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Conserving Genetic Resources: Linkages between Local, National and International Levels*

Introduction:

The rapid loss of biological diversity is a significant global environmental problem. Biodiversity loss, in the form of genetic erosion, loss of species and habitats, can cause unanticipated harm for entire ecosystems (Raustiala, 1997). Perrings and Gadgil emphasize that biodiversity loss at any level diminishes the world's gene pool which comprises the genetic information contained in the set of species on Earth, as well as the information that may be provided in the future through the evolution of these species (Perrings and Gadgil, 2003).

In his discussion of the evolution of international environmental governance, Peter Haas underlines that since the 1972 United Nations Conference on the Human Environment (UNCHE), a stable set of expectations about reciprocal state practice has been established (Haas, 1999). Haas notes that the international environmental accords concluded since UNCHE establish normative and procedural benchmarks against which governments are held accountable by their citizens, by other governments, and by influential international organizations. The opening for signature of the Convention on Biological Diversity (CBD) in 1992 at the United Nations Conference on Environment and Development (UNCED) in Rio has been a crucial step in addressing the concerns about biodiversity loss, as well as the increase in economic benefits from exploitation of natural resources through advances in biological technologies. Entered into force on December 29, 1993, the CBD obligates countries party to the Convention to conserve, sustainably use, and guarantee access to genetic resources, in return for a fair and equitable sharing of the benefits arising out of the utilization of these resources.

This paper will analyze the conservation of genetic resources in Turkey, a center of origin and diversity of a number of crop plants, within a framework of multi-scale linkages. At the international level, the paper will look at two international institutional frameworks, namely, the CBD and the neoliberal economic regime fostered by the International Monetary Fund (IMF) and the World Bank (WB), which direct national agricultural policies toward liberalization through arrangements such as stabilization and structural adjustment programs. Turkey is a party to the CBD, and has been in a process of agricultural restructuring, which has accelerated with the rather recent economic crises under IMF supervision and WB assistance. This makes Turkey a great context in which to analyze the interplay between the two international regimes at the domestic level. The paper will argue that the nature of the policies adopted at the national level can best be understood by looking at the interplay between international conventions/agreements and

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national policy making, as well as limitations of and possibilities offered by domestic structures.

Conservation of Crop Genetic Resources:

Crop genetic diversity, as part of a more general conception of global biodiversity, is crucial for long term food security, as it provides the raw material needed for future crop adaptations to changing pests, pathogens, and environmental conditions. Thrupp notes that agrobiodiversity yields an array of benefits by contributing to productivity, resilience in farming systems, income generation, nutritional values, as well as providing ecosystem services on farm, including pollination, fertility and nutrient enhancement, insect and disease management (Thrupp, 2000).

The centers of origin of the world's crops are concentrated in a few places which are known as Vavilov Centers, after the Russian botanist Nikolai Vavilov (Boyce, 2004).[1] Vavilov Centers, Brush argues, are critical locations for genetic resources of the world's crops because of the gene flow between wild relatives and cultivated types and decentralized selection by the farmers, which comprise the ongoing processes of crop evolution (Brush, 2003a).

The significance of the complementarity between *in situ* diversity (as represented by crop varieties planted in farmers' fields) and *ex situ* diversity (as represented by collections in gene banks) is emphasized by scholars writing about crop genetic diversity. For example, Wilkes notes that while the largest gene pool is found in the "silently shrinking landraces and folk varieties of indigenous and peasant agriculture", the centers of diversity for crop plants have increasingly become mega-gene bank storage facilities (Wilkes, 1992). The Consultative Group on International Agricultural Research (CGIAR) is the body of network of international agricultural research centers including the International Maize and Wheat Improvement Center (CIMYYT) in Mexico and International Rice Research Institute (IRRI) in the Philippines. These centers have been major collectors and storage sites for germplasm and played a key role in breeding new varieties of crops. They make germplasm available to national public institutions and to private plant breeders (Frisvold and Condon, 1998). Despite the fact that gene banks give plant breeders access to germplasm and provide insurance against losses of *in situ* diversity (Boyce, 1996), there are a number of problems associated with them, partly due to problems of limited funding, and partly due to the nature of their conservation strategy. Frisvold and Condon (1998) note that while there has been a significant emphasis on collecting materials, less attention has been given to maintaining the viability of accession over the long term. Most gene banks lack long term storage facilities, and even accessions in long term storage can not be maintained indefinitely (Frisvold and Condon, 1998). Seeds need to be periodically regenerated by planting to harvest new seed, yet, a major problem is lack of funds, facilities, or trained staff to carry out needed regenerations (Frisvold and Condon, 1998). However, one point that should be emphasized is that even if all these problems could be overcome, gene banks by themselves can not be adequate for conservation and particularly evolution of genetic

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[1] In early 20th cc, Vavilov participated in expeditions to collect crop varieties, during which he developed the idea that agricultural biodiversity was not spread evenly in the world, but concentrated in a number of hot spots, such as southern Mexico, southwest Asia (Near East), tropical south Asia, east Asia, the Mediterranean shoreline, Ethiopia and the Andes (Mann, 2004).

diversity. “The ongoing process of evolution, which created this diversity and continues to generate a flow of new varieties, can not be stored; it can happen only in the field.”[2] Hence, while gene banks are crucial, they should be seen as a complementary strategy to *in situ* conservation and evolution of genetic diversity, and not as a substitute.

In centers of diversity, Brush notes, the primary stewards of crop genetic resources, which continue to provide the basis for agricultural development around the world are poor farmers, yet, these genetic resources are threatened by the economic marginalization of poor farmers by the competitive disadvantage of traditional crops compared to modern industrial agriculture (Brush, 2003b). “Genetic erosion-the loss of biodiversity and resources- is being caused by the replacement of local varieties with improved ones or with different crops altogether and by the exodus of farmers to non-farm employment”.[3] For example, the causes of genetic erosion underlined in a number of country reports to the Food and Agriculture Organization (FAO) include replacement of local varieties, land clearing, overexploitation of species, population pressure, environmental degradation, overgrazing, and changing agricultural systems (FAO, 1998).

Bardsley notes that where inefficiencies in agricultural production are associated with natural diversity, industrial agricultural processes overcome these by developing highly mechanized, high-input, and regulated processes (Bardsley, 2003). Scott underlines that modern, industrial farming, which is characterized by monocropping, mechanization, hybrids, the use of fertilizers and pesticides, and capital intensiveness has brought standardization, and one of the basic sources of increasing uniformity in crops arises from the intense commercial pressures to maximize profits in a competitive mass market (Scott, 1998).

In analyzing individual actions, one approach is to emphasize economic rationality, which sees utility maximization, or the efficient promotion of interests at the center of all actions. In his discussion of farmer behavior, Turan notes the observation by Ortiz in Colombia that farmers distinguish between those activities which are guided by subsistence considerations and those which relate to the market.[4] Turan (1984) argues that maximizing gains requires taking high risks, yet, by remaining loyal to time-tested ways, the farmers may be foregoing higher gains, but at the same time, they are avoiding high risks. Bardsley notes that in agroecosystems in mountainous regions reflect large variations in agro-ecological conditions, and that rural communities in mountainous regions of Nepal and Turkey respond to agroecological risk by ensuring that diversity remains integrated within their production methods (Bardsley, 2003). Despite their low yields, landraces are cultivated since they give reliable yields, or they can be re-sown in the spring if the crop fails, whereas the modern varieties can not.

The neo-classical approach to agricultural development encourages the withdrawal of the state from interference in the market governance of production systems (Bardsley, 2003). As Carlson underscores, the International Financial Institutions, the

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[2] Boyce, J.K. (1996) “Ecological Distribution, Agricultural Trade Liberalization and In Situ Genetic Diversity” *Journal of Income Distribution*, 6, 2, pp.265-286.

[3] Brush, S.B. (2003) “The Lighthouse and the Potato: Internalizing the Value of Crop Genetic Diversity” in Boyce and Shelley (eds.) Natural Assets: Democratizing Environmental Ownership (Island Press). P.188.

[4] Ortiz, S. (1971) “ Reflections on the concept of peasant culture and peasant cognitive systems” in Shanin (ed.) Peasants and Peasant Societies (Middlesex, Penguin Books), quoted in Turan, I. (1984) “Policymakers’ assumptions about Peasant Society: Myth or Reality” *Policy Studies Review*, 4, 1, pp.99-109.

IMF and the World Bank, under current policies, have aimed to impress upon developing states the importance of markets and the deleterious effects on development of excessive state regulation or involvement in the economy (Carlson, 1996). Both of these institutions, as well as the World Trade Organization (WTO), Carlson notes, have had success in orienting the developing states towards liberalization of laws affecting international flows of goods and capital.

Brush underlines that threats to traditional agricultural knowledge accompany restructuring in the national agricultural sector, and specific changes in local farming systems. At the national level, systemic changes include integration of local farming systems into national and international flows of inputs and commodities, capital substitution for land and labor inputs, market allocation of land and labor, as well as decline in the percentages of people who depend on agriculture for their livelihoods (Brush, 2003a). He argues that the social value of traditional agricultural knowledge is highest for farmers, and a second social value of traditional agricultural knowledge is in maintaining crop diversity and crop evolutionary processes *in situ*.

The CBD, Kimball notes, is arguably the most encompassing international agreement ever adopted, it seeks to conserve the diversity of life on earth at genetic, populations, species, habitat, and ecosystem levels and to ensure its role in maintaining the life support systems of the biosphere (Kimball, 1997). The CBD is regarded as a framework convention, in, McGraw argues, three ways: first, it creates a global structure to promote continued international cooperation and to support national implementation, emphasizing national action relating to biodiversity within state jurisdictions, establishing a framework of general, flexible obligations that parties may apply through national laws and policies; second, through the negotiations of annexes and protocols, it allows for its further development; and third, it builds upon existing agreements, rather than absorbing related treaties (McGraw, 2002).

The CBD puts emphasis on *in situ* conservation[5], defined as "the conservation of ecosystems and natural habitats and the maintenance and recovery of viable populations of species in their natural surroundings, and in the case of domesticated or cultivated species, in the surroundings where they have developed their distinctive properties",[6] and establishes rules on the access to genetic resources and benefit sharing. Reconciling private and social values across national boundaries, and across highly contrasting social and economic groups has been central to international efforts to staunch the loss of biological diversity (Brush, 2003b). Perrings and Gadgil note that while international agreements are significant for the international coordination of conservation efforts and for the provision of national incentives to protect the global gene pool, national policies are essential to link countries to international frameworks to foster national cooperation and fairness (Perrings and Gadgil, 2003).Yet, they argue, international and national frameworks will achieve little unless biodiversity conservation makes sense locally, in the context of local ecosystems and people's lives. For the conservation efforts they undertake in the national, regional, and global interest, local communities must be fairly

[5] In the preamble of the CBD, it is stated that "…the fundamental requirement for the conservation of biological diversity is the *in situ* conservation of ecosystems and natural habitats…" and "…*ex situ* measures, preferably in the country of origin, also have an important role to play". In the Articles 8 and 9 of the CBD on *in situ* and *ex situ* conservation respectively, the emphasis on *in situ* conservation, and the idea that *ex situ* conservation is predominantly a complementary measure to *in situ* conservation is laid out.

[6] The Convention on Biological Diversity.

rewarded, and those conservation efforts must be consistent with the protection of local public goods (Perrings and Gadgil, 2003).

As such, the conservation of crop genetic diversity presents an excellent case for analyzing linkages between different scales of social organization in environmental governance, namely, the local, national and international levels. Through the cultivation of crop genetic diversity, the farmers in centers of diversity produce a positive externality, which is crucial for global food security, and has an intergenerational aspect. The local conservation of crop genetic resources has significant global implications. While some regimes, such as the biodiversity regime embodied by the CBD, may provide opportunities at the national and local level for the conservation of crop genetic diversity, these are interconnected with the international neoliberal regime embodied by the international financial institutions that affect national agricultural policies. As such, the local conservation of crop genetic diversity by the farmers is embedded at the intersection of these regimes.

In terms of the agricultural sector, the aim of the reforms that the international financial institutions direct is mainly expressed as market oriented production and less government intervention in the agricultural sectors to prevent the inefficiency and huge public deficits caused by this intervention. While this objective *per se* does not provide a ground for incompatibility between the CBD aims, it is important to look at the possible impact of these regulations laid out by the IMF/WB in different contexts. On the one hand, one could argue that the implementation of these objectives may lead to more efficient production and less environmentally degrading practices by the farmers. On the other hand, however, there may be too much pressure on the farmers for efficiency and market oriented production which may lead to unsustainable use of resources. This could involve, in the case of crop genetic diversity, the abandonment of traditional varieties in favor of modern varieties, or put pressure on the livelihoods of the farmers which may cause their abandonment of farming altogether.

It is also necessary to analyze the impact of agricultural liberalization process on the capacity of national governments to carry out certain environmental obligations, with particular reference to CBD. For example, one possible contradiction between the two regimes, though not *a priori*, but could be reflected in the implementation stage, may be with reference to the article 6b of the CBD, foreseeing the integration of conservation and sustainable use of biological diversity into sectoral and cross-sectoral plans, programmes, and policies. The governments under IMF/WB restructuring may emphasize the priority of agricultural efficiency in production, making it difficult and costly to integrate the conservation and sustainable use of biological diversity into the agricultural sector.

As such, the next section will discuss the conservation of crop genetic resources in the Turkish context.

Crop Genetic Diversity in Turkey:

Turkey falls within the Vavilov centers of crop genetic diversity, as two of these centers, namely, Near Eastern and Mediterranean centers are located in Turkey. For example, Zencirci and Birsin note that two wheat species, durum (*Triticum turgidum* var. *dicoccum*) and bread wheat (*T. aestivum*) originated in the agricultural lands of the historic and productive Fertile Crescent in the Near East, located between the Euphrates and the Tigris rivers, today mostly taking place in Turkey (Zencirci and Birsin, 2004). As they underline, wheat not only contributed to production in Anatolia, but also to other countries' wheat production, for example, one Turkish wheat landrace was found to carry genes for resistance and tolerance to various rusts, smuts, and other fungal pathogens, and it was used a source of resistance genes and is a parent of many of the wheat cultivars now grown in the United States (FAO, 1998). Landraces and wild relatives of crops from Turkey continue to provide new sources of important traits needed to maintain and improve agricultural production and efficiency worldwide (Firat and Tan, 1995).

Based on research on the genetic diversity of wheat in the Western Transitional Zone in Turkey, Brush indicates that while high yielding varieties of seeds predominate, local landraces are still cultivated in the production zone studied (Brush, 1995). The probability of cultivation of traditional varieties in a given household, Brush and Meng note, increases when the agricultural plot is situated in less fertile soil, or when the distance to the market and bad road quality increase a household's cost of accessing markets (Brush and Meng, 1998).

As part of the agricultural modernization that took place in the 1960s, high yielding varieties are predominantly used by Turkish farmers. In the field work that I conducted in Turkey, some farmers, particularly in the mountain and hillside villages, still cultivate traditional varieties of wheat, usually along with modern varieties. As the most important reason for cultivating the modern variety, farmers indicate yield which is superior when compared to the traditional variety. The farmers who cultivate the traditional varieties note their suitability to the soil and environment, and view them as an insurance against possible losses from the modern varieties, as well as the quality and taste of the produce. However, a significant number of farmers who cultivate the traditional varieties have indicated that they have started cultivating the modern varieties in recent years, emphasizing that yield concerns have pushed them to try to cultivate the modern varieties. In particular, younger farmers prefer to cultivate the modern varieties with higher yields, and the major priority is not the quality or taste, but the yield attributes of these varieties. When there is a surplus, (more than needed for home consumption), they sell it in the market.

One point that should be underlined is that there is no inevitable trade-off between the cultivation of traditional varieties and modern varieties, as a number of farmers indicate that they cultivate both. Earlier studies on the conservation of crop genetic resources have also pointed that out, for example, Brush notes that landraces are grown today under low input as well as high input agricultural technology, in subsistence oriented and commercialized economies (Brush, 1995).

In Situ Conservation of Genetic Resources:

Turkey signed the CBD in 1992, and ratified it in 1997. As one of the obligations the Convention, Turkey prepared the National Biodiversity Strategy and Action Plan (NBSAP). In NBSAP, it is underlined that signing the CBD provided a new starting point for recognizing the importance of biodiversity and addressing related issues in Turkey. The aim of the strategy includes the assessment of the status of biodiversity in Turkey, describe a conservation strategy with the agreement of related public and private institutions, and prescribe the relevant actions that need to be taken in order to achieve the objectives of the CBD.

One of the projects undertaken with the aim of conservation of genetic diversity is the Global Environmental Facility (GEF) funded *In Situ* Conservation of Plant Genetic Diversity Project that started in 1993 and completed in 1998.[7] The project culminated in the National Plan for *in situ* conservation of plant genetic diversity in Turkey.[8] The aim of this pilot project was to develop *in situ* conservation concept to conserve effectively genetic diversity of wild relatives of cultivated plants and forest tree species that have global significance. Tan notes that this *in situ* project is the first of its kind in the world both for woody and non-woody crop relatives in an integrated multi-species and multi-site approach (Tan, 1998).

In this project, landraces were not the focus. The reason for this was indicated as because the *in situ* conservation of landraces is very complex, involving biological, social and policy issues, and that this would test the limits of a pilot project.[9] During the implementation of the GEF project, Firat and Tan underline, one of the aims was to increase the institutional capacity of Turkey in the *in situ* conservation of landraces. As such, one project that Turkey started is "*In Situ* (on-farm) Conservation of Landraces in the North Western Transitional Zone of Turkey", which aims to analyze the conditions under which conservation of landraces of wheat, lentil, beans and chickpeas in the Aegean, Western Black Sea and Central Anatolian Transition Zones.[10] AARI is responsible for the conduct and analysis of ecogeographic, socioeconomic, and agro-morphologic survey of data for the provision of geographic base data.

In the national plans for the conservation of biological diversity and *in situ* conservation of genetic diversity, the importance of the inter-sectoral linkages in the conservation process, for example, the relationship between genetic diversity conservation and agricultural policies, changing agricultural practices, new market demands are emphasized, and a number of priority action plans are offered to address the problems, and there is an emphasis that the magnitude of genetic erosion is not known, and that measures can be taken to conserve the landraces in the field conditions by some socio-economic arrangements. [11] I argue that this is precisely where the current restructuring of agricultural policies, and its impact on the capability of farmers to conserve crop genetic diversity come to the forefront. At this point, it is the behavior of farmers who continue to cultivate traditional varieties of crops that is targeted for *in situ* conservation of crop genetic diversity, which is embedded in the broader policy context where the priority is aimed at increasing the efficiency and productivity by making the market process determine agricultural production. Also, in this context, the extent of the state capacity to which inter-sectoral linkages can be considered in the current

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[7] The Global Environmental Facility is the designated financial mechanism for the Convention on Biological Diversity.

[8] Kaya, Z., Kun, E. and Guner, A. (1998) National Plan for *In Situ* Conservation of Plant Genetic Diversity in Turkey, (Ministry of Environment). Coordinator: Ministry of Environment, Collaborators: Ministry of Agriculture and Rural Affairs, Ministry of Forestry.

[9] Firat and Tan (1997) "In Situ Conservation of Genetic Diversity in Turkey" in Maxted et.al. (eds.) Plant Genetic Conservation: The In Situ Approach (Chapman and Hall). See also article "Cutting Edge Conservation Techniques are tested in the Cradle of Ancient Agriculture: GEF Turkish Project is a Global Model for In Situ Conservation of Wild Crop Relatives: *Diversity*, Vol.16, 4, (2000).

[10] Dr. Tan is the project leader.

[11] Kaya, Z., Kun, E. and Guner, A. (1998) National Plan for *In Situ* Conservation of Plant Genetic Diversity in Turkey.

agricultural reform process seems highly limited. Below, I will present a brief discussion of agricultural policies and the process of restructuring in Turkey.

Agricultural Policies in Turkey:

During the 1980s, supported by the IMF and the World Bank, structural adjustment policies were implemented in Turkey, with these institutions underlining that state subsidies burdened the economy (Aydin, 1993). Those adjustment policies were intended to increase production and exports, without touching the structural specifics of the Turkish countryside, and for reduction of subsidies and state controls, reliance on market forces and the improvement of agricultural technology were considered necessary (Aydin, 1993). Yet, these reforms were implemented partially, and political and economic events influenced the protection that was provided to agricultural commodities, particularly in election periods (Yildirim, Furtan and Guzel, 1998). For example, there were fluctuations in policies regarding price supports. Until the mid 1990s, Dogruel et.al. note, Turkish agricultural support policies mainly rested on direct interventions to input and output prices, and as basic tools, subsidies in input prices, subsidized bank credits, and floor prices were employed to support agricultural activities, and in some cases, the government would enter the market as the supplier of inputs and buyer of the agricultural products in order to regulate agricultural production (Dogruel, Dogruel and Yeldan, 2003). In the case of wheat production, Albayrak notes that because of the importance of wheat as Turkey's leading agricultural commodity, the government has long intervened in the sector via the instruments noted above (Albayrak, 1998).

However, a dramatic change in the agricultural sector came with the recent restructuring directed by the IMF and assisted by the World Bank, which replaces the existing system of agricultural support with direct income system (DIS). Eder notes that parallel to the IMF's neoliberal agenda, the fundamental problem in Turkey's agriculture was identified by the World Bank as government intervention and market distorting subsidies (Eder, 2001). The aim of this market-oriented reform is the withdrawal of the state from agriculture through "reducing the artificial incentives and government subsidies, and substituting a support system that will give agricultural producers and agro-industry incentives to increase productivity in response to real comparative advantage".[12]

As protection in grains started to be reduced in 2000, there was compliance with the commitment that the prices paid for support purchases would not exceed the targeted inflation. For 2000, Oyan underlines the difference between the realized rates of inflation (39 %) and the targeted rate (25 %) as a measure of the real erosion in farmers' income (Oyan, 2002). In a review on the impact of the reform of agricultural sector subsidization, it is indicated that between 1999-2002 agricultural prices in real terms declined by 13 percent and by 22 percent when measured relative to non agricultural prices (Lundell et. al., 2004). The same study reports that prices of crops such as tobacco, sugar beet and hazelnut fell the most, between 25-50 percent in real terms, grain (wheat, barley and maize) prices also declined by about 5 to 10 percent because of reduced government intervention. According to the results of the ARIP Quantitative Household Survey Data

[12] World Bank (2001), Project Appraisal Document, Agricultural Reform Implementation Project (ARIP).

(QHS)[13] that was conducted in November –December 2002, in terms of the land sown to grains, mainly wheat and barley, the share of agricultural land have fallen 2.0 percentage points (a 4 % reduction) in 2002 when compared to 2001, while the shares of sunflower and fruits and vegetables have increased by about 2.4 and 1.2 percentage points respectively. The authors of the review also constructed a model of gross agricultural income based on the QHS dataset to explain to explain the impact of area shifts observed in the reforms period and the DIS program on agricultural income levels. According to this analysis, those households with greater relative wheat specialization, tobacco specialization and barley specialization all experience a significantly negative impact on agricultural income. With state support eliminated from such staple crops as wheat, for which Turkey is one of the genetic center and origin of diversity, the implications can be very significant.

Discussion:

It was noted earlier that losses of diversity can occur by three main processes, first, the replacement of local varieties with improved ones, second, the replacement of these crops with different crops altogether, and third, by the migration of the farmers from rural areas to towns and cities and pursue non-farm employment. At the same time, the capacity of the state to undertake environmental obligations, including the conservation of crop genetic resources is crucial. In this context, it is important to look at how the interplay between the biodiversity regime as embodied by the CBD and the neoliberal regime as embodied by the IMF and the World Bank is reflected at the domestic level. While the CBD contributed to the formulation of policies for biodiversity and genetic resources conservation, the sectoral integration of the idea of genetic diversity conservation in agricultural policies, as well as the implementation of conservation policies have been circumscribed significantly by the priorities set by the IMF/WB directed agricultural policies. In the context of agricultural liberalization, the major objective is to change the nature of the involvement of the state in the sector, downsizing it, which has reduced the capacity of the state to support crop genetic diversity. I need to add that in the past, when there was a larger state role in the agricultural sector, such support did not exist. Yet, the CBD and the related national strategies for the conservation of biodiversity and *in situ* conservation of genetic resources have provided the framework to justify the formulation and implementation of such policies. I argue that while the aspect of agricultural liberalization as reflected in the downsizing of the state may not have a direct impact on the erosion of crop genetic resources per se, it will have a negative impact on the state capacity to undertake policies necessary for conservation. In addition to the importance of continuing state investment in agricultural research, the capacity of the state to provide incentives or compensate the local communities who conserve crop genetic diversity is limited by this aspect of liberalization. The priorities of the environmental regime represented by the CBD, as reflected in *in situ* conservation of crop genetic resources, is conceptually nested below

[13] The review by Lundell et.al., inform that this is a household survey designed to be representative of farming households which were engaged largely in cultivation of the formerly most highly subsidized crops (tobacco, sugerbeet, hazelnut and grains). The comparison of 2002 household data was through the aggregation of household data to the regional level, comparing this with 2001 State Institute of Statistics (SIS) regional data on the share of the area sown under different crops.

the broader priority of market oriented growth, which is expected to increase efficiency and productivity in the agricultural sector.

In terms of agricultural liberalization, the direct income system was introduced to replace the existing forms of state support to agriculture, which included administered prices, output and input subsidies. The shift from production based subsidies to the direct income system with no production planning attached to it may have a favorable impact on crop genetic diversity conservation, as the farmers can grow the variety that they wish (traditional or modern). Yet, at the same time, we should note that there is a new project that provides incentives for wheat farmers to cultivate modern varieties of wheat by providing them certified seed, with the aim to increase productivity in wheat output. Also, the agricultural liberalization, particularly in the context of wheat production, caused agricultural price squeeze, as reflected in the falling real output/input price ratio, when we compare the real prices of one kg of wheat with one liter of diesel, as well as fertilizers that are most commonly used in wheat production.[14] Also, as noted above, according to a survey conducted in 2002, in terms of the land sown to grains, mainly wheat and barley, the share of agricultural land have fallen from 45 % in 2001 to 43 %. According to the analysis conducted by the authors of the review of the agricultural reform programme, the households with greater relative wheat specialization have experienced significantly negative impact on agricultural income. These indicators show there is increasing pressure on wheat farmers to sustain their livelihoods, which may push the farmers to migrate to towns and cities in search of better livelihoods.

Conclusion:

The conservation of crop genetic resources is an issue that well represents the linkages between different levels of social organization: local, national and international. While some regimes, such as the biodiversity regime as embodied by the CBD may provide opportunities at the national and local level for the conservation of crop genetic resources, these are interconnected with the international neoliberal regime embodied by the international financial institutions that affect national agricultural policies. As such, the local conservation of crop genetic diversity by the farmers is embedded at the intersection of these regimes.

The fieldwork that I conducted in two regions in Turkey shows that that there is no inevitable trade-off between cultivating traditional and modern varieties. It reveals that the cultivation of modern and traditional varieties can co-exist, suggesting that there is no inherent contradiction between the conservation of crop genetic resources and the promotion of agricultural growth and productivity. The local and global benefits of biodiversity conservation involve, Perrings and Gadgil note, public goods, importantly, the global public good, namely, the information contained in the gene pool (Perrings and Gadgil, 2003). The farmers produce a positive externality by the cultivation of traditional varieties, in view of this process' contribution to the world's crop genetic diversity. As such, the local conservation of crop genetic resources has significant global implications.

Yet, as exemplified in the Turkish context, there are significant limitations in the conventional notion of efficiency that underlies the agricultural liberalization undertaken

[14] Author's calculations based on data from State Institute of Statistics and the Ministry of Agriculture and Rural Affairs.

by the government, and directed by the IMF and the World Bank, which focuses on increases in agricultural production based on the market process in the short term. This notion of efficiency does not take into account the positive externality produced by the farmers. The analysis of the implications of this limited approach to efficiency as directing agricultural restructuring processes in centers of origin and diversity of various crop plants is crucial.

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