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Payments for Environmental Services: Who Gains and Who Loses?

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Direct payments for the provision of environmental services represent an innovative tool to improve the environment. However, our research shows that the dual goals of these programs to improve the environment and reduce poverty are difficult to achieve in practice.

-paying for the provision of environmental services is a recent policy innovation attracting much attention in both developed and developing countries. This innovation, which is referred to as “payments for ecosystem services” (when the emphasis is on enhancing “nature” services) or “payments for environmental services” (when the amenities provided by the built environment are also included), will be referred to here as PES. PES programs aim to harness market forces to obtain more efficient environmental outcomes. Since many PES programs operate via farmers in poor regions, international aid agencies and private donors, looking for a double dividend, increasingly consider using PES programs as mechanisms for poverty alleviation. After a short overview of the outcomes of PES programs and their function relative to other environmental policies, we will present research results on the design of PES programs and on conditions that make them effective tools for achieving distributional objectives.

It is useful to divide PES programs into three categories according to their function. Some PES programs pay mostly for *pollution control*. For example, payments for elimination or reduction of animal waste or agricultural chemical residues that reach water reservoirs. PES may also be payments for *the conservation of natural resources and ecosystems*, including forest resources and wetlands, wild flora and fauna species, and agricultural crop and livestock species. Finally, some

PES are used to *generate environmental amenities that are public goods*. Examples include planting trees to sequester carbon to reduce greenhouse gases in the atmosphere (a global public good), and/or to regulate water flows and soil erosion to improve watershed function (a local or regional public good). Another useful distinction is between land diversion and working-land PES programs. The Conservation Reserve Program (CRP) is an example of a land diversion program where farmers are asked to switch from the production of a commercial crop to other activities. A proposed PES system that will pay farmers near Kenya’s Amboseli National Park (NP) to divert some of their cropland to allow elephant movement and access to sources of food is another example of a land diversion PES. An example of a working-land program is the Environmental Quality Incentive Program (EQIP) that pays farmers to engage in practices that reduce nonpoint source pollution (for example, emissions of chemicals to bodies of water) to improve water or air quality.

Effective management of PES programs requires detailed data on the distributions of economic profitability potential and various indicators of environmental quality across space. Better mechanisms to manage PES become feasible with the improvement of remote sensing technologies, emergence of geographic information systems, and improved monitoring and communication technologies. Initially payment programs for land diversion had a fixed per

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acre pay and thus attracted the least profitable lands while maximizing the acreage enrolled. This approach maximizes the environmental quality obtained given the program budget when there is a negative correlation between environmental amenities provided and profitability. However, when more profitable lands also provide more environmental amenities per acre, the targeting of cheaper lands by the program may misfire. An alternative approach is targeting the lands with the highest environmental benefits. This approach will maximize benefits obtained given the overall budget if, for example, all lands have the same production value but vary in their environmental amenities. However, when economic values generated per acre vary, targeting the lands with the best environmental benefits may misfire if those lands also provide the most economic value in production. The environmental benefits given the program budget are maximized if lands are selected to the program using an environmental benefits-per-dollar-paid criteria. Namely, only lands in which environmental benefits per acre exceed a given threshold are targeted for the program. Studies have shown that these targeting techniques may expand total benefits obtained with a given budget by 30 percent and more. Participation in the CRP is now based on proposals where each landowner provides information on several indicators of environmental quality provided by the land, and information on economic performance and the requested pay. This led to purchasing guided mostly by benefits-per-acre criteria. Of course, difficulties in quantifying values of various environmental amenities and comparing across amenities make the design of purchasing formulas challenging.

PES complement other market-based mechanisms in replacing the inefficient command-and-control approaches to controlling pollution. Pollution taxes and fees have been frequently recom-

mended as remedies to pollution problems. Carbon taxes are favored by many economists as the main tool for addressing climate change problems. However, the “polluter pays” principle is difficult to introduce and implement because of political and legal reasons. A recent market-based alternative is the “cap and trade” approach, where policymakers establish an aggregate target level of, say, pollution emissions, allocate emission rights among firms, and allow trade in these rights to meet the emission targets at least cost. The polluting industries prefer “cap and trade” to pollution taxation because, with trading, income is redistributed within the industry, while taxation transfers resources to the government. PES is a third alternative, essentially a subsidy to address the environmental side effects of producers. Studies suggest that pollution control subsidies are likely to emerge when industries are either very strong politically, have well-established legal rights to emit, or when they are too financially weak to pay for the adjustments required for pollution control under alternative arrangements. The emergence of PES schemes in agriculture is explained both by the political clout of farmers in some countries and by the limited resources of farmers in others.

Prevalent poverty in the rural regions of developing countries has led to the growing perception of PES programs as tools for poverty alleviation. Our research uses economic logic to identify the situations where PES are likely to reduce poverty and those where they may actually hurt the poor. We distinguish between land diversion and working-land PES programs. We also recognize that the farm sector is very diverse and includes landowners and landless, and that landowners vary in the size of their landholdings. Furthermore, PES affect production activities and thus may affect the well-being of consumers.

First, consider the impacts of payments for land diversion. These activities

are likely to lead to a reduced area of production and thus reduced output, which in turn may *increase the price of food produced* by the affected lands, especially if this food is consumed locally. Introduction of payments for land diversion may also lead to reduced employment and wages in agriculture, especially when the land diversion activities require little amounts of labor. PES can also directly benefit local regions, for example, by improving local water quality or providing flood protection. Here we consider situations where the *environmental services do not directly benefit the local population*. Considering the impacts of land diversion payments on various groups under these assumptions suggests (Table 1):

- (1) The urban poor are likely to lose from this type of PES because of higher food prices;
- (2) the landless are likely to lose due to both higher food prices and lower wages;
- (3) landowners who participate in the PES benefit from the payments (which are higher than the farm income they gave up) and will likely gain from higher food prices; and
- (4) landowners who do not participate in the program benefit from higher prices if they are net sellers of food, and lower labor costs if they are net buyers of labor, but they may lose if they are net buyers of food and/or net sellers of labor.

The analysis of the impacts on landowners suggests that large landowners are more likely to gain while smallholders may lose.

Overall, the poor may gain from the income generated by payments for land diversion, but are likely to lose from the indirect effect through the output and labor markets. Thus, PES are more likely to have a negative effect on the poor in regions which have a large population of landless and urban poor, and

which are not well linked to the global economy, because food price and wage rates are affected by their production activities. Increased integration of a rural market with the global economy, providing alternative sources of food and income, will reduce the negative effects of PES programs.

If the environmental services benefit the local population, then these benefits need to be added to determine the net effect on poverty. When PES are used to produce flood control buffer zones protecting the residences of the poor and landless, the gains from extra protection have to be compared to the losses from higher food prices and lower incomes.

PES for modifying activities on working lands will not reduce acreage in production and in some cases may increase yield per acre, for example, when farmers are paid to terrace their land to reduce runoff and soil erosion. In other cases, yield may decline, as when farmers are paid not to use a chemical that harms the environment. Working land PES are likely to increase labor requirements for the extra environmental protection activities. Thus, the analysis of the impact of these PES on different groups suggests that (see Table 1):

- 1) The urban poor gain from PES when the environmental protection activities on working lands increase yields, but lose when the activities result in lower yields;
- (2) the landless are likely to gain from PES when they increase yields because of lower food prices and higher wages (when PES reduce yield, the net effect is determined by comparing wage gains against extra food cost);
- (3) landowners who participate in PES programs benefit from the payments (which are higher than the extra cost) but may lose from lower food prices; and
- (4) landowners who do not participate in the program lose from higher labor costs. If food prices decline because of

Table 1. Negative and Positive Impacts of PES

Program/Groups	Land Diversion	Working Lands
Urban Poor	- if food prices are affected by regional production	+ if yield/per acre goes up - if yield/per acre goes down
Landless	-	+
Landowners	- if land is sufficiently small and the farmer is the seller of labor and buyer of food + if sufficiently large	+ in most cases - if food price reduction from high yield dominates other impacts

the PES, net losses will be inflicted on net sellers of food and, if food prices increase, net sellers of food will gain. This last effect will result in gains to poor, smaller landowners when PES increase crop yields, and losses when PES reduce them.

Therefore, working-land programs that increase agricultural productivity and employment opportunities can benefit the poor. Payments for cultural practices that sequester carbon and increase soil productivity are examples of such programs. Similarly, payments for schemes that allow combining preservation of natural species and earnings generated from ecotourism can also be interpreted as working-land programs that benefit the poor.

Our analysis suggests the perception that PES programs can serve to both eliminate poverty and improve environmental quality is not always true. Achieving two objectives for the price of one is tricky and depends on the specific conditions. PES programs for diversion of land from production are likely to worsen the situation of the poor, especially in locations with high population per acre and uneven distribution of land-ownership. Payments for land diversion may have an especially negative effect in cases where the environmental services program disallows indigenous and other poor people from utilizing natural resources in the name of environmental conservation. Concern about the well-being of the poor implies such programs

should be accompanied by safety-net activities to compensate for any losses. On the other hand, PES programs that improve agricultural productivity and provide employment opportunities will more likely benefit the poor and improve the environment. While most of the analyses presented here apply directly to developing countries, even in developed countries like the United States, attempts to design programs that achieve both distributional and environmental objectives are tricky. Programs aiming to attain environmental quality may benefit larger farms, while programs aiming to reduce rural poverty may have a negative effect on the environment. The challenge for economists and policymakers is to identify circumstances and design payment schemes that achieve multiple objectives. When that is not possible, policymakers need to recognize the negative side effects of policies and introduce mechanisms to correct them.

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The analysis presented in this paper is part of research that contributed to the forthcoming annual report, *The State of Food and Agriculture 2007*, by the Food and Agriculture Organization of the United Nations. This report addresses payments for environmental services and will be available November 2007 (see www.fao.org).