



Competitive Tenders:

Designing Agrobiodiversity Conservation Programmes so as to Minimise Costs while Maximising Social Equity



Can payment for agrobiodiversity conservation services (PACS) schemes attain their conservation goal ([ecological effectiveness](#)) at least-cost ([economic efficiency](#)), while ideally involving a pro-poor impact ([social equity](#))? As in most payments for ecological services (PES) schemes, there may be certain trade-offs between such goals, especially between economic efficiency and equity, as will be illustrated through some insights from a pilot quinoa PACS scheme to conserve local quinoa varieties, currently being implemented in the Andean Altiplano.

Background to the use of Competitive Tenders in the context of PES

In order to provide an adequate incentive for a farmer to cultivate a crop species/variety or livestock breed that may be less profitable than one s/he would have cultivated in the absence of the conservation programme, it may be expected that the incentive will have to be sufficient to make up this difference (or the “opportunity cost” as it is referred to by economists, also illustrated in Figures 1 and 2 of Factsheet 1). A good understanding of the opportunity costs involved is thus fundamental to ensuring that incentives are set appropriately and will also play a key role in determining the total resources required to implement the conservation programme.



However, there is a fundamental problem to be overcome by the conservation agency (be it governmental or non-governmental) with regard to the identification of such opportunity costs. Given that such costs may vary significantly between farming households (because of different preferences for the species/varieties/breeds in question, different availability of land and labour, etc.) and locations, it is extremely difficult for the agency to know other than in very general terms (e.g. based on average yield differences and the payment of a fixed price) what the true opportunity costs might be. By contrast, individual farmers are likely to be well aware of their true opportunity costs¹. Such differences are referred to by economists as “information asymmetries” and the existence of such differences in knowledge can result in farmers having an incentive to exaggerate their true opportunity costs in order to maximise the conservation payments they would receive. This in turn would lead to higher overall conservation costs and, given limited conservation budgets, leaving less funding available for conserving additional threatened varieties. Given that better outcomes could have been achieved if the true opportunity costs had been known by the conservation agency, such outcomes are considered to be “cost-inefficient”.



Competitive tender schemes using auction-based mechanisms have been shown to be capable of tackling such cost-inefficiencies arising from the existence of information asymmetries by identifying participating landowners’ actual conservation costs. This is because such competitive processes provide farmers with an incentive to reveal their true opportunity costs, as the higher the payment demanded, the lower the probability of being selected to participate in the conservation programme. Accordingly, it is argued that such tender mechanisms are able to maximize the efficiency of PES, relative to fixed price approaches (e.g. where everyone is paid the same unit amount based on estimated yield differences). Although conservation tenders are increasingly being applied in PES settings, especially in developed countries, to the best of our knowledge this study is the first community-based reverse auction² approach applied in a developing country setting for agrobiodiversity conservation.

The Threatened Quinoa Variety Competitive Tender in Bolivia and Peru

Quinoa is a cereal crop with a long history in the Andes, but quinoa diversity has recently been being undermined through the replacement of varieties by commercially favoured ones. Following the identification of the priority (threatened) varieties to be included in the competitive tender (also see Technical Note 2), communities within the locations where such varieties are found were identified. Between January and March 2010 representatives



¹ Similarly, the conservation agency will be best-placed to be aware of the degree of threat faced by specific species, landraces or breeds, while farmers might be unaware about seemingly locally abundant genetic resources in fact being threatened at landscape, national or global scales.

² We refer to this as a “reverse auction” as the lowest (cheapest) offers made by farmers to participate in the conservation programme are accepted first.

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from 18 community-based organisations (CBOs) in Bolivia and from 20 CBOs in Peru were invited to take part in the competitive tender for conservation contracts regarding the identified priority landraces. A local NGO assisted the CBOs to prepare their bid offers. The CBOs were free to determine for each of the priority landraces:

- (1) the total land area in the community that would be allocated to their cultivation (a proxy for genetic diversity maintenance);
- (2) the number of farmers within the CBO who would take part in the conservation activity (a proxy for agricultural knowledge and cultural traditions maintenance); and
- (3) the in-kind community-level payment required – typical payments or rewards requested included, agricultural equipment and inputs, as well as construction and school materials.

The rules of the tender were simple. Participating CBOs were informed that the winners of the tender would be selected on the basis of those who could offer the most conservation (measured in terms of total land area to be cultivated and the total number of participating farmers³) relative to the proposed reward level. Offers would be evaluated independently for each of the priority landraces and rewards would only be provided to tender-winning CBOs at the end of the agricultural season following verification of the fulfilment of the conservation contract.

The selection process

A total of 12 Bolivian and 13 Peruvian CBOs participated in the conservation tender. US\$4,000 was available for each conservation programme in each country. Where CBOs had no access to seeds of the critically threatened landraces, offers were adjusted for the costs of providing the necessary amount of seed to the CBOs. Given that the objective of the tender is to maintain genetic resource diversity and the accompanying socio-cultural mechanisms that help to sustain such diversity, the land area and farmer number proxies featured as selection criteria along with a third criterion, which was the maximisation of the number of participating CBOs. The latter helps ensure the heterogeneity of seed systems in a given region (and may thus be

considered as a proxy for geneflow maintenance), as well as reducing the risks associated with climatic shocks and/or pest/disease outbreaks by seeking to maximise the spatial distribution of the conservation locations. Furthermore, seeking to maximise the number of participating CBOs is also compatible with local perceptions of fairness, which (see below) may be considered important in ensuring that PACS-type interventions are socially sustainable over the long-term.

Consequently, winning offers could, in principle, be selected according to a range of different criteria. Subject to the conservation budget, selection could be based on the maximization of any of the three selection criteria or a combination thereof, i.e. land area under cultivation (A), the number of participating farmers (F) and the number of participating CBOs (O). With regard to the combined approach (C), the weights associated with each criterion also need to be established. However given the lack of scientific framework to provide such weights (also see Factsheet 2), we limit our analysis to a 40% (A)-40%(F)-20%(O) weighting, which through an iterative process was found to best balance the three conservation goals. Each of these four selection approaches (A, F, O and C) produces a different ranking of the CBO offers with respect to their cost-effectiveness.

Given a total of US\$4000, US\$800 may be allocated to each of the five priority landraces under the Bolivian case study and \$1,000 to each of the four priority landraces under the Peruvian scheme. An iterative process was followed, whereby when the highest ranked offer by any given CBO falls outside the budget for any of the priority landraces, the next best bid is selected until no further bids can be selected without exceeding the budget.

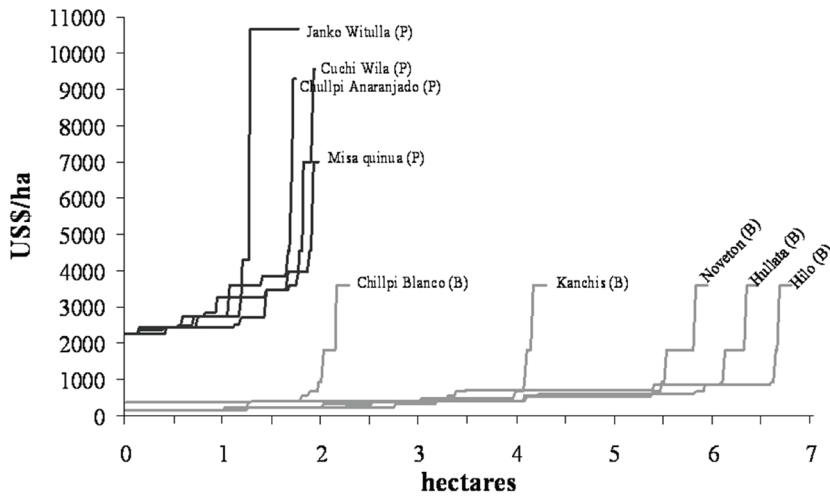
Conservation Costs and Equity Trade-Offs

Conservation costs

A reverse auction approach allowed the identification of CBOs who would provide the desired agrobiodiversity conservation activity at least cost. Figure 1 depicts the marginal cost (supply) curves for the three selection criteria for each of the prioritised landraces. As can be seen, there are significant differences between the Bolivian (grey) and Peruvian (black) supply curves, in particular with regard to the supply of land area for conservation. For example, even for the least widely grown landrace in terms of area in Bolivia, the marginal costs of conserving approximately two hectares never surpass US\$2,000 per hectare. By contrast, none of the prioritised landraces could be conserved in Peru for that level of payment. Further differences can be noted with regard to areas offered for landrace conservation. The average offer by Bolivian CBOs is associated with the allocation of 0.5 ha, compared to just 0.2 ha in Peru, which we hypothesise is mainly due to differences in the quinoa farming systems found in each country. Moreover, it is interesting to note that most of the Bolivian community offers did not surpass US\$200 for any of the prioritised landraces, in contrast to average offers of about US\$600 in Peru.

³ With a view to limiting the conservation agency's monitoring and verification costs, the CBOs were advised that for their offers to be valid, a minimum of at least 2 farmers had to be willing to participate in the programme.

Figure 1. Quinoa Competitive Tender - Farmer Willingness to Undertake Conservation Service



Where the selection approach would be based solely on the number of farmers, this appears lower in Peru as there are significantly more farmers willing to participate in the conservation activity than in Bolivia, with the exception of the landrace Janko Witulla. The cost curve associated with the number of participating CBOs is generally lower in Bolivia.

Using the information from Figure 1, it is possible to calculate the total conservation costs for any potential selection approach. For instance, in order to allocate one hectare to a given priority landrace through a PES scheme, the minimum payment would range from US\$143 in Bolivia to US\$2,400 in Peru. Where effective conservation might be considered to require the involvement of at least 20 farmers per landrace, this would cost US\$460-US\$920. Assuming that effective delivery requires at least five CBOs, conserving any given landrace would cost US\$200-US\$500 in Bolivia, and US\$800-US\$1,500 in Peru.

Cost-effectiveness considerations

Table 1 presents the outcomes associated with the three single criteria selection approaches, aiming at optimizing cost-effectiveness in terms of area (A), participating farmers (F) and participating CBOs (O), in addition to a combined approach (C). As would be expected, selection approach A, is associated with a maximization of the total area under conservation and this approach performs best in terms of funds spent per hectare cultivated with all the targeted landraces. For all landraces, selection approach F, while maximising participating farmer numbers, results in the lowest amount of land allocated to conservation. Similarly, selection approach O generally implies trading-off land area and participating farmer numbers in order to maximise CBO participation. For example, in Bolivia, using selection method T for Noveton leads to 2.94 ha being conserved and involves 17 farmers and 5 communities. by contrast, using selection criteria A, 23 farmers would be involved but only 0.61 ha would

be conserved and 4 communities involved. Similar trade-offs can be identified under the O and C selection criteria.

Consequently, trade-offs can be identified between the cost-effectiveness of the three conservation activities to be targeted. In particular, a clear trade-off arises when trying to maximise conservation area and number of farmers i.e. the best offers in terms of costs per land unit do not correspond to the best ones in terms of costs per farmer. Furthermore, the most cost-effective selection approaches based on land area or farmers cannot at the same time maximize the number of participating CBOs. In other words, the choice is between individually maximising conservation activities based on any one of the three selection criteria (land area cultivated, number of participating farmers or number of participating CBOs) and a compromise solution by combining the three selection criteria.

Table 1: Conservation area (in hectares), number of farmers and number of CBOs per landrace under selection approaches A, F, O and C.

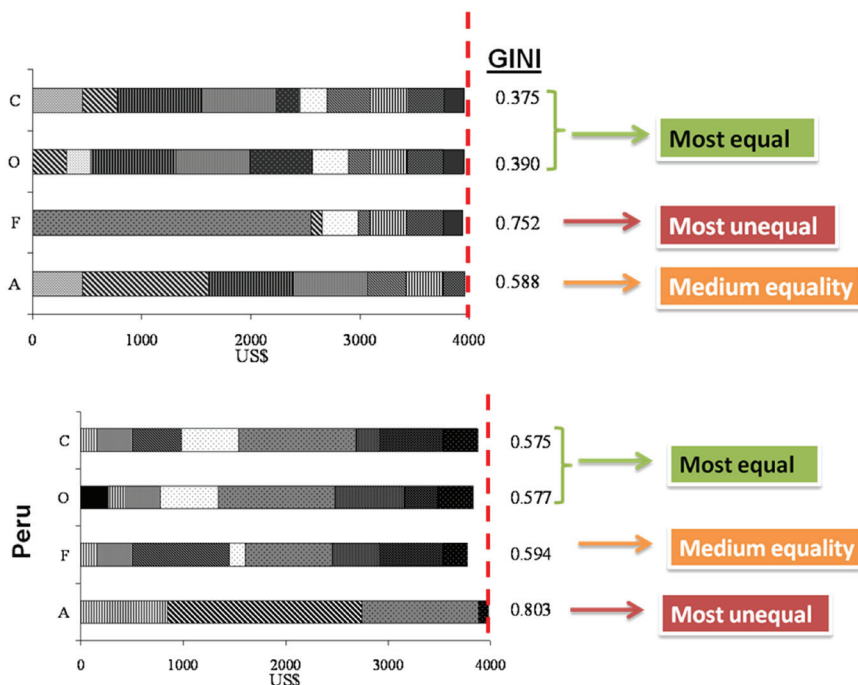
	area (ha)				farmers				CBOs			
	T	A	O	C	T	A	O	C	T	A	O	C
Bolivia												
Chillpi Blanco	1.96	0.39	0.88	2.00	11	22	14	12	4	5	7	5
Huallata	3.30	0.74	3.38	3.38	14	24	16	16	5	5	7	7
Hilo	3.29	0.53	1.72	1.72	11	27	17	17	4	6	8	8
Kanchis	3.00	0.80	3.19	3.15	9	25	17	16	5	6	9	8
Noveton	2.94	0.61	2.63	2.98	17	23	17	18	5	4	7	6
Peru												
Misa quinua	0.39	0.30	0.37	0.44	11	31	17	32	2	3	4	4
Chullpi anaranjado	0.45	0.28	0.28	0.28	14	18	18	18	3	4	4	4
Janko Witulla	0.47	0.43	0.43	0.43	11	28	28	28	2	4	4	4
Cuchi Wila	0.41	0.30	0.33	0.33	13	36	19	23	2	3	5	4

Equity considerations

CBOs may find that either all, part, or none of their offers are accepted depending on which of the four selection approaches aimed at maximizing the cost-effectiveness of the programme is used. Furthermore, each selection approach may be associated with a different distribution of the available budget across CBOs. For example, as can be seen in Figure 2, out of the total twelve CBOs participating in the Bolivian auction, seven CBOs would be selected under approaches A or F and ten under approaches O or C for being awarded with a contract to conserve one or more of the targeted landraces. In Peru only four from a total of 13 CBOs would be selected under approach A and eight under the other three approaches. Hence, the largest number of excluded CBOs would occur under selection approach A in both

countries. In Bolivia the most unequal distribution would be associated with using selection approach F, with just one CBO appropriating more than 60% of the total budget. In Peru, selection approach A would also create a highly unequal distribution, since two thirds of the Peruvian budget would be allocated to just two CBOs. Different selection approaches also result in different CBOs being awarded with conservation contracts.

Figure 2. Quinoa Competitive Tender Selection Approaches and Equity Implications



This analysis demonstrates that the distribution of rewards between the participating CBOs is very sensitive to the selection approaches used. It appears that targeting conservation areas or the number of conserving farmers as the main selection criteria results in a highly unequal distribution of the conservation budget, strongly favouring those groups that offer highly competitive bids regarding a single conservation criteria.

This emphasizes the fact that local perceptions of fairness may need to be sacrificed if cost-efficiency is the overarching goal. However, there a fear that such selection approaches may compromise the political legitimacy of the PES program and its long term success. Instead, using combined selection approaches may make the program seemingly less cost-effective in the short-term but more so in the longer-term given the higher likelihood of the scheme enduring over time.

Given the potential occurrence of irreversible losses of evolutionary processes and informal seed systems managed by networks of farmers and communities should the intervention scheme break down, the long-term sustainability of the intervention is clearly an important economic consideration.

Key Findings:

- There is a need to consider the perceived long-term legitimacy of PACS schemes by considering their ability to attain their conservation goal (ecological effectiveness) at least-cost (economic efficiency), while ideally involving a pro-poor impact (social equity).
- Competitive conservation tender schemes using auction-based mechanisms allow total conservation costs to be minimised and hence more to be conserved.
- Although conservation tenders are increasingly being applied in PES settings, especially in developed countries, to the best of our knowledge this study is the first community-based reverse auction approach applied in a developing country setting for agrobiodiversity conservation.
- The minimum payment to secure one hectare of a priority landrace ranges from US\$143 in Bolivia to US\$2,400 in Peru. Involving the participation of at least 20 farmers per landrace would cost US\$460-US\$920. Involving at least five CBOs per landrace would cost US\$200-US\$500 in Bolivia, and US\$800-US\$1,500 in Peru.
- The articulation of a clear conservation goal, based on single criteria or combinations thereof (e.g. in terms of cultivated area, number of participating farmers and/or communities) is required both in order to calculate the total costs involved in reducing threat levels as well as to analyse potential trade-offs between cost-efficiency and equity.
- The distribution of rewards between the participating CBOs is very sensitive to the selection approaches used. It appears that targeting conservation areas or the number of conserving farmers as the main selection criteria results in a highly unequal distribution of the conservation budget.
- Equity may need to be sacrificed if cost-efficiency is the overarching goal. However, given that this may compromise the political legitimacy of the PACS program and its long term success, combined selection approaches may have a higher likelihood of ensuring that the scheme endures over time – an important economic consideration given the potential for irreversible losses to occur.

Suggested further reading and full citations available at:

Narloch, U., Pascual, U. and Drucker, A.G. (Forthcoming) Cost-effectiveness targeting under multiple conservation goals and equity considerations in the Andes. Environmental Conservation.

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