Conserving Crop Genetic Resources on Smallholder Farms in Hungary: Institutional Analysis

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1. Introduction

Hungary is home to a great diversity of potentially valuable plant and animal species, whose preservation is of global value. The cultivated plants found in Hungary originated primarily in ancient times (Bronze Age, Roman), with a minor number introduced from the "New World". The time and the mode of introduction into the country are various. Most species may be considered indigenous and many varieties "hungaricum" given their longevity as part of Hungary's cultural flora (Ángyán et al., 2003). Several local varieties of wheat, rye, fruits and grapes are present, and Hungary is rich in landraces of domesticated animals (e.g. chicken, cattle, pig). As result of the burst of plant breeding activity at the beginning of the last century and later hybridisation programs, crop landraces were displaced from large- and

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middle-scale farming and continued to be cultivated mainly on small-scale, traditional farms in marginal areas. Beyond the important role that kitchen gardens and small plots play in supplying healthy food for local families and in rounding out household income, they are the most significant venue for crop biodiversity in Hungary.

The Institute of Environmental Management, St. István University, Gödöllő and the Institute for Agrobotany (IA), Tápiószele in partnership with the International Plant Genetic Resources Institute (IPGRI), Rome are implementing a research project on the on-farm conservation of crop genetic resources in three Environmentally Sensitive Areas (ESAs) of Hungary (Dévaványa, Őrség-Vendvidék, Szatmár-Bereg). The goal of the project is to develop a scientific understanding about the current and potential socio-economic role of agro-biodiversity maintained in home gardens. Though we have inventoried crop and livestock species diversity in home gardens in study sties, our research focus is on maize and bean varieties. The legal framework for seed systems and plant genetic resources conservation is now changing rapidly due to Hungary's imminent entry in the European Union and related requirements. Supporting the policy formulation process with scientific findings is an urgent task. The project consists of interdisciplinary institutional, economic, and scientific analysis. The disciplinary background of the research team includes law, economics, ecology, agriculture and sociology.

In the following sections, we present the methodology designed by the research team for Institutional Analysis and institutional questions that are posed relating to crop genetic diversity. After presenting some basic definitions, background, and details of our methods, we summarize initial findings. This paper focuses on the institutional aspects of the research, though we are also conducting an economic analysis at the farm level using different methods and other research questions.

Policy Problem and Research Objectives

Elaborating a policy for plant genetic resource conservation that encourages farmers to grow local varieties while politically feasible and in harmony with the national legal system poses a great challenge. Policy-makers face a number of constraints imposed by international agreements, as well as discrepancies among stakeholders' interests. Identifying the actors with whom policy makers are able to work on plant genetic resource conservation is a first step.

Subsequently, analysing the present situation in a systematic way is essential for identifying good policy options, economic instruments and legal measures. Our proposed methodology for institutional analysis is a research tool that is useful in formulating a policy to conserve agricultural biodiversity in Hungary.

Our analysis focuses on the institutions and organizations that shape the conditions of access to the range of plant genetic resources embodied in seeds traded informally among farmers and formally in market channels. The first aim of the institutional analysis is to identify the institutions and organisations that have significant impact on the seed choices and seed maintenance practices of farmers, and hence, on their access to genetic resources. The second aim is to identify and analyze different stakeholders' perceptions of the issue at hand, as well as their interests and the values they ascribe to them.

2. Background

A. The attributes of crop genetic resources embodied in seed

Plant genetic resources embodied in seed are the foundation of agricultural development. The biological base for agriculture consists of 1) varieties that have been developed for intensive agricultural practice with complementary chemical inputs and/or controlled moisture conditions, and 2) local varieties that are more likely to be suited to extensive production with a lower response rate to external inputs. In less industrialized agricultural systems, case studies have documented that farmers may deliberately adapt or mix the seed of the two types of varieties in an attempt to combine advantageous traits of both (Bellon and Risopoulos 2001; vom Brocke 2001).

Farmer breeding of local varieties through selection and exchange, and their continued usage provides several types of benefits for individual farmers and for public. Local varieties have both private attributes as sources of seed and harvested produce and public attributes, such as those related to their genetic diversity. Public attributes cannot be fully captured in markets and trade. Farmers are consumers of seeds as inputs, as well as producers of seeds they save, exchange and use as food.

B. Formal and local-informal seed system

Typically, the notion of seed system has been limited to the seed industry for developing, multiplying, and distributing finished varieties as certified seed, which can be publicly and privately-funded, and organized in different ways. For example, maize seed industries are thought to develop along a path from pre-industrial organization to the maturity stage, characterized by entirely commercial organization with plant variety protection, patents, and various financing arrangements (Morris, Rusike and Smale, 1998). The notion of a seed system for us has broader meaning and it includes all the channels through which farmers acquire genetic materials and information about those materials, outside of, or in interaction with, the commercial seed industry. These channels include various farmers' organizations, weekly markets and social networks. Figure 1 (and Appendix 1.; Appendix 2.) shows the formal and local-informal seed systems and the activities that constitute them. .

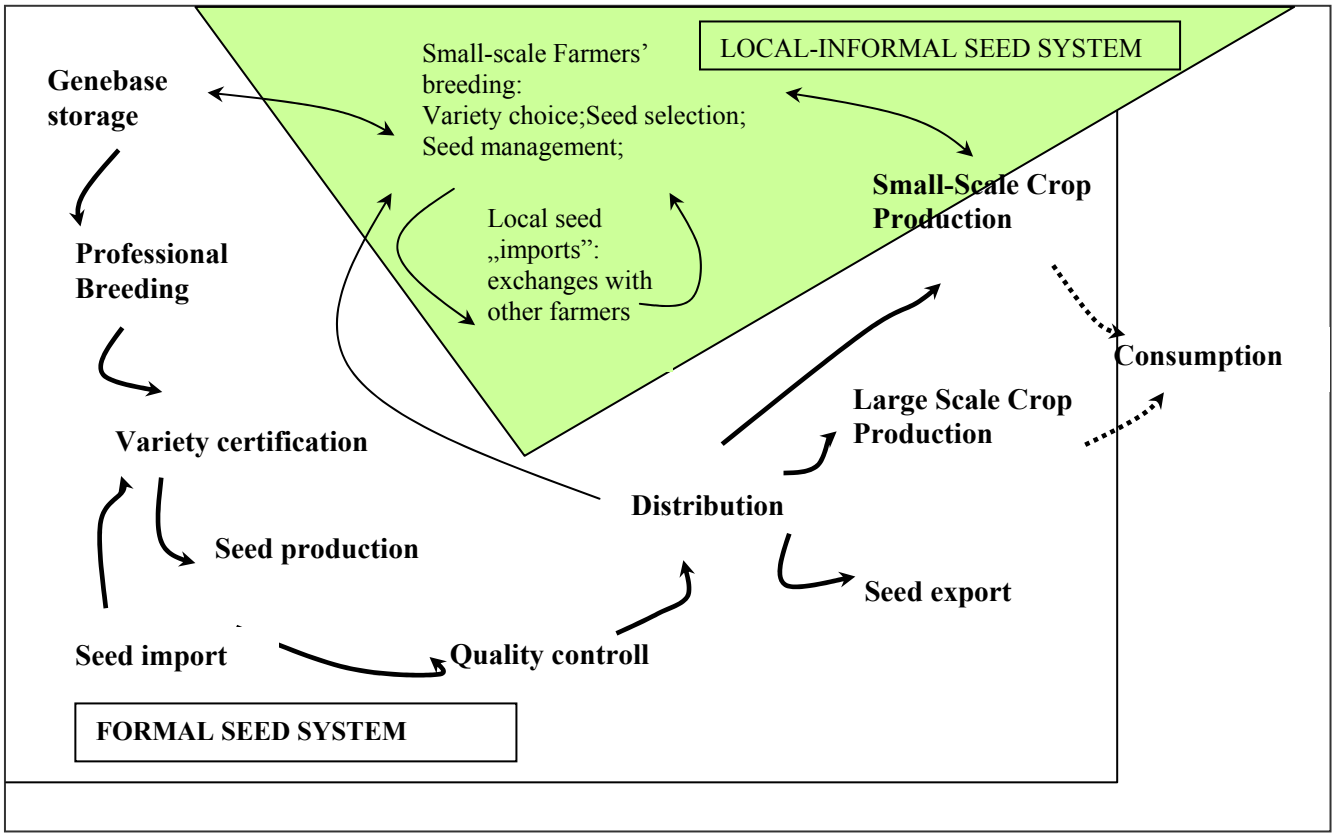


Figure 1 Formal and local-informal seed system (based on Smale and Bellon, 1999)

Farmer seed management consists of variety choice, selection of seed to planted the next season, seed storage, and seed transfers, exchanges, or mixtures (Bellon, Pham and Jackson, 1997; Louette, 1994; Smale and Bellon, 1999). Some refer to farmer seed management and its components as farmer breeding (Cleveland and Soleri, 2002). Variety choice may include either those saved and selected for many generations on farms (traditional, ancestral, or landrace types), or modern varieties (hybrids or improved open-pollinated varieties). Seed selection may include mass selection practices or farmer breeding, as well as re-use of hybrids or other commercial varieties.

Farmers have access to local varieties through the local-informal seed system. Efficient functioning of this system is therefore critical for on farm conservation of crop genetic diversity.

C. The Institutional Approach

Since no comprehensive studies about crop genetic diversity as it relates to farmer decision-making had been previously conducted in Hungary, the problem was approached from a broad perspective. One cannot build a sensible model unless the main parameters or variables involved in farmer decision-making are known. To construct a meaningful model, it is necessary to understand the seed system, its institutional context and the stakeholder environment that keeps the system working and changing.

Those belonging to the institutional school of thought believe that the analysis of the market is not possible by separately analysing the behaviour of the individual participants on the market, but that the evolving institutional structures become separate and independent factors with their own goals, thus modifying the conditions for and characteristics of the operation of the market. From an economist's viewpoint, institutions affect the performance of an individual, group or organization through their effect on the costs of exchange and production. Institutional structures constrain and enable individual actions at the same time. Also, institutions are created, maintained or changed by and through individual actions. Consequently, institutions and agents mutually constitute each other in a dynamic way. *An institutional analysis should reveal this dynamic, that is, the interactions between the main institutional structures and the most significant groups of agents, related to the problem under investigation.*

Institutional economics define "institutions" as basically "the rules of the game in a society, or more formally, the humanly devised constraints that shape human action" (North, 1990: 3). Organizations are groups of individuals with defined roles and bound by some common purpose and some rules and procedures to achieve the objectives previously defined. Like institutions, organizations also shape human action.

Institutional Analysis might concentrate on the following institutions:

- policies and objectives,
- laws, rules and regulations,
- organizations, their routines and core values,
- operational plans and procedures,
- incentive mechanisms,
- norms, traditions, practices and customs.

Research that aims primarily to explore and understand usually involves the application of qualitative methodologies. Nevertheless, economic research aiming at environmental valuation mainly applies quantitative methods and models in order to calculate monetary values attached to the different levels of biodiversity, from genetic diversity and species diversity to diversity at the habitat or ecosystem level (for studies on the economic value of genetic diversity see Drucker et al., 2001; among others). Recently, economic research about environmental valuation has applied methods based in the qualitative empirical tradition of scientific enquiry (see Kaplowitz–Hoehn, 1998 and 2001; De Marchi et al., 2000; Gregory–Wellman, 2001; Kontogianni et al., 2001; among others). A common thread in these methodological endeavours is that they utilize the frame of reference of the stakeholder approach developed in business management and organizational studies (see Mitroff, 1983; Freeman, 1984). Stakeholder analysis may be a powerful tool for policy analysis and formulation in the field of natural resource management (see Grimble–Wellard, 1997; Lochner et al., 2003; Soma, 2003; among others).

Access to crop genetic resources is being shaped in a politically contested terrain where diverse and competing interests are in conflict. There are clear incentives for commercially-oriented farmers to use varieties released by the formal seed industry, but these do not fully serve the needs of small-scale farmers who also grow crops for home consumption. There are less visible trade-offs between profitability and other, public attributes embodied in farmers' seed. The possibility of an irreversible degradation of the crop genetic pool on which farmers and breeders depend for future innovations and livelihoods, combined with limited knowledge

about the utility of crop genetic resource for future generations, entails intergenerational conflicts. An essential task of the institutional analysis is to reveal the extent to which stakeholders perceive these differences in interests.

Stakeholder analysis aims at identifying key actors or stakeholders of a system or a problem under examination. In our research, a stakeholder is an agent that can influence or can be influenced by the operation of the seed system. Typically, the seed system has multiple stakeholders with numerous, conflicting interests and objectives. Stakeholders range from non-market actors, such as regulatory or state agencies and non-governmental organizations, to market actors, including private, for-profit corporations, trade associations, and the farmers themselves. The key stakeholders of our research are the small-scale farmers who manage the seeds of the crops to be planted each season, in the sense depicted in Figure 1.

Classifying stakeholders is a useful preliminary exercise for defining the system more precisely. One might distinguish between market versus non-market stakeholders; active versus passive stakeholders; and primary versus secondary stakeholders. Active stakeholders are those groups that can affect or determine a decision or action; passive stakeholders are those who are affected by those decisions or action. The stakeholders who might benefit or lose the most by decisions or actions within the system called primary stakeholders; the others, with a much smaller stake, are secondary stakeholders. Stakeholders may also be categorized according to two important dimensions: importance (how strong one's stake is) and influence (power to enact one's interest or decision). As shown in Figure 2, stakeholders in area *A* have the largest stake but are also the most vulnerable, since their power to influence the course of actions is relatively weak. Typically, farmers who conserve crop genetic diversity belong to this stakeholder group, cultivating marginal lands and belonging to the least advantageous and politically the least powerful class of society with relatively few economic resources at their disposal.

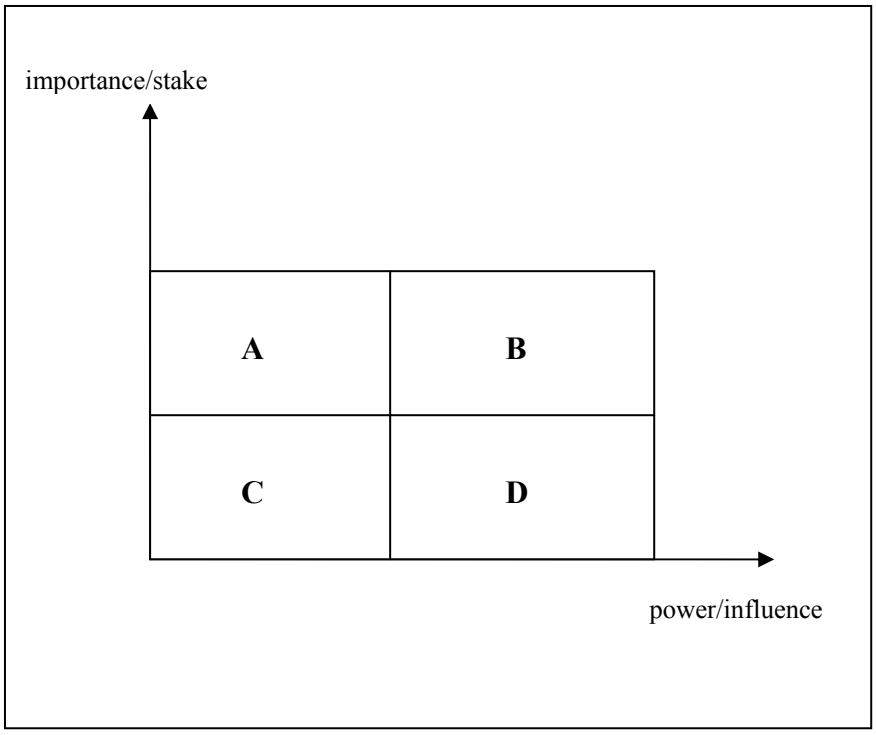


Figure 2 Categories of stakeholders according to their importance and influence (source: Grimble, R. – Wellard, K., 1997)

3. Methods Applied in the Institutional and Stakeholder Analysis

Narrative interviewing techniques were used to gather information on the cultural dimensions of landrace conservation from individual farmers. During narrative interviews, the interviewee has the chance to express his or her thoughts in a less structured way, so ideas and issues previously not considered can arise.

Twenty-two face-to-face, semi-structured interviews were also conducted with representatives of different organisational stakeholders. Since a requirement of the analysis is that all stakeholders answer the main questions, an informal checklist of common issues was prepared for all semi-structured interviews. Some questions asked varied according to the characteristics of the stakeholder, and the degree and mode of his or her involvement. The interviews were longer and more in-depth with those who were more affected, and sometimes more than one interview was carried out. Common issues explored in these interviews are summarized below.

Knowledge and experience

How do the participants understand the concepts of landraces and farm-saved seed, and in what context do they use these terms? With which landraces are they familiar? Have they heard that landraces exist for fields and garden plants as well as for fruit trees? Do the terms agro-biodiversity and genetic diversity mean anything to them? In general, in order to evaluate the familiarity of the participants with our research topic, we asked questions regarding the knowledge and experience of the participants on the topic.

Attitudes and perceptions

What importance do they ascribe to the conservation of agro-biodiversity and landraces/farm-saved seeds? Why is it important or unimportant? Are there any current benefits or expected future benefits from conserving agro-biodiversity? Does the farmer or farmer's organization have any power or any intention to become involved in issues related to the erosion of the gene pool?

Understanding decision-making

Are there any state/local/other incentives in the form of legal, economic or moral support for the conservation of landraces? What are the obstacles encountered by farmers who take explicit steps towards conserving crop genetic diversity? What obstacles are there for other farmers? What resources or power does the farmer have to help the preservation of landraces? What role can the interviewee organization have in preserving landraces? Is there any cooperation or is it conceivable that there could be cooperation between the various stakeholders to conserve crop genetic resources? What kind of information/communication structure is needed to conserve landraces effectively? What changes in rules and incentive systems would be needed to conserve landraces?

Data collection:

Are there any written rules, written missions, guidelines, or plans that influence the decisions and behaviour of the interviewee or interviewee's organization regarding the conservation of genetic diversity? What data is available to them?

Interviewee and organization:

How long has the interviewee been working with agriculture, or with the issue of agro biodiversity? What degree of competence does he or she have? (Demographic information about the interviewee, organization size and other characteristics.)

All interviews were transcribed and analysed by applying coding techniques. The interviews served the purpose of collecting data as well as the aim of exploring the preferences and knowledge of the interviewees. Documents were assembled for content analysis. Organizational policies, national policies, texts of laws and rules, written missions, written rules, founding documents, norms, web page contents are the subject matter of content analysis. In the content analysis phase of the research, all relevant texts are combined and the focus is assessing the relative power and possible influence or each stakeholder in agro-biodiversity conservation.

4. Findings

The Present State of Our Work

There are several types of stakeholders that are connected to formal and local-informal seed systems in Hungary, and these have various interests and values. Figure 3 shows the stakeholder map developed to categorize institutions and organisations prior to planning interviews and collecting data. We planned to interview roughly the same number of actors in each stakeholder group, except in case of farmer interviews, which are more numerous because farmers as a group are more heterogeneous.

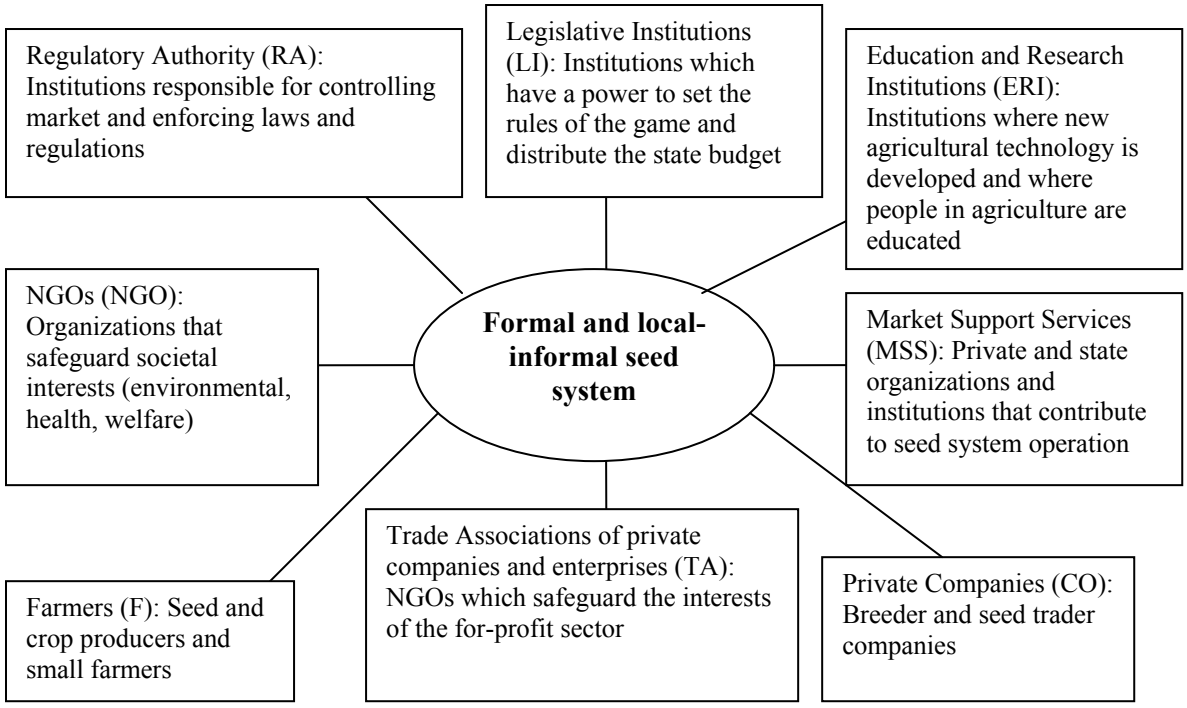


Figure 3.: Stakeholder map of the seed system

By reviewing relevant laws and regulations and interviewing some actors, we were able to identify primary and secondary stakeholders. The individual selected for the interview was the person who was most likely to possess the necessary knowledge to answer questions or who might be considered as a decision-maker.

By July of 2003, we had completed 14 semi-structured interviews, mostly with interviewees affiliated with governmental organizations and research institutes. We have started a series of interviews with market participants, to be completed in the next phase of the project. We have also conducted 13 interviews with farmers in two of the environmentally-sensitive areas that are our study sites (Őrség-Vendvindék and Dévaványa regions). We organized a group interview at the end of March 2003 in Gyomaendrőd, in Dévaványa region. Unfortunately, due to the very low level of interest shown by local farmers, the number of participants was very small. Analysis of the transcribed interview texts and processing of data are in progress.

Institutions and organisations	Activities	Categories	Primary (P)/ Secondary (S) stakeholders	Planed Interview (number)	Interviews have been done
Agrobotany Institutions	Genebase storage	MSS LI	P	X (2)	X
Ministry of Agriculture and Rural Planning Department of Sector Relations	Genebase storage Breeding Seed production	LI	P	X (2)	X
Ministry of Agriculture and Rural Planning Department of Agro-environment	Distribution	LI RA	P	X	X
Ministry of Environment and Water Management	Genebase storage Seed production	LI	P	X	X
Cereal Research Non-Profit Company	Breeding	ERI	P	X	
St. István University Institute of Environmental Management	Seed production Crop Production	ERI	P	X	X
St. István University Department of Plant Production	Breeding Seed production Crop Production	ERI	S		
Debrecen University	Breeding	ERI	S		
Association of the Hungarian Breeders	Breeding	TA	S	X	X
Breeding companies: Pioneer, Singentaseed, MAG Ltd	Breeding	CO	P	X	X
Companies dealing with seed production Pioneer, Singentaseed	Seed production	CO	P	X	
Seed trading companies: Primag Ltd	Seed production	CO	P	X (2)	X (1)
Banks and other financial institutions	Breeding Seed production Distribution Crop production	MSS	S		
National Institute for Agricultural Quality Control	Variety certification Seed production Quality control	RA	P	X (2)	X (1)
National Agricultural and Breeding Committee	Variety certification	LI	S		
Hungarian Patent Office	Variety certification	RA	S		
Crop Products Committee	Variety certification Distribution	TA	P	X	X
Biokontroll Hungary	Seed production Quality control	MSS	S	X	X
Association for Organic Agriculture	Seed production Crop production	TA	S	X	
Environmental Partnership Foundation (environmental NGO)	Seed production	NGO	P	X	
Chamber of Agriculture	Seed production Crop production	TA	S		
Consumer Protection Office	Distribution	RA	S		
Association of the Hungarian Seed Distribution Companies	Distribution	TA	S	X	
Local market	Local Seed System	MSS	P	X	
Farmers' notary (adviser for farmers)	Local Seed System	MSS	S		
Bethlen Gábor Technical School for Agriculture	Local Seed System	ERI	S	X	X
Small-scale farmers	Seed production Crop production	F	P	X (15)	X (13)
Large-scale farmers	Seed production Crop production	F	P	X (5)	X (3)

Table 1: An overview of activity, categories and significance of institutions and organisations

Related National Policies

Several national programmes exist or are under construction that will likely influence the function of the local-informal seed system and may have either favourable or adverse impacts on efforts to conserve agro-biodiversity on farms. These are discussed briefly in this section.

Variety Certification System, and Intellectual Property Rights for Variety: Breeding and seed certification has a historical tradition in Hungary. The Seed Act (1996.CXXXI.) contains the conditions of state legislation, the process of variety certification and institutional framework. The regulation includes three statutory rules: State recognization of plant species (88/1997); Production and sales of seeds (89/1997); and Preservation and usage of genetic materials (92/1997). According to the Act, in Hungary only those varieties can be produced and traded that are officially registered by the state (except for private consumption purposes). Considering the registration procedure, landraces and varieties that are professionally bred fall under the same regulation. Seed regulation is now changing, and a new Property Rights Act is being enforced which has special rules regarding varieties. The proposed new Seed Act defines the notion of landrace, and will adopt Common Variety List of the European Union.[2] During the process of preparing the legislation, the decision makers are currently faced with the problem that conventional means cannot be used to certify and register local varieties. For these varieties, factors have to be considered which are difficult to evaluate by conventional procedures, and certification by authorities must be based on experience gained during production, propagation and use. According to the new regulation, Hungary must accept all the varieties that are certified by any members of the European Union. For this reason, the establishment of a Recommended Variety List will have greater importance. Assessing the potential impact of the proposed new regime on landraces is an important research question.

National Strategy of Agricultural Biodiversity: In the 6th article, the Convention on Biological Diversity (1995.LXXXI.) affirms the obligation of states to establish national strategies for biodiversity protection. The Ministry for Environment in Hungary has prepared a draft Action Plan for Agro-biodiversity preservation (Ángyán et al., 2002), which outlines the important

[2] The current Hungarian Seed Act defines 3 types of variety lists:
-National Variety List (the list of registered varieties and the most important data of them)
-Descriptive Variety List (detailed data of registered varieties)
-Recommended Variety List (the act offers the possibility of composing a list about the varieties that are recommended for specific ecological conditions of tenures)

strategic steps to meet the CBD requirements, and identifies the institutions that are responsible for various actions. Analysing this action plan from the point of view of crop genetic resources is a significant issue.

Breeding Programmes: Plant breeding was strongly encouraged by the government especially from the 1960s until the 1980s. In parallel with the change in agricultural support scheme the direct funding for plant breeding was reduced. At present there is competition between multinational breeding companies and the publicly-financed, underfunded national breeders. Heszky et al. (2002) analysed the pedigrees of the varieties of major crops that were developed by national researchers and certified during the last three years. The vast majority (85.2%) of inbred lines for hybrids originated from domestic gene stocks. It is regrettable that crop area in maize varieties bred in Hungary has decreased continuously since the introduction of imported varieties from abroad, so that there are no apparent incentives to use local genetic materials in research. Economies of scale also influence national maize breeding activity. The Carpathian Basin has heterogeneous ecological conditions. Three climatic zones are found within the limits of the country (atlantic-alpine, continental, sub-mediterranean) and geography is also diverse. For organic farmers and farmers producing in areas with low productivity potential, varieties with good adaptability to complex environmental stresses with levels of other inputs are essential. The sales potential of domestic seed market is small, and the lifetime of individual varieties is short, so that large seed companies are not interested in developing varieties for particular environmental niches using Hungarian genetic materials. There is some demand for the establishment of an innovative National Breeding Program to work more directly with farmers in enhance local materials for production in less favored areas of the country.

National Agri-Environment Programme: Organic Farming Scheme and Zonal Programmes: The primary goal of the National Agri-Environment Programme is to establish farming practices that are based on the sustainable utilisation of natural resources, the preservation of natural values and biodiversity, the protection of landscape values and the production of healthy products. The Organic Farming Scheme provides support for farmers who apply or are willing to apply organic plant production and animal husbandry practices. The support may vary with production categories (arable, grass, vegetables, vine, fruit) or animal species. The zonal programmes are primarily schemes for marginal areas with low production

potential but significant natural value. This programme probably has a crucial role in on-farm preservation of crop genetic diversity because:

- It ensures a land-based subsidy for farmers situated on low-potential or environmentally sensitive areas. This group of farmers might be potential users of landraces.
- It ensures a land-based subsidy for organic farmers. This group of farmers might be potential users of landraces.
- It finances the establishment of Regional Agro-environmental Centres partly in order to explore and conserve traditional cultivation practices that are appropriate for specific regions. In the future these centres might play a crucial role in the maintenance of landraces.
- Subsidies might be available to support breeding for specific purposes, e.g. organic production of specific environmental conditions.

Biological-base Tender: The tender has been operating for 10 years, and consists of two parts. One part, a non-compensatory subsidy, is available for ex-situ conservation to maintain specific varieties. The target group of this tender includes large institutions and gene bank collections, which means that this is not available for individual farmers or for farmers' associations. On the other hand, candidates can apply for a non-compensatory investment subsidy as well for covering costs of certification of new varieties. The tender finances some research, such as a country-wide exploration of ecological factors that have a significant impact on important agricultural products.

Nature Protection Regime: The aim of the Nature Conservation Act (1996. LIII.) is the general protection of biological diversity and it assumes importance because of the wild relatives of crop species. The Nature Protection Regime has a crucial role in maintaining the ecological conditions upon which the availability of wild genetic resources depend. For maize and bean, there are no implications of this Act in Hungary.

Related International Agreements and Regulations

Hungary has joined important International Agreements relating to the protection to Plant Genetic Resources, and national regulations must be understood within these frameworks:

i. International Treaty on Plant Genetic Resources for Food and Agriculture
ii. International Convention on Biological Diversity (CBD)
iii. FAO Guidelines on Plant Collecting

The International Convention on Biological Diversity (1995. LXXXI. Act) has been ratified in 1994.

The International Treaty on Plant Genetic Resources for Food and Agriculture is likely to be enforced soon. Hungary has signed but has not ratified this Treaty. The Treaty countries agree to establish a Multilateral System to facilitate access to plant genetic resources for food and agriculture, and to share the benefits in a fair and equitable way. The Treaty contains provisions for Farmer's Rights, which include the protection of traditional knowledge, and the right to participate equitably in benefit sharing and in national decision making about plant genetic resources. It gives governments the responsibility for implementing these rights. There is very little information available on the utilization of the material collected from farmers and stored in the Hungary's national gene banks. Therefore the benefit sharing based on utilization in plant breeding or elsewhere has little chance of being successful, even if the meaningful algorithms for calculating shares could be developed.

Hungary has signed all international agreements concerned with Intellectual Property Rights (IPRs) as well. Our regulations are being reformed, in order to incorporate the commitments stemming from the following agreements:

iv. Patent Cooperation Treaty,
v. TRIPS,
vi. UPOV.

The research on this project intends to explore the possible impact of the adoption of IPRs in agriculture on farming communities by describing the new regime and exploring stakeholders' views.

The International Convention for the Protection of New Varieties of Plants (UPOV Convention) has been introduced in Hungary on the 1st January, 2003. (2002. LI.) The basic obligation is that each contracting party shall grant and protect breeder's rights. The 14th

article contains the scope of the breeder's rights and the 4th article points out the National Treatment. The achievement of this agreement falls under the direction of the Chief Executive of the Office of Patent Right's and the Minister of Agriculture and Rural Planning.

The Extent of the Seed System in Hungary

Both formal and local-informal seed systems have a tradition in Hungary. Economic transformation, social structure and cultural change have affected both systems and their institutional setting. In the last 15 years, the seed system changed considerably because seed companies were gradually privatized and the agricultural sector was liberalized. In the near future, the European Union will requires other minor changes in the Hungarian institutional structure and legislation.

The market for seeds is an open market, and anyone is entitled to trade in seeds, provided that a seed has been certified by the Hungarian Agricultural Quality Control Authority. At present there are 936 companies in the formal seed sector, quite a number of them trade in seeds. The size and functioning seed system differs for the study crops, maize and beans. The maize seed industry is vertically integrated and concentrated, with a few multinational companies sharing total sales. The bean seed industry is not so concentrated and is relatively small. In 2001 the harvested area of maize was 1,258,120 ha, from which 29,017 ha was for seed propagation. After quality control and certification, a major share of the planting material (seed) (59 % - 32,471 ton) was exported mainly to West European countries. The propagation area for bean (including green bean) was just 97 ha in 2001, and the total harvested production is not enough to satisfy domestic demand, so that bean imports are required.

Fierce competition on the seed market after liberalization, combined with profound changes in social conditions as a result of economic transformation, had adverse impacts on the local informal seed system. In the case of certain species (e.g. paprika seedlings and some bean varieties), local informal seed exchange and trade is more extensive than in the tightly-controlled, commercial species (maize, sunflower, wheat, etc.). Since trade with local varieties is prohibited, there are no precise market data about the frequency of exchange and size of the "market". It might be possible to make a crude estimate of the frequency of usage of local varieties considering the results of our survey targeted at the household level. The

size of our sample[3] was 330 households, but only 282 cultivated beans, and 152 (54 %) appear to use landraces or local varieties. In case of maize, only 13 % of the farmers cultivated local varieties (23 farmers) and others (175 farmers) acquire their seed from the formal seed system.

Small-scale farming has a long established tradition in Hungary, and neither the socialist regime, nor the acute agricultural crisis that followed, succeeded in eliminating it. The average farm size is 4.8 ha in Hungary, 12.71 % (1,065) of cooperatives and 94.81 % (908,796) of private holdings have less than 10 ha area. According to the census of the farmers in 2000, all 697,336 households have kitchen gardens. The area in gardens totals 41,193.66 ha, implying an average garden size of 591 m^2. The primary goal of kitchen-garden cultivation is subsistence farming and recreation, followed by supplementary income.

In parallel with international trends, the ageing of farmers is observable in Hungary, too: 59 % of workers are middle-aged or older. The average age of male farmers in private holdings is 53 years and 60 years for females. The average wage in agriculture is 73 % of the industrial sector and payment is usually uncertain. The small plots and gardens are unsufficient to provide the necessities of life for families, and with few rural employment opportunities, young people move to towns. It is primarily the elderly, with limited labor capacity, who manage gardens. According to our interviews, a lot of old farmers have experience in intensive farming because they worked for state-owned cooperatives during the socialist regime but they usually studied crop cultivation from their parents. Among middle-aged farmers, knowledge gained from parents is less significant in current farming practices. In the cooperatives of the socialist regime, these farmers became familiar with the application of fertilizers, chemical pesticides, and high-yieldling varieties. Now, because of rising opportunity costs of labor in some areas, there is a demand for labor-intensive technology in small-scale farming practices as well, with may have adverse consequences for the use of local varieties.

The hybridisation programs had a crucial role in spread of high yielding varieties, adopted first by large-scale farmers and cooperatives and later by smaller-scale farmers. Today all

[3] In the sample, the bean and maize producers are over-represented, because of using a pre-survey about species they cultivate, before choosing the sample. In the first round we chose households cultivating one, the other, or both these crops.

farmers have access to registered seeds and the network of shops and traders are well developed so that there are no distribution problems. In parallel with the expansion of the formal seed trade in local farming communities, the informal system weakened. Access to local seeds and knowledge about specific production practices are difficult and realized through personal contacts. Seed sales on local markets are exclusively controlled by the National Institute for Agricultural Quality Control, so that the functioning of local-informal seed system is de-legitimized. Local seed such as bean seed, when sold in farmers' markets, is sold as food.

The number of non-governmental organizations dealing with the issue of agrobiodiversity conservation is limited. None have taken it upon themselves to represent the cause or to lobby for it. Organic farmers are those who have shown the most interest in landraces. Small landowners do not have strong representative organisations, so their grass root initiatives are usually unsuccessful. Empowering them to be able to participate will be a crucial prerequisite. The institution of participatory variety selection or participatory breeding is non-existent. During the course of formulating legislation, farmers have not been consulted. Only professional experts and non-governmental organizations have been consulted, though they often have few ideas about how to implement crop genetic resource conservation.

5. Conclusion and Further Work

Conclusions

Crop genetic resources are embodied in local varieties of seeds. Access to the range of local varieties is realized through channels of the formal and local informal seed system, which are interrelated. In Hungary, at present, the formal and local seed systems are artificially separated by legal barriers to the recognition, sale and exchange of farmers' seed. As a consequence, it is very difficult to collect data about the extent and operation of the local informal seed system.

Our analysis focuses on the institutions and organizations attached to the seed system. Small-scale farmers producing to meet the needs of their families have played an important historical role in the conservation of plant genetic resources in Hungary. Since monitoring so many farmers is costly and difficult, regulations have not succeeded in preventing them from

growing landraces and exchanging their seed, though the system functions inefficiently. The aging farm population, combined with loss of traditional agricultural knowledge during the socialist period and after the economic transition, is associated with a growing demand for labor-saving, modern technology. This process coincided with the growth of the commercial seed industry.

A certain proportion of the local varieties will not be able to fulfil even the less stringent requirements of a "lighter certification" envisaged under new legislation. During the current process of preparing legislation, policy makers are faced with the challenge that conventional means cannot be used for the certification and registration of local varieties.

The Hungarian seed market is small. Investment in breeding for the specific conditions of a certain production niche is uneconomic, and the few Hungarian research institutions involved in this kind of work are not financially viable. Only very few registered seeds traded in Hungary are bred from local varieties. The use of high-yielding varieties by multinational companies and registered by the authorities is the norm.

The authorities dealing with the preservation of genetic resources are the Ministry of Agriculture and Rural Development, National Institute for Agricultural Quality Control, and the National Gene Bank. Though the experts employed by the National Gene-bank have an understanding of the issues, they are not in any position to make decisions other than as it relates strictly to the budget for ex-situ conservation.

One possible prospect for the future is that the local informal seed system might be legalized and supported by government, encourage the establishment of a well-integrated seed sector might be established. Seed savers' organizations and participatory breeding activities might be supported as part of the National Agri-Enviroment Programme, along with the investigation of labelling approaches to protect organic production process or production quality.

The other scenario is that the local seed system will be eliminated because of the absence of conservation policy and every farmer will use high-yielding varieties in their fields and gardens. In the first case the local seed sector will be strengthened, which is favourable for on-farm management of agricultural biodiversity and which is come up to the expectations of

EU policy (98/95/EC directive and 2002/53/EC directive 20 paragraph). In the second case, the process of genetic erosion is likely to be accelerated and the well-being of rural households may also be adversely affected. .

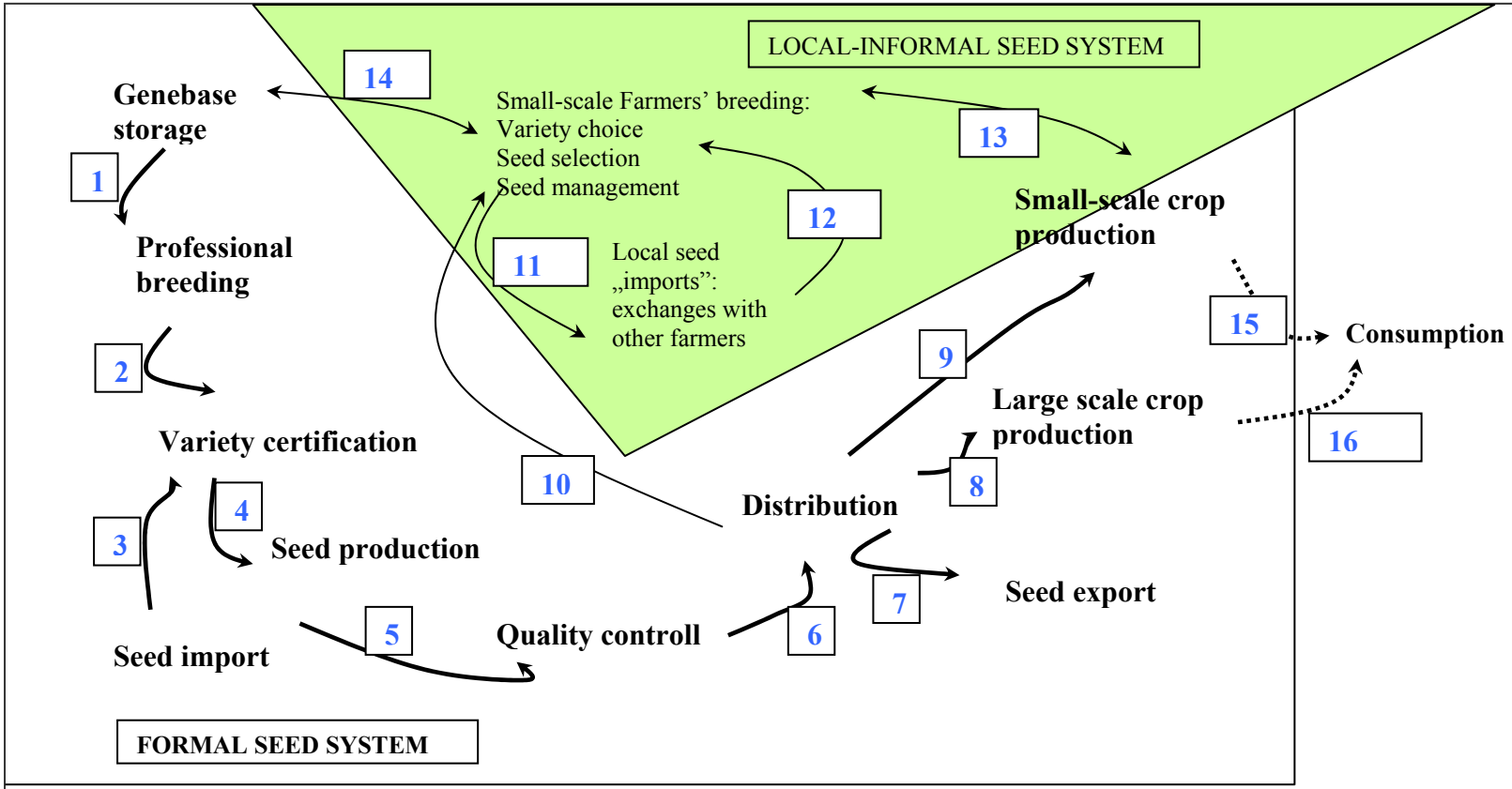
Future Work

We have not completed the Institutional Analysis, and further work is required. The interviews with market participants remain to be completed, and the interviews with farmers in the Szatmár-Bereg ESA need to be prepared.

We have identified actors/stakeholders and categorised them. By reviewing the regulations and collecting market data, we defined their role in the seed system and their significance in contributing to in-situ conservation of crop genetic diversity. Assessment and comparison of the stakeholders' values and perceptions through analysis of interview texts are in progress. We have made contact with farmers' organizations, and are organizing an informal discussion group, where experiences gained with local varieties will be discussed. Local actors with whom we can cooperate in the future need to be found. In the next round of research, we will seek to extend the focus to secondary stakeholders.

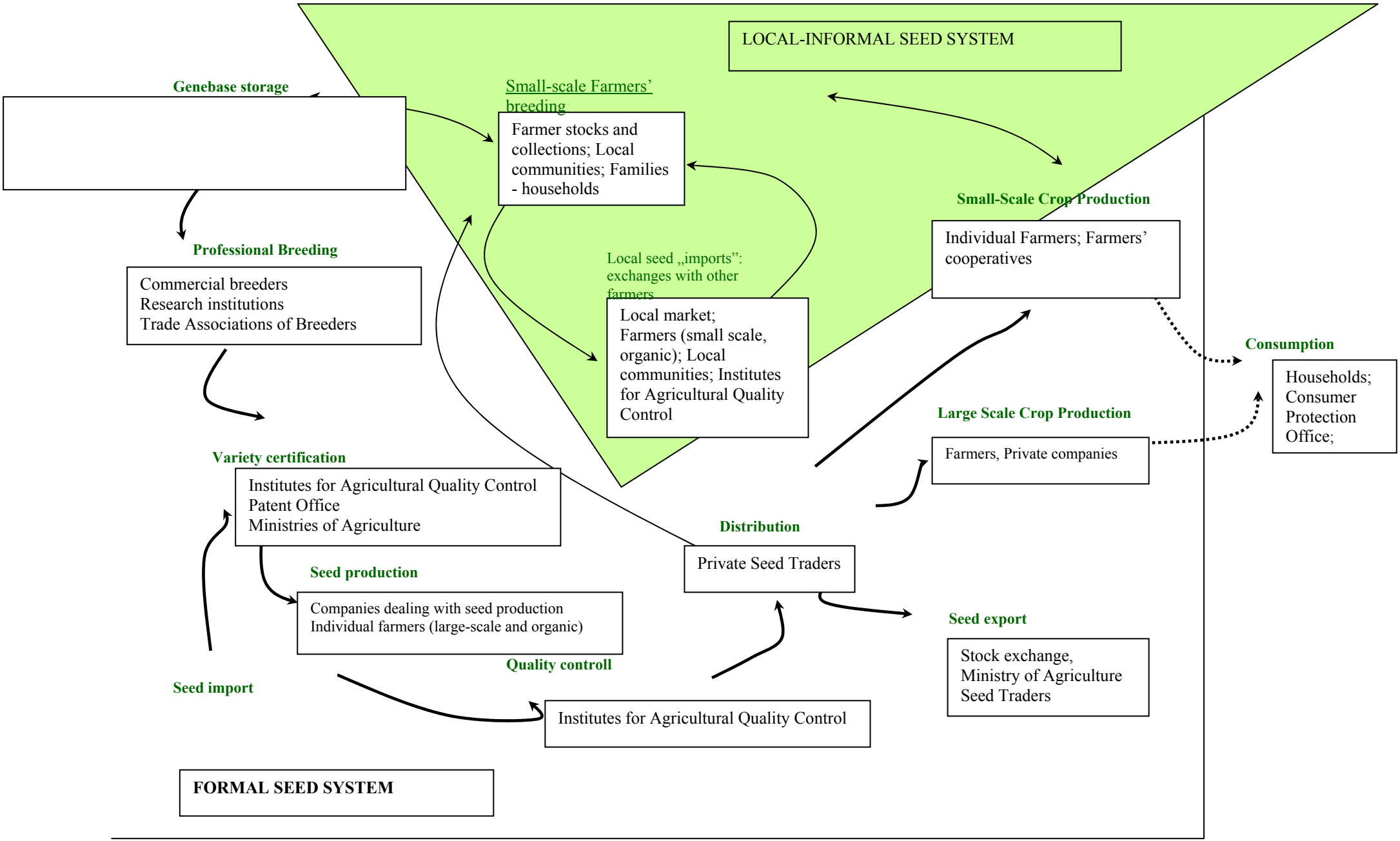
It is our hope that a policy for the conservation of plant genetic resources could be founded on the results of our project, and it is our intention to suggest specific modifications to current seed regulations in Hungary. We plan to arrange a forum for the experts of the St. István University and the Institute of Agrobotany to discuss the possible measures that could be implemented with the aim of preserving genetic diversity of crops, and make a joint policy recommendation which would be circulated among decision makers.

Observations show that there are some regions in the country where the local varieties have entirely disappeared and would have to be reintroduced. The question arises whether it is possible to determine the minimum stock of landraces (the critical natural capital for local varieties) necessary to maintain a population of any one variety. This is a matter not of quantities, but of the number of varieties that a farmer plants within a specific area and the genetic structure of the species as it is managed by farmers. The research question will then be how many farmers are needed to cooperate in order to conserve a variety, and what are their incentives to cooperate.



What kind of genetic resources flow trough the channel:
1: genetic material with useful characteristics
2: candidate seed;
3: registered seed in abroad;
4 – 10: registered seed;
11-13: adapted/local varieties;
14: any kind of crop/seed
15: crop from local varieties and from registered varieties
16: crop from registered varieties

Appendix 1: Genetic Resources Flow in the Seed System



Appendix 2: Institutions of Formal and Local-informal Seed System

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