1979
Fruit and Ornamental Plant Research Public Utility Company	H-1223 Budapest	108
Dendrological Foundation	H-1088 Budapest	94
Márk Gergely	H-1024 Budapest	465
Óbuda Horticultural Ltd.	Budapest	201
National Park Duna-Ipoly	H-1021 Budapest	138
Western Hungarian University, Botanical Garden	Sopron	1119
Production and Marketing of Horticultural Products	H-9700 Szombathely	117
Agricultural Sciences Centre, University of Debrecen	H-4032 Debrecen	103
Avasi Arboretum, Miskolc	Miskolc	529
Total		7768

VII. Microorganisms

Institute	Location	No. of accessions
Institute for Agrobotany	H-2766 Tápiószele	442
Micotech	H-1037 Budapest	122
Institute of Plant Protection, Hungarian Academy of Sciences	H-1525 Budapest	130
Saint Stephan University, Faculty of Food Science	H-1118 Budapest	781
Plant- and Soil Protection Service	H-2481 Velence	536
Vegetable Research Institute	H-6000 Kecskemét	140
Vine and Grape Research Institute of Agriculture and Rural Development Ministry	H-6001 Kecskemét	193
Kaposvár University, Institute of Fodder Crops	H-7095 Iregszemcse	137
Plant Collection of the Hungarian Natural Museum	Budapest	192
Veszprém University	H-8200 Veszprém	283
Total		2956

Figure 4.

Composition of PGR collections of the Institute for Agrobotany

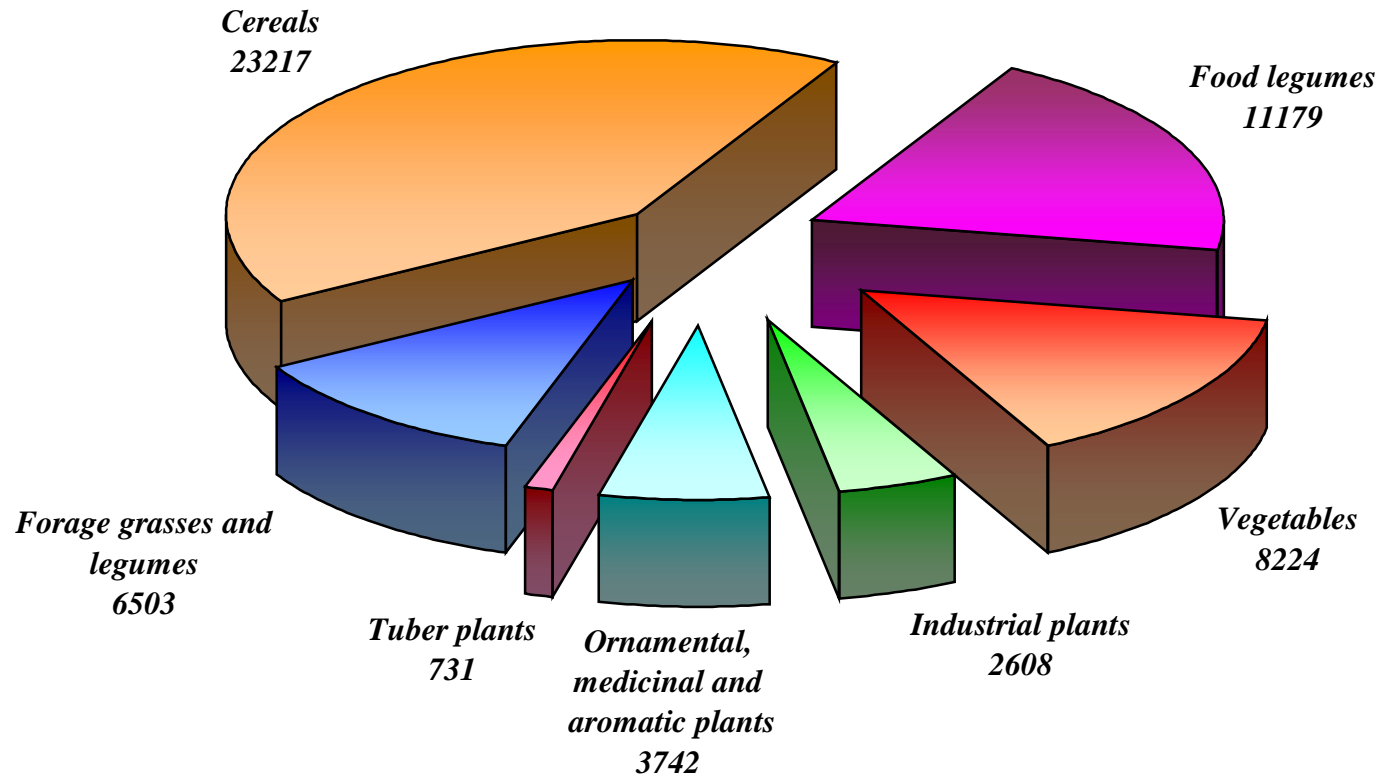


Figure 5.

Number of suspected duplicates in the collections of the Institute for Agrobotany

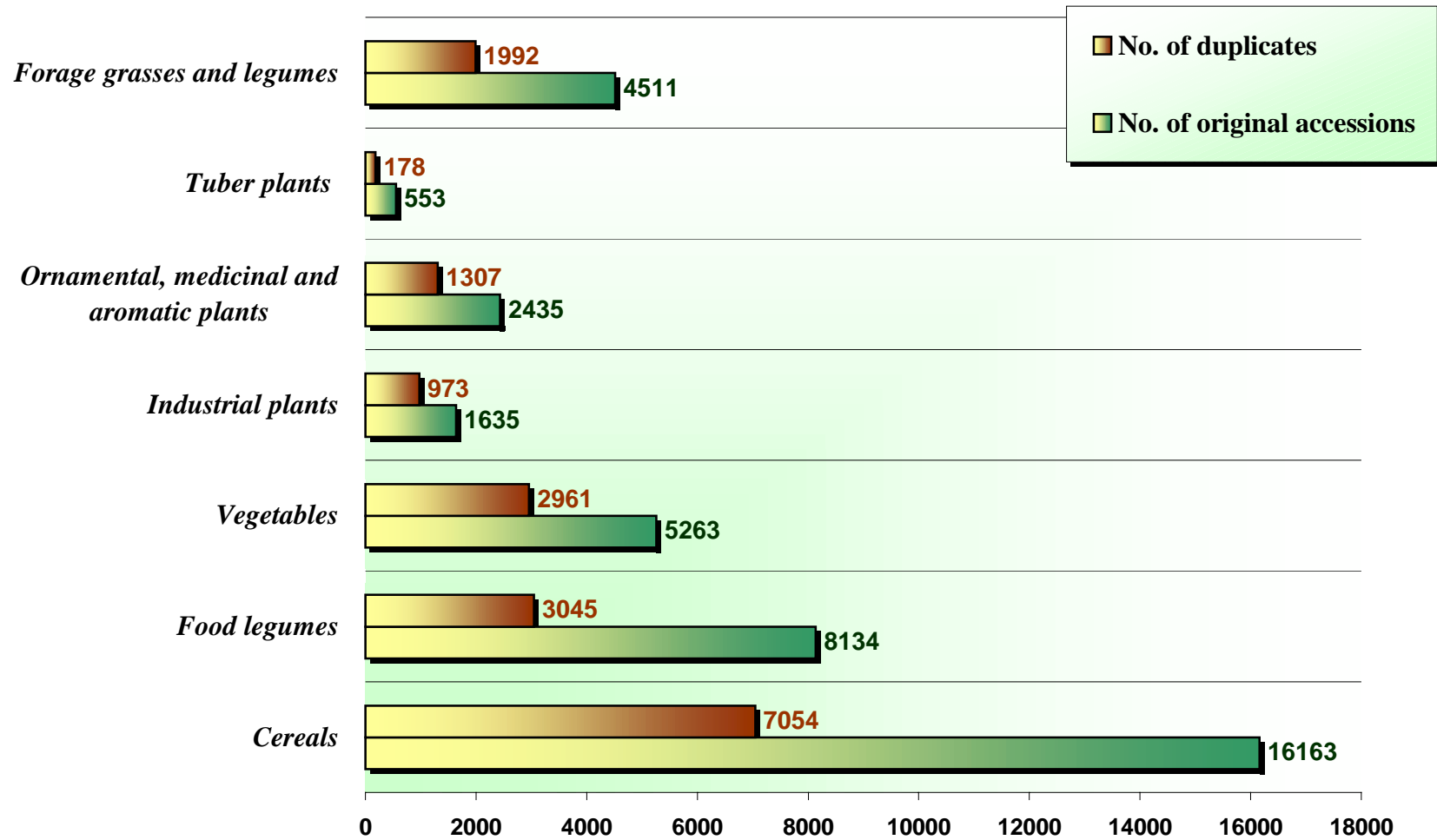


Figure 2.

Distribution of species with registered cultivars

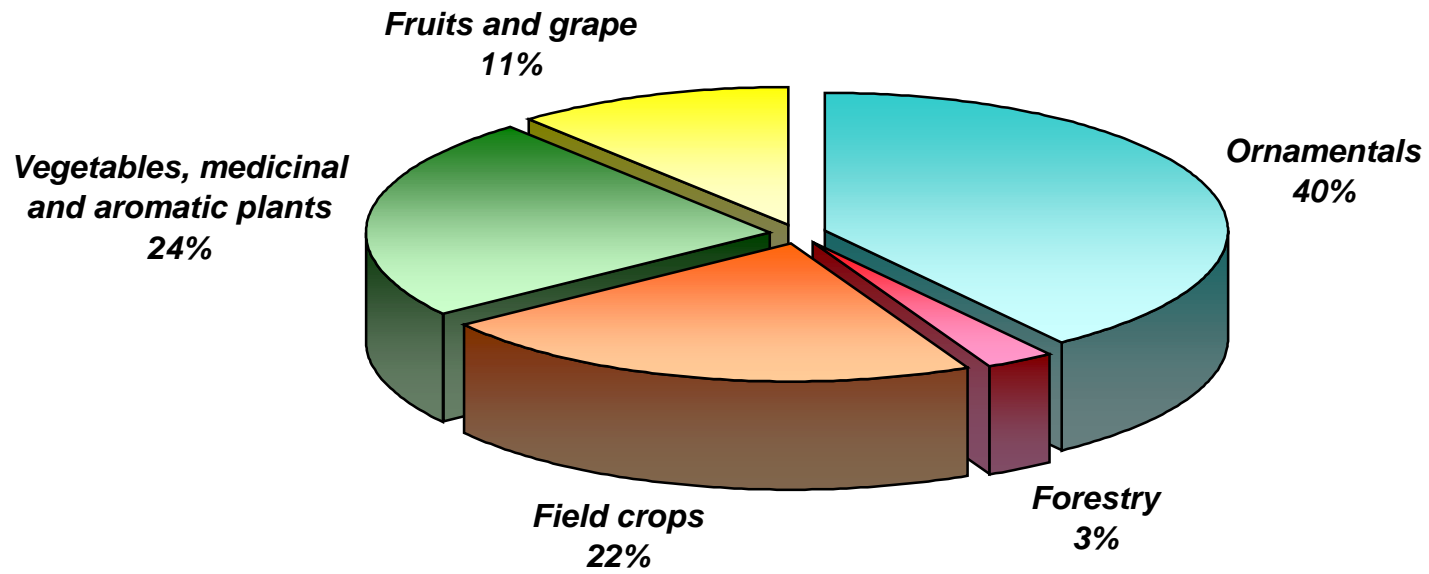


Figure 3.

Distribution of registered cultivars by main crop groups

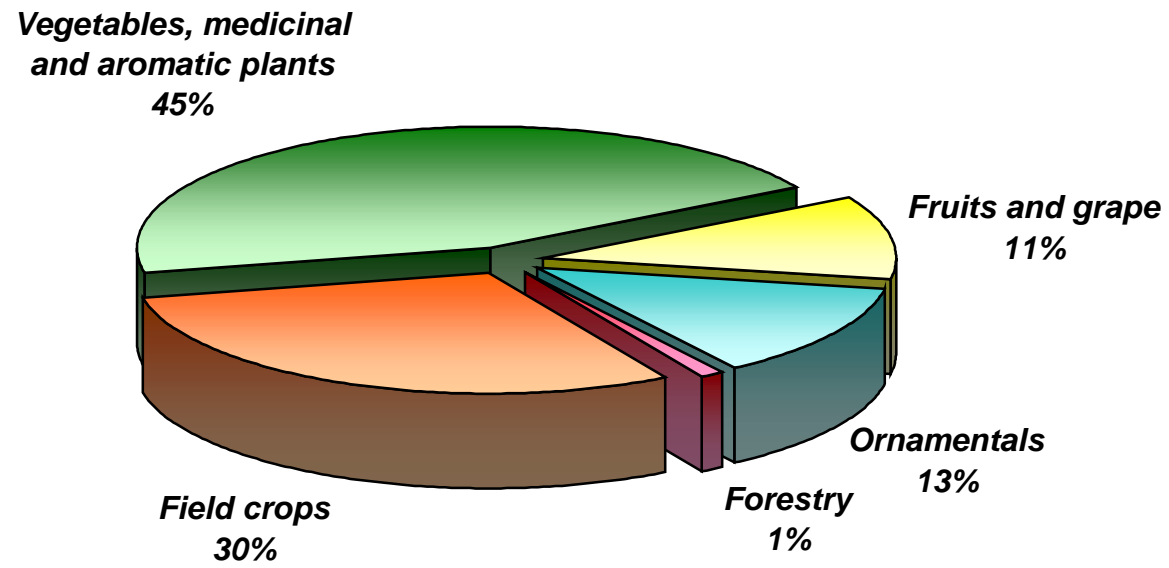


Figure 1.

*Number of registered cultivars in Hungary
1944 - 1998*

