Payment for Agrobiodiversity Conservation Services (PACS): *Policy Intervention Strategies*

Executive Summary

- FAO Reports on the State of the World's Plant and Animal Genetic Resources for Food and Agriculture depict an unprecedented loss of agricultural species, varieties, breeds and associated traditional knowledge occurring across the globe.
- The Convention on Biological Diversity's (CBD) Strategic Plan for Biodiversity 2011-2020 specifically calls for the development and application of positive incentives for the conservation and use of biodiversity. *In situ* conservation is also the preferred approach under the CBD.
- The need for intervention and positive incentives for plant and animal genetic resources (PAGR) conservation and sustainable used can be economically justified (existence of public good values not reflected in market prices, leading to lower levels of conservation than socially justified).
- Some observers have hailed PES as "*arguably, the most promising innovation in conservation since Rio 1992*". Agrobiodiversity-related payment for ecosystem services (PES) schemes appear to be an environmentally effective and cost-efficient mechanism through which to provide such incentives. Equity considerations may also be taken into account.
- Such 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. Competitive tender mechanisms can be incorporated to assist in the identification of least-cost conservation service providers (farmers or communities), with payments (rewards) being made not only in cash to individuals but also in-kind and at a community level. Such payments also permit farmers to diversify their income sources, not only by providing conservation services per se for wider society but also through their potential participation in monitoring and verification activities.
- An overall PACS-based policy intervention strategy for an environmentally effective, cost-efficient and equitable ABD conservation and sustainable use programme could be expected to address the following:
  - Where interventions should take place (targeting interventions to areas of high agrobiodiversity and high poverty in order to maximize impact)
  - What should be conserved (prioritisation of particular PAGR such that the most diversity can be conserved for any given budget)
  - How much should be conserved (establishing of PAGR monitoring systems, baselines and conservation goals)
  - Which farmers or communities should be involved in conservation activities (identifying least-cost providers so that limited conservation budgets can achieve maximum impact).
  - How to sustainably finance such interventions (identifying combinations of market, public and private sources of finance).
  - How to improve the performance of existing poverty alleviation programmes through improved integration of ABD.
- The consideration of PES for the promotion of PAGR is an innovative use of PES.

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Project "Payments for Agrobiodiversity Conservation Services (PACS)"

PACS and the Convention on Biological Diversity

In addition to its relevance to countries' National Biodiversity Strategies and Action Plans, the PACS work undertaken contributes directly to the Convention on Biological Diversity's (CBD) COP 8 Decision VIII/25 (Incentive measures: application of tools for valuation of biodiversity and biodiversity resources and functions), as well as the CBD's Strategic Plan for Biodiversity 2011-2020. The Strategic Plan specifically calls for: the development and application of positive incentives for the conservation and use of biodiversity (Target 3); the integration of biodiversity values into local planning, development and poverty reduction strategies (target 2) and the development and implementation of strategies for the maintenance of plant and animal genetic resources (PAGR) in order to minimize genetic erosion and safeguard diversity (Target 13).

Importance of Agrobiodiversity and the Need for Conservation & Sustainable Use Incentives (*see Factsheet 1 for further details*).

Agricultural biodiversity[1] (ABD) is the basis of human survival and well being. However, despite its importance, agricultural biodiversity at the ecosystem, species and genetic levels continues to be lost at an accelerating pace. A key reason for this loss is that while the benefits of ABD are increasingly recognized, their full value is often not fully accounted for by individuals and society. This is because many components of ABD provide a mixture of benefits to the farmer (i.e. private benefits, for example related to the production of food and fibres) and benefits to wider society (i.e. public benefits, for example related to agroecosystem resilience and the maintenance of evolutionary processes and future options). Markets capture only a part of this total economic value and thus underestimate the true value of these resources, thereby creating a bias against activities compatible with conservation and sustainable use. As the costs of conservation tend to be local (i.e at the farm level), while the benefits tend to be regional, national or even global, poor farmers cannot be expected to be able to afford to conserve PAGR purely for the benefit of wider society without adequate incentives to do so.

The ability of agrobiodiversity-related PES, so-called "payment for agrobiodiversity conservation services" (PACS) schemes to permit the "capture" of public conservation values at the farmer level, thereby creating incentives for the *in situ*[2] conservation of agrobiodiversity and supporting poverty alleviation, therefore, appears to be well-worth exploring.

Applying PES to agrobiodiversity conservation issues *(see Factsheet 2 for further details)*

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. 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 – e.g. not clearing forest land for agriculture in order to reduce CO_2 emissions or improve downstream water quality). 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 for agrobiodiversity conservation services (PACS) may be understood as a sub-category of agriculture-related PES (typically related to soil and water conservation activities) that focuses on socially valuable and threatened local PAGR. Payments may not only be made in cash to individuals but also involve in-kind payments made at a community level).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.

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.

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 identification of funding sources for PACS schemes.

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[1] In this context, agrobiodiversity is understood to encompass all diversity within and among plant and animal species found in domesticated systems

[2] **Why is *in situ* conservation necessary/why not just *ex situ*?**: Concerns about genetic erosion in crops have led to efforts to "insure" against losses by sampling and storing large numbers of landraces and wild relatives of cultivated plants *ex-situ* in collections, or gene banks. However, most of the world's crops, especially those that may be critical to the livelihoods of marginalized people, are not represented. Over recent years, *in situ* methods have increasingly begun to be seen as complementary to *ex situ* approaches, with the former also being mandated by the CBD. There is recognition that these methods address different aspects of genetic resources and neither alone is sufficient to conserve the total range of genetic resources that exist. Key elements of crop genetic resources cannot be captured and stored off-site and, even where they can be, a backup to gene bank collection is necessary. Secondly, crop genetic resources are more than just raw genetic material but also embody ecological relationships such as gene flow between different populations and species, co-evolutionary adaptation and selection to predation and disease, and systems of agricultural knowledge and practice associated with genetic diversity. Thirdly, it has become increasingly evident that agricultural development is not necessarily incompatible with the on-farm maintenance of diversity. This is particularly so under heterogeneous and marginal conditions where locally adapted landraces contribute not only to stability and resilience (particularly in the face of catastrophic risks) but also to maintaining productivity in low-input, low-output production systems, including those susceptible to future change.

PACS-based policy intervention strategy *(see Factsheet 2 for further information)*

An overall PACS-based policy intervention strategy for an environmentally effective, cost-efficient and equitable ABD conservation and sustainable programme would be made up of the following six key components.

1) Targeting for Impact: ABD hotspots & poverty mapping

Given the contribution of ABD to the livelihoods of the poor and the potential to use ABD as an instrument for development, the identification of the overlap in the extent and distribution of PAGR diversity of national/global importance and high rates of poverty permits the targeting of specific locations where pro-poor ABD conservation and use interventions can potentially have the greatest impact.

Recommendation: Undertake a mapping of the overlap in the extent and distribution of PAGR diversity and high rates of poverty as a means of targeting as well as to gain an improved understanding of the dynamic processes of genetic resources evolution managed by farmers, together with the processes that maintain genetic resource diversity on-farm and their interaction with drivers of poverty.

2) Genetic resource prioritisation for diversity-maximising cost-effective interventions: *Decision-support tools to target, prioritise and value the diversity maintained by the poor.*

Having identified the key ABD/poverty hotspots to target, it will still be apparent that not everything can be conserved. Many PAGR are threatened and, 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-type decision-support tools (see Fact Sheet 2 and Technical Note 1) permit the identification of a priority conservation portfolio that maximizes the diversity that can be conserved for any given budget allocation.

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 plant and animal (livestock) genetic resources.

Challenges: There is still a high level of scientific uncertainty, especially associated with the definition of critical risk values (*see Technical Note 3 for further information*) 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.

Recommendation: The establishment of the current status of the PAGR targeted for conservation and sustainable use interventions, together with the definition of critical risk values urgently needs to be undertaken. Further details are discussed under the following Component (Status and Threat Monitoring).

3) Integrated participatory diversity status and threat monitoring system: *Understanding the current status of the resources within the priority conservation portfolio.*

Although many PAGR are widely recognised as being threatened, there is only limited information available regarding their actual status. Only isolated efforts at monitoring agrobiodiversity on-farm have been undertaken. There is no equivalent of a "Red List" for crop species under threat. Conventional monitoring efforts, where they exist at all, suffer limitations due to ad hoc approaches that lack rigorous survey and sampling methods, poor understanding of search effort costs, do not systematically involve the participation of local-level actors and are usually based on collections instead of direct observations in the field.

Furthermore, even once PAGR status has been established, the definition of critical risk values remains to be undertaken i.e. the defining of how much of the prioritised resource should be conserved in order for it to no longer be considered at risk. PAGR and their (uncertain) future values may be lost irreversibly if their population falls below a critical threshold or so-called safe minimum standard (SMS). SMS approaches are widely applied with regard to wild biodiversity and seek to avoid maximum future losses of value. In the case of animal genetic resources, FAO defines a livestock breed generally not to be at risk if there are 1,000 breeding females and 20 males. No such equivalent measure exists for PGR. In the case of crop genetic resources, the estimation of a SMS is likely not only to be based on the cultivated area but also, in order to conserve the underlying evolutionary process involving human selection and practices, to also be based on the amount of seeds available in local systems and their age, the number of farmers of a specific species/variety, the degree of local knowledge maintained and geographical distribution (*see Technical Note 3 for further information*).

While it is possible that the resulting 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.

Challenges: 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 the desired agrobiodiversity conservation service per se (e.g. maintenance of evolutionary processes or option values) 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.

Recommendation: Participatory diversity status and threat monitoring system, integrated with systematic conventional, non-participatory monitoring activities urgently need to be developed and tested. The definition of conservation goals based on a safe minimum standard approach also urgently needs to be undertaken. This will permit an enhancement of capacities to prioritise, design and implement cost-effective on-farm conservation interventions that actively involve farmers and complement on-going *ex situ* conservation efforts. Potential funders of PACS schemes are also more likely to be willing to finance such schemes where the provision of conservation services is clearly verifiable relative to an initial baseline.

4) Pro-poor conservation and use strategy design and testing: *Incentives and mechanisms for poor female and male farmers and/or livestock-keepers to maintain genetic resource diversity, and capture the benefits from doing so, improving their welfare and making conservation sustainable for the future.*

Having identified where to develop ABD conservation and use interventions (Component 1), on which genetic resources to focus on (Component 2) and their status (Component 3), consideration is required regarding how to design the incentives *per se* for farmers to maintain

the public good values (e.g the evolutionary processes embodied in gene flow, agricultural system resilience, future option values) of those genetic resources in the priority conservation portfolio in a pro-poor and cost-effective manner.

Such incentive mechanisms may draw on a "domesticated" version of payment for ecosystem services (PES). So-called payment for agrobiodiversity conservation services (PACS) have been shown to be a potentially useful complement to more conventional niche product market development. They can also generate rewards for farmers not only for undertaking conservation activities per se but also for supporting status monitoring and PACS scheme monitoring and verification services, thereby allowing poor farmers to diversify their livelihood options.

In order to determine how much a PACS-based conservation programme will cost and how these costs can be minimised, there is a need to assess farmer/community willingness to participate in the proposed conservation activities (along with associated PACS programme management costs – including for monitoring and verification activities).

Least-cost conservation of PAGR approaches would be expected to 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[3]. 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.

Challenges: In addition to the status monitoring and conservation goal identification challenges identified above, 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.

Recommendations: A number of options appear to be worth exploring, including:

a) Existing *agricultural market channels* may be used to promote the use of threatened PAGR. Local and global consumers of PAGR may be willing to pay for the on-farm utilization of some limited range[4] of local PAGR through such mechanisms as eco-labelling, certification or denomination of origin schemes when niche product markets are developed.

b) *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 biodiversity offset concepts, regulatory obligations and corporate social responsibility could be means of motivating such private sector support for investments aimed at mitigating their negative impacts.

c) 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 programs). Where in-kind payments can be associated with such things as technical advice or school materials, then existing government agricultural development, extension and education programmes could be used to support PACS schemes. These functions may also be fulfilled by *quasi-governmental entities*, such as development banks and conservation agencies or *NGOs*.

d) Additional sources of funding for PACS could be found within existing *national poverty alleviation programmes*, as discussed in the following section.

5) Assessment of poverty alleviation interventions on ABD conservation and use

An in-depth assessment of how poverty alleviation efforts can be linked to the maintenance and sustainable use of genetic resources can form a useful additional element to the analysis carried out under Component 4, specifically with regard to issues related to the equity criterion (ability of the poor to benefit from incentive schemes) and sustainable financing of incentives (in particular, re-allocation of existing support).

Challenges: To date, limited attention has been paid to assessing the diversity impact (positive or negative) of existing poverty alleviation efforts; including with regard to how improvements in financial status indicators may to some extent be undermined by declines in other (ABD-related) goods and services of importance to overall welfare (e.g. insurance functions and socio-cultural values).

Recommendation: Realise a systematic evaluation of poverty alleviation interventions in terms of their being capable of producing outcomes that maintain crop diversity on-farm and that create livelihood incentives for farmers to do so. Such an analysis might be expected to identify opportunities to mitigate the diversity impacts of existing poverty alleviation efforts, as well as to improve the effectiveness of such efforts by focusing on means of enhancing the existing diversity contribution to livelihoods. Both such goals may be achievable within the existing government resource allocation, thereby increasing the potential for wide ranging implementation.

6) Capacity-building for pro-poor conservation strategy design and implementation, as well as for up-scaling and mainstreaming in order to achieve a wider outcome and impact on the lives of the poor.

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[3] Opportunity costs are the benefits forgone from undertaking the conservation activity rather than a more financially attractive alternative.

[4] It should be noted that relying solely on market development might be a risky 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).

Recommendation: i) Raising awareness of development agency, policy-makers and national biodiversity strategy and action plan (NBSAP) managers with regard to the economic methods and decision-support tools available to support ABD conservation and use strategy design and implementation[5]; and ii) Strengthening of implementation and analytical capacities of NBSAP, local government and NGO staff associated with ABD conservation and use programmes.

Conclusions

Given that, generally, threatened PAGR are located in disadvantaged and remote rural areas in developing countries, the above PACS-based framework may prove to be a useful part of rural development packages and a useful potential tool for policy-makers.

Under such circumstances, PACS schemes would need to be designed in a way that takes fairness considerations on-board in order not to undermine the long-term legitimacy of such programs and thus their robustness.

Furthermore, before PACS schemes are adopted, a careful assessment should be undertaken of existing social preferences that are of relevance for the success of formal institutions brought from outside the community. Improved understanding of the ways external rewards systems may affect existing resource management practices given various market and group contexts will be highly important in the context of enabling policymakers to design PACS schemes in a way they can draw upon, support and complement existing patterns of collective action.

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[5] Such work could also be carried out in collaboration with Bioversity's existing **Genetic Resources Policy Initiative (GRPI II)** whose objective is to strengthen the capacity of developing countries to design comprehensive policy frameworks for genetic resources. Such collaboration would facilitate awareness-raising and technical training amongst key decision-makers and technical specialists.