COUNTRY REPORT ON THE STATE OF PLANT GENETIC RESOURCES FOR FOOD AND AGRICULTURE

CROATIA

Note by FAO

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INTRODUCTION TO THE COUNTRY AND THE AGRICULTURAL SECTOR

1. Geography

Croatia is situated in Southeast Europe, at the crossroads between the Pannonian Plain and the Mediterranean Sea. Its land area is 56 594 km^2 and coastal see area is 31 067 km^2. Croatia has three geographical regions: Mediterranean, Mountainous and Pannonian, with Pannonian region as main agricultural area.

2. Climate

The coastal region of Croatia has a Mediterranean climate with hot dry summers and mild rainy winters, while continental climate is predominant inland, with hot summers and cold winters.

Mean annual quantity of precipitation in Croatia ranges from 600 mm (some Adriatic islands) to 3 500 mm (peaks of Dinara mountain), while most parts receive 800 -1 000 mm. Eastern Slavonia and Baranja, most important cereal-growing areas, are among the driest regions, but the distribution of precipitation during the year is such that most of it falls during the growing season. With average of 2 600 hours of sunshine a year, Croatian Adriatic coast is among sunniest in Mediterranean.

3. Population

According to the 2001 Census, Croatia had a population of 4 492 049 with average annual growth rate of - 0.63 (Census 1991/Census 2001) and population density of 79.4 per km^2. Estimated population in 2006 was 4 440 000. Approximately 40% of total population lives in rural areas. Average age of population, as well as the life expectancy, has been steadily increasing over the last couple of decades.

4. Land use

Total area of agricultural land in 2006 was 1 216 000 ha (according to Statistical Yearbook 2007). Approximately 71% of total agricultural land was used as arable land and gardens, followed by meadows (13%), pastures (9%), orchards (4%) and vineyards (3%). Compared with 1997, percentage of land used as arable land and gardens has increased, while area of meadows and pastures has decreased.

Major part of arable land and gardens in 2006 was sown by cereals (67%), followed by oil seed crops (13%), forage crops (12%), sugar beet, vegetables, potatoes, tobacco, flowers, aromatic and other plants. Percentage of area under cereals has been stable for the last ten years, while area under other crops varied from year to year.

Of the total agricultural land, 13.5% belongs to legal entities and 86.5% to private family farms (irrespective of whether they produce for sale on the market or for their own consumption). There are approximately 170 000 registered agricultural holdings. Average farm size is 7 ha (available agricultural land) or 24 ha (used agricultural land).

5. Agricultural production

Sector of agriculture, forestry, hunting and fishery contributes 6.5% to the GDP (including food industry about 10%). Approximately 1 million people (50% of total labor force) receive at least one part of their income from agricultural production. Most important cereals in Croatia are wheat and maize, with harvested area in the last 10 years ranging between 146 000 to 242 000 ha and 296 000 to 407 000 ha, respectively. Other important arable crops include oil seed crops (soybean, oilseed rape, sunflower), forage crops (alfalfa, clover, forage grasses) sugar beet, potato, tobacco and vegetable (beans, tomato, cabbage, sweet pepper etc).

Average yields of arable crops within the last 10 years differed mostly due to the weather conditions in particular year, especially prolonged droughts, but in general were stable. Most important fruit species are apple, plum, olive, sour cherry, peach and pear. Grapes are mostly grown for wine production, with only small percentage of table grape production. Within the last couple of years considerable efforts have been taken to increase the area under orchards and vineyards.

6. Seed supply system

Only certified or officially controlled seed of registered varieties may be put on the market in Croatia. There are numbers of firms which deal with production, processing and trading of seed which net cover whole Croatia. However, seed exchange is still present to certain extent, but mostly vegetable and flower seeds in villages.

Both domestic and introduced varieties are found on Croatian market. Most important breeding programmes are those of cereals, oil seed crops and forage crops. Sugar beet breeding programme has been terminated within the last ten years. There is practically no breeding of vegetables in Croatia at the moment. However, efforts are being done to preserve old Croatian vegetable varieties from extinction.

CHAPTER 1

THE STATE OF DIVERSITY

Within the last ten years Croatia went through a lot of changes that had significant influence on diversity of agricultural crops grown in the country. After accession to UPOV and becoming the candidate country for EU accession, new stricter seed marketing regulations were adopted.

Many of the old cultivars do not meet DUS requirements and consequently will be withdrawn from the Variety List of Republic of Croatia. Also, economical and social changes rendered some of the domestic breeding programmes unprofitable, so they were terminated (sugar beet, vegetable species). Although those changes much improved seed supply system and increased confidence of farmers regarding the seed they buy, there are some negative effects on diversity of the crops.

Major arable crops grown in Croatia include cereals (maize, wheat, barley, oats, rye, triticale), oil seed crops (sunflower, soybean, oilseed rape), forage crops (alfalfa, clover, forage grasses), sugar beet, vegetables, potatoes and tobacco. Croatia has strong breeding programmes of cereals, oil seed and forage crops and tobacco. However, introduced varieties and imported seed of those crops are also present on our market. Large part of potato and practically all vegetable seeds are imported. Although there is a large number of arable crop and vegetable varieties on the National List, relatively small proportion of those varieties is sown every year.

Practically 100% of cereal, oil seed crops, sugar beet and tobacco seed sown is certified seed of registered varieties. In commercial production of other major crops only certified seed is sown as well. Still, a certain amount of farm-saved seed is used in production for on-farm use and especially for vegetable and potato production for family consumption. Marketing of non-registered varieties is illegal, but farmer-to-farmer or gardener-to-gardener non-profit exchange of old varieties is common.

Only a few landraces of cereals are still maintained, for example maize landraces kept in families for cooking of young ears or producing special types of cornmeal. Landraces of vegetable are more common, for example in beans, cabbage, onion and garlic. There is still a large diversity of pumpkin landraces, used for baking, as pie filling or for dried seeds. In Mediterranean area kale (*Brassica oleracea var. acephala*) landraces are carefully maintained. Also, some vegetable species that are rarely found on the market, or are not on the National List at all, are also kept in families, such as horse radish, rhubarb, yard-long bean (*Vigna unguiculata* subsp. *sesquipedalis)* or runner bean (*Phaseolus coccineus*).

In commercial fruit and *Vitis* production only controlled planting material is used. Both domestic and introduced varieties are planted. For specialized production, especially for highest quality vine and olive oil, old indigenous varieties are highly valued and encouraged. *Vitis* diversity of Croatia is well documented and conserved.

More and more people buy planting material in commercial nurseries for growing for family consumption. Still, there is a large number of old orchards and vineyards which contain indigenous varieties. Such varieties are often carefully kept in families and exchanged with neighbors and friends. This is especially the case with underutilized fruit species, such as white and black mulberry (*Morus alba, Morus nigra*), carob tree (*Ceratonia siliqua*), European cornel (*Cornus mas*), common medlar (*Mespilus germanica*), as well as old varieties of apples, pears and olives.

Croatia has rich diversity of medicinal and aromatic plants. Some of those species are commercially grown (chamomile, lavender, sage) and some are collected in wild. Some edible plants are also collected in wild, such as asparagus, blackberry, elder (flowerheads for refreshing drink and berries for jam), rose hip (for herbal tea and jam), caper (*Capparis spinosa*), wild sorrel, dandelion and bear's garlic (*Allium ursinum*). Also, many forage grasses and legumes grow wild.

CHAPTER 2

THE STATE OF *IN SITU* MANAGEMENT

At the moment, there is no programme in place in Croatia for on-farm conservation of traditional crop varieties. However, there are very good experiences with conservation of indigenous domestic animal breeds (horse, donkey, cattle, sheep, goat, pig, turkey), where registered producers receive incentives to grow breeds of lower economical value, but of great importance for bio-cultural heritage.

This successful programme could be the model for on-farm conservation of indigenous crop varieties. Most of activities in *in situ* conservation are directed towards protection of habitats. According to the Croatian Nature Protection Act, protected areas are classified in 9 categories. Currently, there are 444 protected nature areas designated in various categories, covering a total area of 5 124.80 km^2 (9.05% of total territory). The largest portion of the territory is protected in the nature park or national park categories. There are 2 strict reserves, 8 national parks and 10 nature parks already protected and an 11th nature park, the Lastovo Archipelago, is in the process of designation. Several areas are in the process of designation in other categories[1] .

TABLE 1

Strict reserves	Area (ha)	National parks	Area (ha)	Nature parks	Area (ha)
Bijele i Samarske stijene	1 175	Plitvice lakes	29 482	Kopacki rit	23 894
		Paklenica	9 600	Medvednica	22 826
		Risnjak	6 400	Velebit	200 000
Hajducki i Rozanski kukovi	1 220	Mljet	5 375	Biokovo	19 550
		Kornati	21 700	Telascica	7 050
		Brijuni	3 395	Lonjsko polje	50 600
		Krka	10 900	Papuk	33 600
		Northern Velebit	10 900	Ucka	16 000
				Vransko lake	5 700
				Zumberak – Samoborsko gorje	33 300

The State Institute for Nature Protection carries out inventorying and monitoring of the status of flora and habitats in Croatia. The Institute has recently published "The Red Book of Vascular Flora of Croatia", as well as "The Red List of Threatened Plants and Animals of Croatia" (2004). The Red List states 90 species of higher plants as critically endangered, 62 as endangered, 71 as vulnerable and 186 as near threatened. The Red List was the basis for regulation on strictly protected and protected wild taxa, which came into force in 2006.

1 Biodiversity of Croatia, State Institute for Nature Protection, 2006

CHAPTER 3

THE STATE OF *EX SITU* CONSERVATION

Croatia has a long tradition of *ex situ* conservation of plant genetic resources for food and agriculture, with first collections dating from 1920's. However, although many different institutions had collections used for their own purposes, coordination at the national level has been missing. There were several attempts to link all the collections. First, in 1980's, (while Croatia was still part of ex-Yugoslavia) Yugoslav Bank of Plant Genes was started, with strong support and contribution from Croatia. Due to war and dissolution of Yugoslavia in early 1990's this project was terminated. In 1991 project Croatian Bank of Plant Genes was initiated and was supported by the Ministry of Science and Technology for the whole decade. Although it achieved certain results, it failed to include all the PGR collections in Croatia and remained restricted only to one department of the Faculty of Agriculture in Zagreb.

In 2004 Croatia entered programme SEEDNet, supported by Swedish government, which gave impulse for organizing the network of collections at the national level. At the moment, following institutions and collections are included in the network.

TABLE 2

Institution	Collection
Institute for Seed and Seedlings, Osijek	Obsolete cultivars of agricultural and vegetable crops
Agricultural College, Krizevci	Vegetable
University of Zagreb,Faculty of Agriculture	Medicinal and aromatic plants
	Fodder crops
	Maize
	Vitis field gene-bank
	Apple field gene-bank
Institute for Agriculture and Tourism, Porec	Back up *Vitis* field gene-bank
Institute for Adriatic Crops and Karst Reclamation, Split	Back up *Vitis* field gene-bank
	Olive field gene-bank
The Agricultural Institute Osijek	Fodder crops

Network is coordinated by the Institute for Seed and Seedlings, Osijek. All the above mentioned institutions have been receiving support from SEEDNet since 2005 and also from the Croatian national budget since 2007 (through Ministry responsible for agriculture). Some of the institutions already had conservation facilities in place, while others, like Agricultural College Krizevci, were fully equipped for medium-term conservation within the last couple of years. Institute for Seed and Seedlings, Osijek has facilities for long-term conservation. Therefore it is planned to establish back-up collection of all seed-propagated accessions there. National *Vitis* field gene-bank, situated at the University of Zagreb, Faculty of Agriculture, has back-up collections in Split and Porec, containing accessions originated from those regions. New back-up collections in continental part of Croatia are currently being established. Fruit field collections received less attention in previous years, so it is planned to give them more support in the next period.

In 2007 main part of the Croatian Plant Genetic Resources Database (CPGRD http://cpgrd.agr.hr) has been constructed. At the moment only passport data are being entered, according to EURISCO descriptors. Inclusion of characterization, evaluation and collecting data is planned.

CHAPTER 4

THE STATE OF USE

4.1 Distribution of plant genetic resources

Croatia has not established mechanisms to record the specimens of plant genetic resources in all institutions involved in plant breeding. General inventory is still under way, to found out what specimens are present in Croatia as conserved genetic resources. There is no recording mechanism for initial materials available to breeders, nor documented system of origin of germplasm used in breeding programmes. Therefore it is not possible to show distribution of conserved genetic resources according to breeding programmes.

For the last couple of years efforts have been taken to establish such a system and software for central information system has been created, for access to data on genetic resources in Croatia. Database is now available at the web site of Faculty of Agriculture in Zagreb (Croatian Plant Genetic Resources Database - CPGRD http://cpgrd.agr.hr). It is planned to upgrade this system and interconnect it with the existing database of information that breeders provide when they submit applications for acceptance of new variety, which would make distribution data available as well.

4.2 Utilization and enhancing the use of plant genetic resources

Croatia has breeding programmes for plant species that are most important in terms of area of agricultural land used for production. Breeding is performed on 29 plant species. Representation of varieties in production resulted from those programmes is also important. At the moment there are 3 052 varieties on the Variety List of Republic of Croatia, out of which 425 were bred in Croatia, 2 193 are foreign, and 434 are old varieties.

There are no institutions in Croatia working solely on pre-breeding. Therefore pre-breeding activities for major crops are organized and financed jointly in context of directed breeding programmes. Such situation renders breeding programmes little bit more expensive compared with countries where systems of funding of pre-breeding programmes from other sources are developed. Due to lack of funding there is no breeding programmes in Croatia for minor and underutilized crops. Because of relatively small market potential which could repay breeding costs, it is not to be expected that breeding programmes for minor crops would be started.

In addition several breeding programmes were terminated within the last 10 years (sugar beet, durum wheat). With increase of life standard and development of ecological production, modest demand for specific domestic varieties of vegetables, fruits and grapevine has been recorded. Such demands are beneficial for development of gene bank activities and pre-breeding programmes. Breeders have recently started to requests state co-funding of pre-breeding programmes for major agricultural crops. It is to be expected that the state will be involved in solution of funding of plant gene-banks and pre-breeding programmes through measures of the Ministry of Agriculture and that would contribute to the increase of number of plant species used.

Seeds for production of crops less represented in terms of area sown, primarily vegetables, is procured mostly by import of seed of bred varieties. Old domestic varieties are produced in very low quantity. Legislation does not allow marketing of varieties that are not on the variety list and system of acceptance of old domestic varieties to the variety list has not been developed. Seed production, as well as maintenance, of old varieties has been reduced to only a few such varieties. Thus old varieties have been led into situation of disappearing. There is awareness regarding conservation of old varieties, thus in the context of current adjusting of national legislation according to EU legislation, efforts are taken to establish legal framework for improvement of this situation.

4.3 Education

For the purpose of development of agriculture, as well as breeding programmes, in Croatia there is organized high education for training of necessary specialists for agriculture. These are high schools in Križevci and Požega, and Faculties of Agriculture in Osijek and Zagreb. Faculties organize MSc as well as PhD studies in different areas. In addition to programmes of genetics and breeding at the Faculty of Agriculture in Zagreb, with tradition longer than 40 years, there is also MSc programme for seed production and breeding at the Faculty of Agriculture in Osijek.

Production of specialists with highest education is sufficient for Croatia's needs, as well as needs of development of breeding programmes. There are 6 breeding companies in Croatia. Two largest and most important breeding companies in Croatia are The Zagreb Bc Institute for Breeding and Production of Field Crops and The Agricultural Institute Osijek, which have developed breeding programmes for a number of plant species. These companies have good connections and collaboration with similar institutions in Europe and USA, so their experts often participate in study visits and collaborative programmes, which enable them to improve their knowledge, as well as to exchange breeding materials.

4.4 Seed supply systems and the role of markets

In Croatia, seeds are marketed by private companies and state institutions under the same terms. Among private companies there are both Croatian and foreign ones. Seed supply system is well established and insures that seeds of controlled foreign and domestic varieties produced in Croatia as well as imported, for all plant species that are demanded, are present on the market.

Croatia has self-sufficient seed production for plant species that are most common and sawn on majority of arable land (maize, cereals, soybean, sunflower), but for those species part of the seed quantity is also imported, as well as exported. For other plant species import is higher that export. For plant species that are in the certification system, seed of old varieties can be marketed only if the variety is registered in the Variety List. Since old varieties do not meet criteria for addition to the Variety List of Republic of Croatia, some of them will be transferred to the National Variety List, which has been recently established for the purpose of keeping such varieties in use. Setting out of regulations that will provide clear and simple system of addition of old varieties to the National Variety List is planned.

4.5 Crop improvement programmes and food security

In Croatia there is well established formal-sector crop improvement programme utilizing advanced methodologies and technologies. Breeding programmes for the following plant species are the most important in Croatia: maize, wheat, barley, triticale, soybean, sunflower, alfalfa and fodder pea. Breeding methods used are conventional methods of hybridization of selected parents and backcrossing. Out of 1 390 varieties added to the Variety List in the last 10 years, 205 were varieties bred by Croatian breeders. Many of them have traits specially requested by producers.

For example a number of wheat varieties (*Divana, Golubica, Arnica, Mura*) is used for increasing quality of flour for bread production. Maize hybrid varieties such as Ossk 430, Ossk 515, Bc 4 982 and others are resistant to European corn borer, which used to cause high losses in the past due to lodging. New varieties of sunflower (Fakir, Orion) have increased oil content and significantly smaller heads, so they are less susceptible to lodging. Desirable traits have been introduced to the new varieties from old domestic varieties as well as from the germplasm obtained abroad.

Owing to existing breeding programmes yield potential of varieties used in agriculture has been increased. Together with progress in application of new production technologies, this results in gradual increase of yield in production of all plant species.

Owing to breeding programmes focused on improvement of quality, yield and resistance to certain diseases and stress, yields of most of the crops are more stable and quality is higher.

No important changes are expected in this system.

CHAPTER 5

THE STATE OF NATIONAL PROGRAMMES, TRAINING AND LEGISLATION

5.1 National programmes

Croatia still does not have officially accepted national programme for plant genetic resources. For the last couple of years programme has been worked on. At the moment the document with appropriate content has been submitted to the Ministry of agriculture for acceptance.

According to this document PGR activities should be performed by following 12 participants that are recorded as holders of different collections of specimens of plant diversity:

- Institute for Seed and Seedlings, Osijek
- Agricultural College, Krizevci
- University of Zagreb, Faculty of Agriculture
- Institute for Agriculture and Tourism, Porec
- Institute for Adriatic Crops and Karst Reclamation, Split
- The Agricultural Institute, Osijek
- Centre for Mediterranean Agriculture, Punat (Island of Krk)
- Agricultural High School, Ilok
- University of Osijek, Faculty of Agriculture
- Gardening Centre, Zagreb
- Podravka, Koprivnica
- Bc Institute for Breeding and Production of Field Crops

It can be expected that by the time the program is accepted this number will be updated and number of collections included will be increased.

They are mutually connected through six working groups which cover all plant species for which the accessions are recorded. Working groups are organized according to the organization of working groups adopted through project SEEDNet which initiated the activities.

5.2 Networks

Each working group within the national programme is organized through different number of participants (network).

One representative of each group participates in the central national committee which is established by the Minister of Agriculture. Within each group all relevant questions are discussed ranging from field of work to setting out plans that are finally adopted by central committee and submitted to the Minister for approval of funding.

5.3 Education and training

Basic education for the purpose of work with plant genetic resources is obtained at high schools and faculties in Croatia, either through graduate or post-graduate studies. Nevertheless, for very specialized proficiencies additional courses are required. Some courses can be organized at domestic high education institutions and for others possibilities for participation in courses abroad are used. Within the SEEDNet project several participants from Croatia took courses for PGR collections and database management in NordGen, Sweden. Transfer of acquired knowledge is planned through

in-country training courses supported by experts from NordGen and CBM Sweden within the SEEDNet project. It can be said that there are no obstacles to acquire all necessary expertise for work with PGR.

5.4 National legislation

All legislation in Croatia, including that which forms legal framework for PGR activities, has been intensively changing over the last 10 years. During those changes it was strived, on one hand, to harmonize with international documents that Croatia signed after dissolution of ex-Yugoslavia, and on the other hand to adopt all EU recommendations how to regulate certain areas.

Instead of Act on acceptance of newly created varieties, approval of introduction into production of foreign varieties and protection of varieties of agricultural and forestry plants, taken over from ex-Yugoslavia, new Act on seeds, planting material and registration of varieties of agricultural plants was adopted 1997 and amended in 2003. As soon as 2005, completely new Act on seeds, planting material and registration of varieties of agricultural plants was adopted, which is also harmonized with EU regulations. Also, Act on variety protection was adopted in 1997 which is also harmonized with UPOV convention 2000, and amended and harmonized with EU regulations in 2008.

Based on above-mentioned Acts, a series of regulations has been adopted which regulate in detail the implementation of those Acts. This work is still intensively being carried out since not all the groups of plant species have been covered yet. In the domain of old varieties national variety list has been created which includes all materials that are being used but that do not meet standards of UPOV convention and EU. Elaboration of this system is intensively being carried out.

The use of abovementioned old varieties is elaborated in regulations on marketing of seed. Separate regulation on PGR elaborates the scheme of organization and funding of plant gene-bank and related activities. On its basis the Minister appointed the National Committee for PGR.

5.5 Information systems

The development of the information system for recording of and access to data on PGR in Croatia has been initiated only a couple of years ago. At the moment the central database is launched and is accessible at http://cpgrd.agr.hr, but the data input is still under way. It can be expected that it will take several years for all existing data to be completely transferred and accessible for searching. At the same time, there are still discussions regarding what should be in the public domain and what part of existing materials will be available for exchange, as well as some other related questions.

At the same time for all materials that are being marketed or produced there is a comprehensive information management system that is constantly being improved. It can be expected that a part of the data from this system will be accessible online in couple of years.

5.6 Public awareness

Simultaneously with work on organization of PGR and information system, work on public awareness on PGR is also increasing. In this field apart from institutions mentioned in the national programme, institutions responsible for nature protection, NGOs, as well as others take part (schools, governmental institutions etc.).

CHAPTER 6

THE STATE OF REGIONAL AND INTERNATIONAL COLLABORATION

Since 2004 Croatia is a partner in the SEEDNet (South East European Development Network on plant genetic resources) programme. SEEDNet includes 12 partners from the Southeast Europe. It receives financial support from the Swedish International Development Cooperation Agency (SIDA) and technical support from NordGen and CBM. The SIDA support is foreseen for a period of 10 years.

Main aims of SEEDNet are establishment and strengthening of national programmes on PGR in order to secure the conservation of PGR in the region, promotion of sustainable utilization of PGR and strengthening of collaboration, networking and linkages among various stakeholders at both national and regional levels through pooling of resources and use of comparative advantages available in the various institutions and countries.

The governing body of the network is the SEEDNet Regional Steering Committee, consisted of representatives of all partners. The RSC sets priorities and draws up plans and strategies for the regional network, considers proposals from the regional working groups, decides of annual work plans and budgets, monitors network and working group activities and provides overall technical guidance to the network.

Regional activities are performed through crop specific and thematic working groups which work on specific regional projects. Each working group includes participants from all partner countries. Regional working groups meet annually to discus progress and plans.

SEEDNet gives opportunities for training and education, both short-term training courses and MSc courses in Sweden. Specialized workshops are also held within the region.

Apart from giving Croatia opportunity for regional collaboration, SEEDNet also gave impulse for development of Croatia's national PGR programme. It supported national activities regarding public awareness, national meetings of stakeholders and work of national crop-specific working groups.

Croatia also participates in the European Cooperative Programme for Plant Genetic Resources (ECPGR).

Ministry of Agriculture, fisheries and rural development has commenced work regarding signing of the International Treaty on Plant Genetic Resources for Food and Agriculture.

CHAPTER 7

ACCESS TO PLANT GENETIC RESOURCES FOR FOOD AND AGRICULTURE, SHARING OF BENEFITS ARISING OUT OF THEIR USE, AND FARMERS' RIGHTS

7.1 Changes in the international legal and policy framework in relation to access and benefit sharing for plant genetic resources

Since submitting the first Report on the State of the World's Plant Genetic Resources for Food and Agriculture, Croatian legal framework regulating this area has been significantly changed. In addition to Convention on Biological Diversity signed in 1996, ratification of International Treaty for Plant Genetic Resources for Food and Agriculture is planned. Croatia also signed the UPOV Convention in 2001.

International documents mentioned above have been incorporated, or are being incorporated at the moment, in the laws and regulations, that constitute the basis of the whole system of variety registration and seed production.

In this way, in addition to availability of plant genetic resources, sharing of benefits arising out of their use between farmers and breeders working on their conservation and enhancement has been ensured. With introduction of register of all subjects in agriculture it has become possible to have overview of use of genetic resources and it also enables everybody to reimburse all investments in maintenance and improvement.

7.2 State of access to plant genetic resources

Situation then there is an elaborated legal framework for usage has attracted whole range of foreign companies to offer their latest varieties to farmers in Croatia.

Croatia does not have special agreements with other countries which elaborate terms of access to genetic resources. Nevertheless domestic breeding companies do not report obstacles in access to genetic resources from outside our country that are necessary for their work. Likewise access to genetic resources held by Croatia is not regulated or restricted. This enables domestic accession holders to send accessions abroad without any special permits except usual phytosanitary documents for prevention of spread of diseases by plant material movement.

7.3 Increase of benefits arising out of use of plant genetic resources for food and agriculture

Basic benefit arising out of PGR use is the general yield increase of agricultural crops and stability of yield achieved by a large number of farmers, which also increased average yields recorded in Croatia.

Also, on small area, some new crops which had no tradition in Croatia, are being introduced to production, such as millet, oil pumpkin, sweet potato etc. Although such production is not sufficient for domestic needs, it is a benefit in terms of base broadening of plants grown for food.

7.4 Funding of plant genetic resources activities

Funding of plant genetic resources activities is still at its beginning. Out of several ways of PGR use only benefit arising from use in plant breeding can be completely charged. Therefore breeding programmes are self-financed by charging of royalties. For some programmes this is not sufficient since it does not cover the cost of activities that precede breeding work, such as pre-breeding, but also other needs and activities such as inventarisation, collecting, regeneration, characterization and evaluation of genetic resources that are the basis of breeding.

The state still does not have elaborated system for collecting of dedicated funds arising out of use of genetic resources, except general seed sales tax. Funding of PGR from the budget has started only in the last couple of years, amount of money is insufficient but is increasing. Such a situation is promising the possible solution of this limitation in the near future.

7.5 Implementation of Farmers' Rights

In 2001 Croatia signed UPOV Convention which gives possibilities to the state to regulate farmers' rights for varieties for which plant breeders rights are granted. Based on this convention and obligations set out in EU directives, in 2008 Croatia adopted Act on variety protection which also regulates farmers' rights. Since funding of plant genetic resources activities is visible only through charge of their use, expressed in new varieties, and since for most agricultural plants used for food bred varieties are used, for such varieties production of seed by farmers for their use is not envisaged.

Only for old and domesticated varieties there is possibility for production for farmers' own use. In accordance with this, system of agricultural subsidies envisages possibility for receiving subsidy for production of agricultural crops only in case then certified seed is used. Since seed certification is completely official or under official control it ensures overview of seed quantities that are being marketed, thus ensuring, among other things, also charging of royalties.

CHAPTER 8

THE CONTRIBUTION OF PGRFA MANAGEMENT TO FOOD SECURITY AND SUSTAINABLE DEVELOPMENT

Development of PGRFA management system should have several important contributions:

- Enable continuation of existing breeding programmes and their enhancement.
- Contribute to sustainable development of agriculture by increasing the number of plant species in production as well as awareness about the need for conservation of biological diversity.

Continuation of existing breeding programmes should ensure the following:

- To avoid complete seed supply dependence on large international companies. Such companies, led mainly by profit they can make, if necessary transfer production from one country into another, leaving the former without settled seed supply system. Domestic breeding companies, even the smallest ones, are focused primarily on domestic market so they envisage production of varieties arising from their programmes primarily on the market of their country. For those purposes, apart from production of new varieties, they also contribute to the development of seed production and marketing network.
- In their breeding programmes domestic breeders primarily create materials adjusted to the local agro-ecological conditions. Thereby such varieties are often more reliable for production in extraordinary conditions that can be expected locally compared to varieties created in other areas.

Development of PGRFA programme enables familiarizing with new species or sometimes stimulates re-activation of production of crops used in the past but now almost forgotten, which although new in the environment sometimes give very good results.

Research of traits of different materials is the basis for inclusion of new genotypes into breeding programmes and thus for genetic base-broadening which is the foundation of breeding work. It is also the way to conserve found PGR diversity, either in existing form or by including it into the new creations. Thus one of the basic principles of sustainable development is achieved "to create the new and thereby not to destroy the old".