Domesticating PES: Applying Payments for Ecosystem Services to Agrobiodiversity Conservation Issues

Summary

An innovative application of payments for ecosystem services (PES) to address agrobiodiversity conservation issues would lead to a focus on socially valuable and threatened local plant and animal genetic resources. The main steps to designing and implementing such payments for agrobiodiversity conservation services (PACS) involve:

- the defining of the conservation strategy (i.e. prioritising what to conserve)
- the defining of the conservation goal (i.e. how much needs to be conserved in order to reduce threat levels)
- determining the costs of the intervention and minimising these by identifying least-cost conservation service providers (farmers or communities)
- identifying sustainable sources of long-term conservation funding

Andean grains

What is PES?

Payments for ecosystem services (PES) have been hailed by some observers as "*arguably, the most promising innovation in conservation since Rio 1992*". PES schemes seek to provide incentives to farmers and other landholders to provide ecosystem services that benefit wider society. Such ecosystem services include, for example, carbon storage and the maintenance of soil and water quality. PES schemes have, to date, hardly addressed agrobiodiversity issues per se. Instead they have tended to focus on forests and their associated ecosystems. PES schemes are associated with the voluntary participation of farmers or landholders in the provision of a well-defined ecosystem service (or the land use necessary to secure that service). There must of course be at least one service provider and one service beneficiary, with the latter providing compensation to the provider that is strictly conditional on the actual provision of the service (i.e. if the service is not provided despite an agreement to do so, then no payment is made). Payments may not only be made in cash to individuals but also involve in-kind payments made at a community level).

Applying PES to agrobiodiversity conservation issues

Payments for agrobiodiversity conservation services (PACS) may be understood as a sub-category of agriculture-related PES that focuses on socially valuable and threatened local PAGR. The consideration of PES for the promotion of PAGR is limited and represents an innovative use of PES.

The current project has sought to assess the potential of PACS to serve as a least-cost and pro-poor PAGR conservation incentive scheme, especially in the context of poor rural communities in developing countries where most threatened and valuable local PAGR can still be found.

Indian millet

PACS might be expected to focus on a particular agricultural practice, such as sustaining the on–farm utilization of local PAGR. The on-farm utilization of local PAGR in turn relates to the on-farm conservation of genetic diversity which is associated with provision of certain agrobiodiversity conservation services, such as: the provision of highly nutritious foods with unique tastes; the maintenance of resilient production systems (a form of insurance); the maintenance of cultural traditions, local identities and traditional knowledge; and the maintenance of evolutionary processes, gene flows, and future option values.

The "providers" of such services are most likely to be found in less intensive agricultural systems. Relevant communities are located in remote areas of developing countries, consisting of small-scale farmers, who manage species, varieties or breeds with unique adaptive traits (e.g. disease resistance, drought tolerance) bred over many years of domestication across a wide range of environments.

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There may be a range of service "beneficiaries" and thus potential buyers, as the demand for agrobiodiversity conservation services may be assumed to be dispersed reaching from local farmers and communities, to consumers all over the world and society in general. This has implications for the sustainable financing of PACS (i.e. who will be the service purchasers), as will be discussed futher below.

What are the main steps in designing a PACS scheme?

In addition to associated location targeting and capacity building (see Policy Brief 1), four key steps are required to establish a PACS scheme. These are:

1. *Defining the conservation strategy*. We need to decide what it is that we want to conserve? Many PAGR are threatened and, given limited funding, we cannot conserve everything. In order to decide what to conserve, we need to prioritise and develop appropriate tools to do so.

2. *Defining the conservation goal*. Having decided which are the priority PAGR that our conservation programme should focus on in Step 1, we must now decide how much of these individual PAGR need to be conserved in order for them to no longer be considered threatened. This requires the establishment of PAGR conservation goals that are sufficient to ensure that these resources are maintained within safe ecological limits.

3. *Assessing farmer or community Willingness to Accept (WTA) rewards to undertake conservation*. Having determined how much of each priority PAGR needs to be conserved, we now need to identify the costs involved in achieving such targets and ideally minimise these costs by identifying farmer households or communities that can provide the desired conservation services at least-cost. Under PACS, as reward payments are conditional on the conservation activity having actually been carried out, such cost calculations also need to include monitoring and verification activities, in addition to overall conservation programme management costs.

4. *Identifying sustainable sources of funding* for the long-term implementation of the PACS scheme, based on the cost requirements identified in Step 3.

These four steps are discussed in further detail below.

1. ***Defining the conservation strategy through prioritisation (What it is that we want to conserve?)***

In situ on-farm conservation of agrobiodiversity, in addition to *ex situ* conservation, is important for its ability to secure the valuable and unique benefits deriving from genetic evolution. This has special significance in an era of climate change. However, an increased risk associated with on-farm conservation is the threat of loss of many PAGR. Given limited funding, we cannot conserve everything. In order to decide what to conserve, we need to develop a process by which it is possible to decide "which species to take on board Noah's Ark?". Weitzman (see Technical Note 1) and others suggest combining measures of: i) diversity/dissimilarity; ii) current risk status; and iii) conservation costs, so as to permit the identification of a cost-effective diversity-maximizing set of species/varieties or breed conservation priorities.

Hence, for any given quantity of conservation funding available, it is possible to identify a priority conservation portfolio that maximizes

On-farm conservation of nutritious millet genetic diversity by indigenous farming community in Koraput region of Orissa, India.

the diversity that can be conserved. Such a prioritization approach has a strong appeal due to its rigorous mathematical justification and the possibility to derive optimum conservation decisions with well-defined properties. Nevertheless, despite the conceptual basis having been developed for an important decision-support tool, there is no existing example of this approach having been used to inform actual "real-life" conservation policy design and implementation. This is true for both AnGR and CGR.

A number of technical issues also remain to be overcome. In particular, there is still a high level of scientific uncertainty, especially associated with the definition of critical risk values and with determining the degree of dissimilarity between and among species/varieties and breeds. Moreover, the cost of establishing the baselines necessary for carrying out the prioritization task needs to be taken into account and, given the general lack of detailed national statistics related to the status and trends of specific genetic resources, such activities need to be adequately funded.

2. ***Defining the conservation goal (How much should we conserve?)***

Once PAGR have been prioritized regarding their level of threat and their uniqueness or disimilarity, another challenge lies in defining how much of the prioritised resource should be conserved.

PAGR and their (uncertain) future values may be lost irreversibly if their population falls below a critical threshold or so-called safe minimum population size. In defining such a population size, it must be borne in mind that the evolutionary dynamics under on-farm conservation in crop plants are primarily driven by three important factors. These are (i) the reproductive behaviour and seed production ability of the species, (ii) the genetic diversity within a specific population size, and (iii) the natural and human selection pressure being applied on the population. Accordingly, on-farm conservation does not only imply the cultivation of certain land areas and thus the

generation and conservation of seeds, but also the maintenance of seed distribution networks, local traditions and local knowledge. As such, PACS schemes may well need to incorporate a conservation strategy aiming for the maintenance of local seed systems as a whole (comprising seed production, storage, exchange and related agricultural knowledge). As part of such a strategy, a conservation goal needs to be defined in terms of which PAGR are to be conserved (as per Step 1 above) and what might be considered to constitute a safe minimum standard (SMS) or population needs to be established. However, such issues have only been dealt with, at best, to a limited extent in the literature on PAGR.

A safe minimum standard (SMS) based on maintaining the resource in question within a safe ecological limit and thereby avoiding irreversible losses of PAGR can be considered as a means of restricting the replacement of local PAGR by improved PAGR to an extent that does not threaten the long-term *in-situ* survival of the resource. Such an approach, widely applied with regard to wild biodiversity, thereby seeks to avoid maximum future losses.

The complexity in the application of a SMS approach lies in the difficulty of defining such a minimum PAGR population size. In the case of domesticated animals, FAO defines a livestock breed generally not to be at risk if there are 1,000 breeding females and 20 males. In the case of crop genetic resources, the estimation of a SMS is likely not only to be based on the cultivated area[1], but also on the amount of seeds available in local systems and their age, reproductive system, the number of farmers of a specific species/variety and the degree of local knowledge maintained. Additional criteria, such as geographical distribution of PAGR and associated agro-ecological factors within those locations, existing seed distribution networks or breeding infrastructure, socio-cultural traditions and market integration could also be taken into account when establishing a workable SMS.

Consequently, it appears that there are many factors and underlying dynamics that would affect the definition of a SMS for PAGR. While it is possible that such goals might be fairly modest (e.g. individual variety conservation area goals might be expressed in hectares or tens of hectares rather than hundreds or thousands of hectares), to the best of our knowledge, existing research of this type is extremely limited and more work needs to be done in this area.

As with most PES programs, PACS may need to trade-off to some extent the use of scientifically rigorous conservation indicators against those that are somewhat easier (and less costly) to implement in practice. Scientific precision in linking conservation goals with the provision of agrobiodiversity conservation services is, nevertheless, urgently needed, so as to make sure that limited resources are invested in those conservation activities that indeed lead to additional conservation services. As in other PES schemes this is also important for the generation of additional funding, as potential beneficiaries are more likely to be willing to finance such schemes where the provision of conservation services is clearly verifiable.

3. ***Assessing farmer/community willingness to participate in conservation activities (How much will the conservation programme cost and how can we minimise these costs?)***

The total costs of a PACS scheme comprise: i) *opportunity cost* payments to the farmer, ii) *implementation costs* and iii) *transaction costs*.

Opportunity costs are the forgone benefits of alternative land-uses to the farmer. If the benefits that farmers forgo from participating in the conservation activities rather than using their land for some alternative activity are comparatively high, payment levels have to be correspondingly high. PACS schemes might therefore be expected to make most sense at the margin of profitability, where small payments to landowners can tip the balance in favour of the desired land-use. Least-cost conservation of PAGR should thus focus on species/varieties/breeds and agricultural practices that provide considerable private values to the farmer and high public values to wider society. As poor smallholder farmers are often carrying out *de facto* conservation, they may be expected to provide opportunities to implement relatively low-cost conservation strategies at very low opportunity cost. Such individual farmer or community-level opportunity costs may be revealed through a competitive tender approach (see Fact Sheet 3 and Technical Note 2). It may be expected that reward-levels for PACS schemes may be lower than those for PES, since farmers' opportunity costs of not using land for agriculture would normally be expected to be higher than those of agreeing to continue the existing agricultural practice or undertaking an alternative one.

In addition to opportunity costs the farmer could incur *implementation costs* if investment in land-use change is required. While opportunity costs are permanent costs, implementation costs are often one-off costs associated with changing the agricultural system to incorporate the conservation activity under consideration. PES schemes might be expected to involve higher implementation-costs, since they are directed towards land-use changes, while PACS schemes might require less costly interventions (e.g. involving improved access to certain seeds or agricultural knowledge, or assistance with rotation of male breeding animals between villages, etc.).

Transaction costs should also be accounted for when assessing the total costs of a PACS scheme. Costs include start-up costs (such as prioritisation, location identification and information acquisition, program design, negotiation and contracting) and the permanent costs of running the scheme (administration, monitoring, enforcement). As conservation of PAGR may be relatively easier to monitor and to enforce, transaction costs might be expected to be lower for PACS than for PES. Where PACS/PES schemes can focus on communities rather than on individuals, some cost savings might be obtainable, since economies of scale tend to reduce average transaction costs. Contracting a few large farmers rather than many small ones, as do some PES-schemes, could also be a strategy to reduce transaction costs. However, where the PACS goal is to conserve local public values (such as traditional knowledge and culture), rather than just national/global option values, a minimum network/number of farmers would still be required. Furthermore, there is also a trade-off between efficiency and equity that needs to be considered.

With specific regard to the *monitoring and enforcement of PACS contracts*, institutional arrangements would need to be created that deal with baselines, verification of service delivery and sanctions in case of non-compliance. The establishment of scientifically rigorous baselines is a necessary precondition for any PES/PACS scheme. Determining baselines requires the construction of easily understandable performance metrics, clearly associated with specific conservation services in order to allow evaluation

[1] Relating the conservation of specific crop species/varieties or livestock breeds to associated levels of genetic diversity is a rather complex task, and it is also unclear to what extent these can be directly linked to the wider provision of agrobiodiversity conservation goals, such as the maintenance of evolutionary processes or cultural traditions.

of "additionality" (i.e. the degree of conservation achieved by the intervention compared to no intervention) over the contract period.

4. ***Identifying sustainable sources of funding for the long-term implementation of the PACS scheme (Where will the funding come from?)***

The *sustainability of PACS interventions* is a key area of concern. Programs might have a limited life-span, unless adequate funding can be established over the long-term. A number of options appear to be worth exploring.

With regard to the potential of existing agricultural market channels in promoting the use of threatened PAGR, local and global consumers of PAGR may pay for the on-farm utilization of local PAGR through such mechanisms as eco-labelling, certification or denomination of origin schemes or geographic appellation when niche product markets are developed. Such, *niche product market development* for agrobiodiversity-related products is increasingly being promoted as a means of sustainably achieving conservation through use. These "conservation-through-development approaches" can potentially be sustainable, as they build on existing agricultural market channels and thus could be used to generate a sustainable source of funding.

But it should be noted that relying solely on market development might be a dangerous strategy for the conservation of a diverse genetic resource pool, especially as market conditions can change rapidly and generally consumers and agribusiness tend to favour a narrow suite of crop species/varieties or animal breeds. Market chain approaches may also require relatively high initial investments to generate appropriate product volumes, with such volumes being far in excess of those required to achieve modest conservation goals, and where overly successful may even displace other threatened agrobiodiverse genetic resources (leakage effect).

In this context, PACS schemes might be capable of providing a stronger and more flexible longer-term foundation for conservation activities, and may be better suited for ensuring the *in-situ* conservation of safe minimum populations of PAGR.
Niche product market development and PACS can thus be viewed as complementing each other. In fact, a broader conservation strategy could incorporate a mixture of incentive instruments, and as such could combine niche market development with PACS schemes built on governmental funds as well a private sector funding, such as through biodiversity offset programs.

In addition, *private sector entities* with forward or backward linkages to agriculture may be identified as an additional category of beneficiaries through potential future product development. There are also certain private industries, whose operations directly and indirectly exacerbate the replacement of traditional PAGR. Drawing on the concept of biodiversity offsets, regulatory obligations and corporate social responsibility could be used to motivate their support for investments aimed at mitigating their negative impacts.

As marginal commercial values of agrobiodiversity conservation for industry are normally not high enough to fund larger-scale on-farm conservation efforts and as off-sets for adverse biodiversity impacts are only just emerging, *government agencies* at a local, regional, national or even international level may be required at present to take on the role of service buyers. For example, local authorities could foster the use of traditional crop varieties by buying related food products and distributing them to public facilities (e.g. school meal or other food-based intervention programs). These functions may also be fulfilled by *quasi-governmental entities*, such as development banks and conservation agencies or *NGOs* that acknowledge the importance of agrobiodiversity.

Further suggested reading and full citations:

Narloch, U., Drucker, A.G. and Pascual, U. (Forthcoming). Payments for agrobiodiversity conservation services for sustained on-farm utilization of plant and animal genetic resources. Ecological Economics.

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