# Multifunctionality in Peasant Agriculture: a means of Insertion into Globalization

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**Abstract**

Peasant agriculture has been neglected as modern farming occupied its space in the production of basic foods. Exclusion of smallholders in LDCs is the outcome of declining prices for basic foods now produced and marketed globally by developed countries. This is an effect of globalization: it responds to advances in information technologies, communications, and biotechnology. Productivity gains in capital intensive agriculture have evolved since the Green Revolution to today's knowledge technology in agriculture. As productivity in modern farming depends on genetic improvement of crops, biodiversity is essential to maintain the pool of genes necessary for genetic engineering. Biodiversity is reduced because of the increasing space for cash crops in smallholder agriculture in response to declining prices, thus threatening the sustainability of modern farming. This paper suggests the concept of multifunctionality to compensate peasant farmers for biodiversity maintenance. It would be a mean of insertion of peasant agriculture into globalization.

**Key words:** peasant agriculture, exclusion, knowledge agriculture, declining prices, biodiversity conservation, biotechnology.

## Introduction

For some authors (Rubio, 2005 and 2006; Kay, 2005; Bartra, 2006a; Rainelli, 2007) the role of peasant agriculture in less developed countries has been neglected as a consequence of the evolution of agricultural systems in the world. This is particularly due to the spectacular changes that have occurred in the past two decades in capital intensive-land extensive agriculture of developed nations.

Even though globalization has strengthened pockets of modern agriculture in some less developed areas (Mazoyer, 2004), it has also deepened the gap between modern agriculture and the backward rural sectors in a process of exclusion. It has dampened the attempts for modernization in traditional agricultural systems in poor countries. Exclusion is an effect of globalization (Munck, 2005), operating at all levels of the social and natural environment.

As the main result of the new economic order in what concerns agricultural commodity production, the role of small-holder productive activities in LDCs' rural areas is becoming less and less important, thus inconsequential, to the global perspective of food, fiber, and energy provision coming from agriculture (Bartra, 2006b).

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Because of the diminished importance of peasant farming to the global society, peoples in the rural environment around the world are experiencing a continuous deterioration in their living conditions. As the income gap widens between rural and urban, poverty increases and the effects on the rural society become more apparent.

According to the *World Development Report* (World Bank, 2007), rural poverty has increased for large areas of the world in the period 1993-2002. The number of people living under the poverty line of $ 2 is still over 2.2 billion and those living under $1are .8 billion. Except for the case of China (reflected in the aggregate of East Asia and the Pacific), absolute poverty in the rural areas has increased in the rest of the world. The period covered by the report coincides with the intensification of the globalization process affecting agriculture (Ward and Skrede Gleditsch, 2004).

This paper aims to explain the reasons for the diminution of the role of peasant agriculture in less developed countries, and to point out the resulting consequences for the agricultural systems of the world. It also explores possibilities to open effective contributions of small-holder farming to the sustainability of agriculture, both at the modern farm sector and at the level of traditional farms.

**The role of small-holder farming prior to the 1980s.**

With the inauguration of the Cold War by the late 1940s, an important aspect of national security for the Western hemisphere was to reach food sufficiency and safety, thus food security policies were in the priority of national objectives. Developed nations specialized in the production of energy and protein and fibre appropriate to template latitudes, while tropical agricultural output and natural resources were complementary and required stabilization in less developed areas of the world (Ferrer, 2000; Wallerstein, 2005).

The agricultural model transformed peasants into farmers in European and North American agriculture (Weitz, 1973), while the Latin American, Asian and African peasants could not overcome traditional methods in farming (Schultz, 1964). Thus agriculture could be sharply differentiated between developed and underdeveloped nations.

In spite of differentiation, both types of agriculture had as a common aim to enable food security, that of the north through capital intensive techniques contrary to southern patterns relying more on land-labor intensive methods. When attempts of development by means of industrialization were intended particularly in Latin America, the objective of food security was modified to include low price availability of food as part of the agricultural policy package, to face large urbanization processes that accompanied the pro manufacturing effort. To keep the industrial cost of labor low thus allowing better provision of scarce capital, cheap food and agricultural prices had to be kept in check (Espinel, 1991).

Land reform and a set of market incentives were made available to peasant agriculture in most developing countries and a modernization model was followed throughout the 1960s and the 1970s (Schultz, 1978; Ibister, 2001). These efforts were supported by developed nations: the Alliance for Progress and the Peace Corps in the Kennedy era are good examples of the interest prevailing on peasant agriculture in the tropics.

Thus the role assigned to small-holder agriculture by farmers in capital intensive- and peasants in traditional- agriculture was clear. Food security was a priority, coupled with cheap food and fibre to favor urban capital accumulation. In less developed countries peasantry constituted an important actor in economic performance and agricultural policy through these early decades of modernization of the farm sector was in high interest to governments, in both developed and underdeveloped nations.

But at the beginning of the 1980s a turn in the globalization process of the world affected the prevailing dual model of modern-backward agriculture in which peasants in the tropics had played a substantial role.

**Globalization: the effect on modern agriculture**

Perhaps the most striking effect of the globalization process in the last third of the 20$^{th}$ Century is the revolution that took place with information technologies (IT). Probably the change in the way society has created and reshaped the means by which modern production has developed obeys mostly to the introduction of computers in the design, analysis and control of the productive processes. It is clear to most analysts that nations in the world are moving from the industrial society to the information society (Castells, 2001).

Solbrig (2001) states that agriculture and the rural environment have been affected significantly by the changes that are taking place. These changes have impacted the production process, the economy of farming, and the rural social structure.

According to this author, the process of production in the rural sector has been affected by the evolution of technologies available to agriculture. Starting from the Green Revolution, input technologies were predominant. The breakthroughs brought by the development of improved seeds at experimental stations, particularly on grain cultivars, readily opened the road to high impact input agriculture as the newly developed hybrids were responsive to large doses of fertilizer and refined pest control and irrigation methods (Eicher and Staatz, 1998).

As the Green Revolution technologies brought undesirable effects on the environment (Carson, 1962), the massive use of manufactured inputs was rapidly adjusted to lessen environmental damages and a process technology was enforced in agricultural production, including integrated pest management and irrigation efficiency, such as drip irrigation methods.

Finally, in the last portion of the 20$^{th}$ Century process technology was largely modified by the application of information technology to agricultural scientific advances. As a result, at present we observe what has been denominated as knowledge technology in agriculture. The use of satellites and computers to manage agricultural data and apply them to crop cultivation has developed precision agriculture. But the most striking advances have occurred in biotechnology. Sequencing the genome of plants and animals has transformed the way in which we look at agriculture today (Enriquez, 2001a).

In capital intensive-land extensive agriculture, because of the combination of precision methods and improvements through genetic manipulation, of which genetic engineering is most important, crop production in developed nations -and selected areas of developing countries- has been transformed. Because of the homogenization of production techniques enabled by the application of digital technology to agronomical and biological principles, agriculture can now be managed in ways more similar to manufacture, applying serial processes and specialized division of labor (what is known as "fordism" and "taylorism", respectively; see Harvey, 2004, ch. 8). The main effect of this reshaping of agricultural production is the diminished role of differential rents of land in the formation of prices, thus accelerating the declining trend of food and fibre prices as well as increasing the mass production of agricultural output (Espinel, 2006). Moreover, the assimilation of agriculture to industry is originating the decommoditification of agricultural produce.

Impressive jumps in productivity have maintained food production increases above world population growth (Clay, 2004).Today's modern agriculture has less concern with respect to food security as the emphasis is put on new market reach and marketable product developments. This strategy priors product homogeneity in nutrient content and presentation which allows massive production and distribution as it penetrates at all levels of consumers and breaks most geographical barriers (Ruben et al., 2007; Roep and Wiskerke, 2007).

The development of communication technologies, coupled to post-harvest improved techniques, and new methods in the food processing industry, together with the use of information technologies that have greatly refined spatial economics, allows the emphasis on distributional aspects indicated before (Fujita, Krugman and Venables, 1999). Today, production of coffee at South East Asia, marketed by multinational corporations, rules the international price for coffee beans in the world despite of quality matters that have distinguished Colombian or Brazilian production.

Similar outcomes can be observed with agricultural production being transferred from their original sites to very different environments as a result of technology developments. Perhaps the impact of potato production at northern latitudes far away from its Andean origins, in an international food chain such as McDonald's exemplifies the change in geographical implications that once differentiated consumption on the basis of agricultural location (Espinel, 2006).

This has been possible because of the advances in agricultural science, from soil and nutrient management to pest controls and genetic improvements. Parallel to these results, agriculture at the small holder, peasant level, in LDCs finds more and more difficult to compete with modern capital intensive agriculture. As the increase in productivity of modern farming is accentuating the trend to declining prices of basic food items, stagnant traditional farming cannot develop to meet techniques compatible with such low prices.

Prior to the changes indicated above that have occurred in modern farming, agriculture was regarded as one sector of the economy where returns to scale for the most important processes were constant. The high-payoff input technologies of the Green Revolution gained popularity among development economists mostly because they were replicable regardless to scale, thus they were suitable for application to small-holder farming (Stevens and Jabara, 1988). Constant returns to scale of the Green Revolution techniques were also true for capital intensive agriculture in developed countries. But this type of agriculture was quick to understand that capital intensive choice of techniques were best when combined with extensive land farming and monoculture, thus techniques were rapidly developed to gain returns on scale. Soon predominant Green Revolution technology was adapted to these results and moved away of reach to LDCs's traditional agriculture.

The model of monoculture cultivation gained predominance for most important crops in agriculture of developed countries. Development of manufactured inputs for massive application and the means to use them in land extensive cultivation were developed in parallel. These accentuated the differences between capital intensive-land extensive modern agriculture and labor intensive-land intensive backward agriculture in LDCs.

When, by the 1980s, biotechnology and IT exploded into agriculture, the modern agriculture of developed countries was ready to absorb the new paradigm results. The transformation of plant breeding techniques to tissue culture and genetic engineering rapidly took advantage of land extensive monoculture, where it was far more effective. The productivity gains reached by these practices were tremendous, and agriculture quickly moved into the so called knowledge technologies.

Modern, rich countries' agriculture readily passed from self sufficiency to large surplus production. This change took place aided by agricultural policy that emphasized large amounts of agricultural subsidies through long periods of time. Gradually surplus harvests displaced small scale agricultural production at LDCs, first on Green Revolution crops as wheat and maize (Espinel, 2006), and then into most of other food and fiber crops (Rubio, 2006; VanHuylenbroeck and Espinel, 2007).

Resulting from the upgrading from input technology into knowledge technology in agriculture, coupled with advances in the agrifood industry and sophisticated distribution methods, modern capital intensive-land extensive cultivation displaced traditional farming through the last two decades of the 20th Century. Market access for small scale agriculture shrank rapidly, as supermarket role in agricultural product distribution and sales started dominating the scenario of urban (and increasingly rural, too) food markets. The increased role of supermarkets further accelerated the homogenizing trend in agricultural products in consumer markets (Reardon, Timmer, and Berdegué, 2003). Soon agrifood commercialization chains were reshaped diminishing the role of small holder and rural village markets to give place to marketing institutions dominated by urban based chains of storage, wholesale, distribution and retail innovations.

**The effect on LDCs peasant agriculture**

Together with these changes, peasant agriculture in LDCs lost importance moving away from the strategic role of staple food production. This role which had been designed to ensure food safety and to keep urban wages low now became increasingly insignificant. As rural weight diminished in terms of society's welfare, small-holder production in rural areas became less relevant to economic growth at low income countries and lost importance for food supply stabilization in the global economy.

As a consequence of the diminishing role for peasant agriculture, agriculture itself and rural development policy were semi-abandoned in the whole of governments' policy packages. Save for some crops that kept sound economic performance for LDCs, like tropical fruits as bananas, cocoa, and shrimp culture, rural production declined consistently and rural incomes shrank consequently (World Bank, 2007).

The intent of modernization that received great impulse in LDCs through the 1960s and 1970s was abandoned by the early 1980s, following liberalization that affected agriculture as a result of the Washington Consensus propositions (Williamson, 2000; Espinel, 2002). In effect, liberalization of the macroeconomic prices, namely the exchange rate and the interest rate, favored export agriculture. But the advocated transparency of prices in the economy also meant the sharp increase of the price level, thus increasing the cost of domestic food. Governments' objective of low prices could only be achieved through imports of fresh and agribusiness foods and staples. Peasant agriculture then further retrieved as production costs increased while low price imports were ready to replace domestic produce in supermarket shelves.

As small-holder and peasant agriculture has characterized by multiproduct farming (Hildebrand et al, 2005), farmers in such category at LDCs enjoyed a situation of equilibrium by combining a fraction of their farm area dedicated to marketable production, i.e. a basic food or fibre, while the rest of the area was oriented to self consumption, communal exchange, and conservation practices (for a description of this agricultural organization, see Bartra, 2006b; also Dufumier, 2004). Studies on peasant agriculture point out the rationality of small scale farming as a balance of natural resources, the "assets" of the farmer at low-income agriculture, with the allocation of labor for the production of both, marketable and self consumption goods (Martínez Alier, 2004).

Farming strategies in traditional areas have characterized as multicropping systems, where farming is essentially a composition of techniques for modifying plant environment. Peasant and small holder agriculture has followed a strategy of mixing various plant and animal species in order to manage and conserve energy, soils, and humidity, and better protect from external shocks as climate and pests (Wilkens, 987).

To illustrate the case of multiproduct farming and small-holder auto-sufficiency I refer to data on the Ecuadorian rural sector (Luzuriaga and Zuvekas, 1964; Espinel, 1991, 2006 and 2007). The dominant scenario for small farming peasant agriculture averages farms ranging from 3 to 5 hectares. As reported by Hildebrand et al. (2005), the typical farm combines eight to twelve crops, plus some other half dozen of species that have either direct or indirect importance to the whole farm produce. Agricultural and animal production destined to the market represents less than thirty per cent of total output, but provides the gross of money income for the peasant family, complemented with rented out labor income. The cash income is used to provide for consumption of food and services for family needs, plus productive inputs and farm replenishing and improvements. Thus the bulk of peasant family requirements are produced by farm output destined to self consumption and communal exchange (Martínez Allier, 2004).

However, as one result of globalization on peasant agriculture, we find that competitiveness for small holder local agriculture in LDCs is lost very fast as the agriculture of developed countries increasingly specializes on the same crops cultivated under capital intensive-land extensive methods (Espinel, 2006). This has happened because of the adaptation of crops to template areas in modern agriculture due to application of refined technology. Biotechnology and precision farming, i.e., knowledge technology, is responsible for gene and resource alterations that allow profitable management of specie characteristics not only in terms of production far from original habitats, but also at very low costs per unit of output which, combined with market techniques, result in reduced prices.

Price declination trends for staples cropped in LDCs affects income at the level of small farmers in poor countries of the world, forcing them to increase the areas of production to compensate income lost, in attempt to overcome the low productivity trap of traditional agriculture. As this process continues, farmers are faced to a trade-off between increased areas of production for the market and reduction of multicropping practices. The result is a loss of biodiversity.

In Ecuador, the case of rice is used to show this effect. Contrary to traditional farming, the reason for the increase in one crop, rice, while decreasing other crops is the growing requirement of cash income. In effect, rural families experiment enlarged expenditures for the purchase of consumables and agricultural inputs, while at the same time prices of the staple crops are going down. This situation is also reported elsewhere with respect to other countries in Latin America (see for instance, Giarraca on Argentina's small farmers, 2004).

Increased cultivation of one crop combined with the reduction of multicropping results in a loss of agricultural genetic diversity. This brings a sharp impact on the habitat of small-holder agriculture and homogenizes the life-world of crop areas, and by doing so reduces its capacity to adapt and reproduce in changing biological conditions (Risler and Mellor, 1996).

There is evidence that this type of outcome is taking place in different parts of the developing world. Of about 75 types of vegetables existing at the beginning of the 20$^{th}$ Century, about 97 per cent of the varieties of each type are now extinct (The New Internationalist, March 1991, p. 17). At the same time, thousands of local varieties of rice, wheat, maize, and potatoes have been eliminated.

In Ecuador, most of the rice produced by peasant farmers for own consumption comes from varieties that are unknown at the market level. Local names of varieties like Chileno, Patucho, Donato, Conejo and at least half a dozen more (Espinel, ongoing research), are cultivated in different locations, while the so-called improved breeds are seeds patented by research centers and international corporations. These patented seeds cannot be reproduced by farmers, as property rights are already established over them.

The consequence of such pattern is the reduction of varieties at the rural level. In India, for example, thirty five thousand diverse varieties of rice have been replaced by no more that ten varieties in about three fourths of this mega diverse country (The Toronto Star, October 23, 1993). The resulting "global" varieties have been selected through years of research from the local (indigenous) varieties native of developing countries, in a process that started at the international level with CIMMYT at Mexico and IRRI in the Philippines (Eicher and Staatz, 1998). Gradually this research was displaced to private research units controlled by multinational firms. The direction of research moved towards a model of extensive mono-cropping, changing the pattern of world system of food supply (McMurtry, 1998).

The combination of increased productivity and reduced cost per unit of land achieved in modern agriculture of developed countries explains the continuous trend of declining prices for staples (see, for instance, the evolution of prices for staples in Ecuador in Herrera and Espinel, forthcoming). It is unquestionable that the efficiency gains obtained in developed countries in terms of productivity per unit of land, or per unit of labor input reflects the great advance of modern agriculture which relies more and more in the application of science to agricultural production. Biotechnological breakthroughs achieved through genetic engineering are inseparable of today's agricultural accomplishments (Enríquez, 2001b). But it also represents limits to agricultural development.

The impact of intensive agriculture on the environment is inevitable and, thus, continuous action has to be taken to manipulate soil nutrients and soil structure in order to maintain levels of productivity but, above all, actions for genetic renewal become necessary after a given time (Parker, 2000). The variation in habitat that agriculture continuously imposes to the environment occasions the inadequacy of plants to current conditions and makes change necessary (Altieri and Nicholls, 2001). This change is possible only if new genetic material is available, and thus modern agriculture requires returning to original pools of genetic reserve (Vera, 2001). These are in the tropics, in peasant farmland in less developed countries.

**The impact of diversity loss to modern agriculture**

Increased productivity in developed countries relies more and more on the genetic improvements that alter plants. Efficiency gains obtained in the production of grains such as rice translate into declining prices. Price reduction has an impact on the incomes of small farmers in less developed countries which drive them to increase the area cultivated of those same grains instead of local varieties in order to increase cash receipts. Increasing area of cash crops reduces multi-cropping and consequently affects biodiversity, further reducing prices and thus reinforcing the declining trend. The impact on the habitat of small agriculture in less developed countries results in a reduction of genes of selected species and limits the germplasm at disposition for new genetic improvement. This becomes a vicious cycle that at large will result in a bottleneck to general improvement on the efficiency of crops.

As a result of this process, in the medium-to-long run farmers at both sides are the losers. As genetic pools deplete, farmers at developed nations will find productivity increases more difficult, and rising costs for crop protection to environmental change due to climate, pests and diseases. Genetic engineering and biotechnology applications to agriculture will become more expensive in direct relation to the depletion of the genetic pool at the tropics. Corporations involved in genetic developments for agriculture and other human uses start finding difficulties in the identification and collection of species, as these are depleting very fast (Primack and Ros, 2002). Investigators and collectors are experiencing more complications and search expeditions take more time to obtain plants, animals and microorganisms to experiment at developed nation's R&D laboratories[2].

On the other hand, smallholder agriculture in less developed countries will also suffer by the limitations imposed by reduced incomes in the face of increased costs. The increase of a monoculture system of agriculture will further reduce biodiversity. The environmental change

[2] In 2003 a graduate student of the University of Florida, collecting data at rural Ecuador, reported systematic presence of researchers from USA, Japan, Germany and France, looking for species and indigenous knowledge to adapt into pharmaceutical and agricultural use. They complained about the increasing scarcity of some species and the consequential necessity of moving farther into more remote areas of the rural environment (Breuer, 2003).

will impose a greater toll on underdeveloped agriculture as a consequence of the impact on the habitat. One inevitable outcome of such trend will be the increase in poverty and the reduction on the living conditions at rural areas.

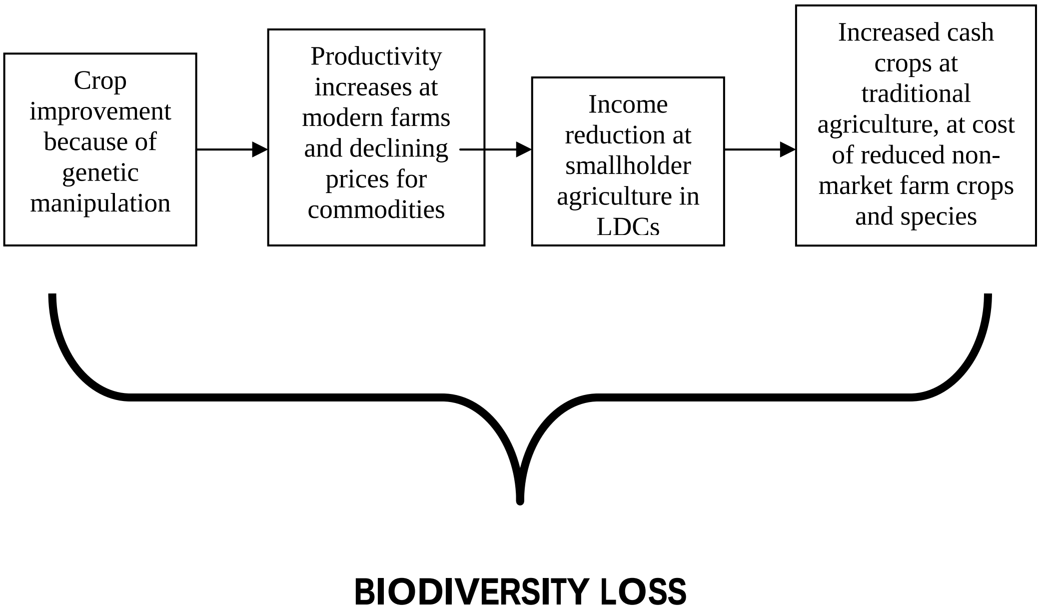
**Biodiversity conservation as a problem of an economic externality**

The characteristic of environmental biodiversity is to be regarded as a public good. It fits perfectly to the criteria of non-exclusion and non-rivalry. Thus, property rights are not well defined (Van Huylenbroeck and Espinel, 2007) and biodiversity use and conservation cannot be regulated adequately (Tisdell, 2005). Moreover, because of asymmetries of information, biological diversity is not valued in similar terms among its users. For instance, city dwellers enjoy escaping to nature and are willing to pay some for access; biotechnology labs searching for genes to engineer, value biological diversity substantially higher; rural peoples living surrounded by nature perceive it as abundant, thus value it intrinsically as part of their livelihood system. These three actors, not counting numerous more, give very different valuation to biodiversity.

Of course, those intervening to alter biodiversity are by far dominated by the agriculturalists. As it is well accepted, agriculture is the main impact on the environment, as the ecological footprint of developing farmlands accounts for the major reshaping of the face of the earth (Ninan, 2007). The reserve of world biodiversity is found mostly in the tropics, where small-farmer, peasant agriculture prevails. Thus, these farmers appear as the main responsible for its conservation. But, as we have seen above, economic incentives are pushing in an opposite direction. Income reduction in poor rural areas drives peasants to till more forests when available, although in most cases no new land can be incorporated. What dominates then is a redistribution of space in the small areas of farmland at the atomistic structure of agricultural systems in LDCs.

Redistribution takes place in the trade-off between marketable and non-marketable produce inside the small farms. As greater cash income is required, more internal consumption crops are sacrificed. As thousands of farmers are in these conditions, the impact on biodiversity loss is increasingly significant. However, as it happens in general with environmental degradation, the effect of biodiversity depletion is slow to become apparent. But perception is starting to change; climate alterations become more frequent, water quality and quantity starts to call attention at urban and rural sites, and other aspects of natural resources alteration affect life in different forms (Gore, 2007).

The most apparent toll from biodiversity loss is sustainability of agriculture itself. Both modern agricultural systems and traditional farming suffer the direct consequences of genetic depletion. At the base of this the perverse pattern underlying biological diversity destruction there is a problem of market failure (Espinel, 2007). Different valuation of the genetic pool accumulated at the tropical smallholder farmlands gives wrong signals to corporations, farmers and peasants located both at developed nations and LDCs. The externality caused by the vicious cycle described above can be graphically seen as




Is there an efficient form of reversing this trend?

**Multifunctional agriculture as a model of biodiversity conservation in peasant farming**

The reduction of environmental impact and the conservation of biodiversity are regarded as high values for today's global society. The claim for improvement for care of the environment has evolved from warnings to energetic practices imposition, which started with the Bundtland Report, *Our Common Future* (United Nations' World Commission on Environment and Development, 1987).

However, little has been accomplished globally and at local level it is even more reduced. This is particularly true for developing countries. Perhaps one of the reasons for this result on such a delicate matter it is precisely the fact that the environment concerns us all, but individually it is little what affects each of us. This public good characteristic is at the base of the externality implied in our management of the environmental problem. Put it simply, benefits of environmental services such as clean air are appreciated by all, but the cost of cleaning air from pollution is borne only by a few. The problem of environmental care is that neither environmental benefits can be duly charged to those enjoying them, nor environmental costs can be levied from those imposing its damage. This is an economic external effect. If both, prices for environmental services could be charged and costs for environmental damages could be levied, i.e. if the externality could be internalized to the economy, environmental benefits would not be underproduced and damages would also be reduced (Tisdell, 2005).

One reason for the difficulty in environmental care and conservation is that social valuation for them is little quantifiable in economic prices, thus their observance and preservation are much more a moral recourse than an economic obligation. For some aspects of environmental protection and degradation control, economic theory has provided non traditional price system models of valuation, such as hedonic pricing and contingent valuation methods (Hanley et al., 2000). These models have been useful in some aspects of ecological preservation, mostly concerning natural resources. Such models have been used in carbon sequestering programs and watershed preservation, as well as in landscape conservation and improvement. Mixed price and other forms of valuation, as those for ecotourism programs, have also been relatively successful in rural areas.

When it comes to biodiversity conservation, the problem becomes more complex. The benefits of biological diversity have been largely internalized at the farm level of biodiverse based agriculture, i.e. multiplecropping smallholder agriculture in the humid tropics of poor nations. But as this agriculture has been developed in the combination of price and non-price production of goods and services, the valuation of biodiversity, mostly linked to the non-price part of the farm output, is hard to value in market terms (Bartra, 2007). Thus, when price led agriculture dominates smallholder agriculture, biodiversity is at loss.

The *WDR2008* (World Bank, 2007) suggests that models for ecological preservation concerning agriculture should emphasize a more direct correspondence between environmental service users and providers. Then this could be a form of biodiversity conservation.

The European Union (EU) is developing a model of multifunctional agriculture. The concept broadly indicates that agriculture produces food and other commodities within the price system, but it also conveys the production of a series of other services of which environmental services are most important (VanHuylenbroeck and Durand, 2003). In sum, the model states that besides commodities, agriculture produces a number of goods and services which are in high demand for society, such as clean air and water, access to nature and landscaping, and others that are not duly valued and thus not adequately paid to farmers.

Among this set of goods supplied by agriculture is the genetic pool that offers biodiversity. The main product of biodiversity is the variety of genes carried by plants, animals, and microorganism that convey use value to humans through medicinal drugs, nutrient improvement and, with crescent importance, genetic engineering to improve commercial cultivars (Spillane, 2002).

Here then is a clear possibility to establish a direct link by users of biodiversity and providers of its care and maintenance. Corporations involved in the biotechnology industry in advanced countries are seeking the genes to develop genetically modified organisms (GMOs) to improve crops, increase animal production, incorporate and facilitate nutrient content to foods, and enhance drug production and utilization. As long as genetic material is available, the biotechnology industry guarantees sustained growth. But gene scarcity would be a severe limitation to the industry, and would imply as well a setback to the trend of modern agricultural development.

The care and maintenance of biodiversity then becomes important not only in terms of environmental conservation for abstract society's welfare, but it is crucial to the existence of the biotechnology corporations that represent a large investment and expect adequate profits in return to R&D involving genetic resources. The cost of biodiversity loss thus will be of importance to the performance of the corporate industry at developed nations. Adequate perception of this issue on the side of the biotechnology corporate industry should motivate willingness to conserve genetic diversity.

On the other hand, governments of LDCs with smallholder farming in rich biodiverse rural areas should commit resources to diffusion of knowledge to peasant farmers to understand the use of the genetic pool in modern agriculture. Then more adequate valuation of genetic resources can be achieved by farmers, thus generating the development of property rights on biodiversity. In order to internalize the effect, adequate institutions have to develop to elicit market mechanisms for pricing gene resources.

The acknowledging of property rights and the perception of local interest about biodiversity should be channeled through rural civil society actions that exercise pressure at the local, the national and the global community. Thus, following the concept of multifunctionality, the expected final effect would be the construction of agreements that involve governments, the private sector, and the civil society at LDCs' rural sector.

Conservation and sustainable exploitation of biodiversity would thus become a recognized agricultural activity at the level of smallholder farming in poor countries. The role of peasants would turn back into importance, as biodiversity production can then be added to self sustaining farming, Moreover, as biodiversity is directly linked to modern agriculture in developed nations, the newly recognized role to smallholder peasant agriculture would mean a clear insertion of the role of peasants in the global development of food and fibre for the world. It would be a mean for the insertion of peasant agriculture into globalization.

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