



Tropentag 2012, Göttingen, Germany
September 19-21, 2012

Conference on International Research on Food Security, Natural Resource
Management and Rural Development organised by:
Georg-August Universität Göttingen and University of Kassel-Witzenhausen

Plant Genetic Resources in Vietnam: Current Situation of Conservation and Utilization

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Introduction

Vietnam, an enormous richness in plant genetic resources, is ranked the 16th in 25 countries that have high biodiversity level (MNRE, 2005). Regarding the flora, there are over 12,000 species of 305 vascular plant families existed in 33.6 million hectares of area. 11,611 species are identified, and 2,300 species are used in daily life of inhabitant (Pham, 1999; Tran and Ha, 2000).

It is widely indicated that plant genetic resources are in serious erosion and threatened by climate change and human activities with various causes: deforestation, arable land expansion, urbanization, and the substitution of traditional cultivars by high yield cultivars due to the market oriented economy (VNPPA, 1998; Pham and Luu, 2008; Hoang, 2009). Following the classification of the International Union for Conservation of Nature (IUCN, 2011), there are 608 plant species in Vietnam listed in Red List Category, among them 24,2% (147 species) is enumerated in critically endangered, endangered and vulnerable levels; 75,8% (461 species) is in near threatened and least concern levels.

In situ and *ex situ* conservation methods are applied for conserving plant genetic resources. Accompany with conservation, evaluation and utilization, plant genetic resources are also executed in varying national programs for food security and agricultural development.

Conservation systems of plant genetic resources in Vietnam

***In situ* conservation**

In situ conservation is conducted for saving important indigenous plants, landraces, and wild related varieties. There are two main activities in this field: establishment of biological resources in protected areas and on-farm conservation sites.

Biological resources in protected areas have been established with three different levels including National parks, Nature conservation areas, and Cultural historical environment sites. Within seven years, the total areas has increased by 9,957 ha (Table 1), from 2,390,135 ha (2002) to 2,400,092 ha (2009).

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Conservation of biodiversity on-farm has been implementing in many provinces to conserve variously traditional crops. With the participant of inhabitants, on-farm conservation activities will share the traditional knowledge about maintenance and sustainable use of plant genetic resources.

Table 1. Protected areas in Vietnam (ICEM, 2003; Hoang, 2009)

Types	Year	2002		2009	
		No.	Area (ha)	No.	Area (ha)
I. National parks		25	851,361	30	1,041,956
II. Nature conservation areas		60	1,351,106	60	1,184,372
IIa. Nature reserves		48	1,259,353	48	1,100,892
IIb. Habitats/species conservation areas		12	91,753	12	83,480
III. Cultural historical environment sites		37	187,668	38	173,764
Total		122	2,390,135	128	2,400,092

Ex situ conservation

Field genebanks

There are 21 institutions in The National Plant Genetic Resource Networks conserving 5,371 accessions in field genebanks with different group of crops (Figure 1). Field genebanks are established not only for maintenance of asexual reproduction plants, also for propagation and hybridization.

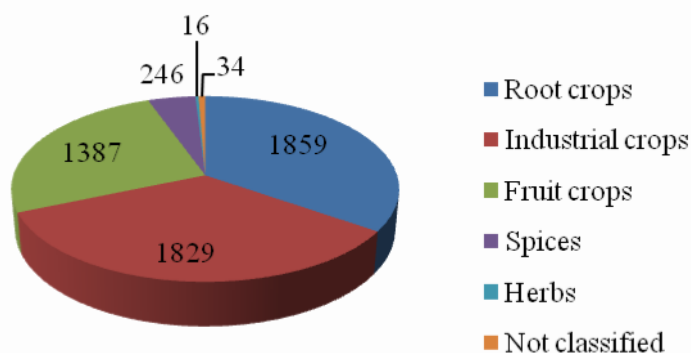


Figure 1. Number of accesions related to cultivated crops in field genebanks

In vitro genebanks

In vitro conservation method is applied for recalcitrant seed plants and some vegetatively propagated crops that are difficult to be maintained in the field condition. *In vitro* culture technique has been developed and maintained about 515 accessions including root crops (taro, eddoe and potato); fruit crops (banana, strawberry, and grape); flowers (orchid, chrysanthemum, carnation, rose, gerbera, gladiolus, anthurium, and lily).

Seed genebanks

Seed genebanks are the main *ex situ* conservation activities for plant genetic resources in Vietnam. Most of the seed collections from more than 18 plant families are conserved at the National Genebank at Vietnam Agricultural Science Institute (VASI). Up to now, 15,760 accessions are stored in seedbanks (Table 2) with long-term storage condition (-10°C to -20°C, 35% RH) and medium-term storage condition (0°C to 5°C, 45% RH).

Table 2. Plant genetic resources in seed genebanks (VASI)

Plant groups	No. species	No. of accessions	%
Cereal	5	8123	51.5
Vegetables	64	4008	25.4
Legume	23	2756	17.5
Fiber crops	3	544	3.5
Oil crops	3	315	2.0
Not classified	5	14	0.1

Plant genetic resources of Vietnam were also conserved oversea via international cooperated programs. For illustrating, 1125 vegetable accessions from 16 different families were collected and stored at seed genebanks of AVRDC – The World Vegetable Center – and in the project ADB RETA 5839 accessions within four years (1999 – 2002).

Utilization of plant genetic resources

Research and utilization of plant genetic resources are applied with three main targets: Allocation, introduction and providing genetic information for users; enhancing the conservation activities via exploitation; and cooperation with institutes and breeding centers in using the valuable underutilized-crops. In recent five year from 2006 – 2009, 7.057 accessions were accessed for quantitative and qualitative traits. 1.093 accessions of 18 genera are used as breeding materials in national breeding programs; some new promising cultivars have been released and used in agricultural production.

Conclusion

The enormous richness in plant genetic resources of Vietnam reduces by human activities and natural disasters, therefore *in situ* and *ex situ* conservation methods are applied to reduce biodiversity loss. In addition, the utilization of plant genetic resources is executed in various breeding programs for food security and agricultural development.

However, national programs included *in situ* and *ex situ* conservation maintain less than 1% among them. In addition, utilization of plant genetic resources is low concentrated, 6% of conserved accessions are used in national breeding programs. It is necessary to structure the management networks as well as to modernize the equipment's in order to maintain and utilize the available national plant genetic resources efficiently.

Acknowledgements

The authors acknowledge the financial support for this study from Ministry of Education and Training of Vietnam in cooperated with German Academic Exchange Service (DAAD).

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