Assessing Farmer Willingness to Participate in ***Minor Millet Conservation Programmes*** *and Estimating Conservation Programme Costs*

Executive Summary

A stated preference contingent valuation survey was applied with the objective of determining farmers' willingness to accept (WTA) compensation to participate in a conservation programme for specific minor millet species/varieties.

As hypothesised, the higher the initial incentive offered, the larger the proportion of farmers likely to accept the offer. Furthermore, the incentive required to cultivate a least preferred variety is higher than that of a most preferred variety (in this case approximately Rs. 600/acre p.a.).

Based on the risk assessment and farmer WTA offers, three types of conservation approach may be considered. For those landraces which are not currently threatened and are widely cultivated, ensuring continued *de facto* conservation through sustainable use may not require any external incentives. Alternatively, such *de facto* may be supported over a longer term by niche market and value chain development activities.

For those landraces which are threatened and where the level of incentives required are not excessive, PACS type incentives may be appropriate. A "ballpark" estimate of the overall conservation programme incentives required (excluding management/administration costs) would total approximately Rs.39,500/acre (US$880) or Rs. 198,000 (approximately US$4,400) for a 5 acre safe minimum population covering each of 10 threatened varieties.

For those landraces where very high incentives for *in situ* conservation are required (i.e. kodo millet), an *ex situ* conservation strategy may be preferred, if alternative and cheaper *in situ* locations cannot be identified.

Methodological Approach

A stated preference contingent valuation survey was applied across approximately 450 farming households in 5 panchayats (Devanur, Alathur, Thiruppuli, Gundari and Selur) located in the Kolli Hills region in Namakkal district of Tamil Nadu, Southern India.

The objective was to determine farmers' willingness to accept (WTA) compensation to participate in a conservation programme for specific minor millet species/varieties.

A double-bounded format was used, whereby if an initial offer was accepted a lower offer was made and acceptance/rejection of that second offer noted. By contrast, if the first offer was refused, a second higher offer was made and acceptance/rejection of that second offer was noted.

As part of the household survey described in Research Findings 1, farmers had previously been asked to identify their most preferred variety (MPV) and their least preferred variety (LPV). Contingent valuation questions were then asked about their willingness to cultivate these 2 specific varieties on 10 cents (0.1 acres of land) if planted pure and 15 cents if planted mixed.

In order to reduce hypothetical bias, respondents were told that their replies would help inform the potential future design of a conservation programme and that this programme would be based on competitive tender approach (see Technical Note 2). Under such a tender, least-cost providers are chosen only up to the point where a predetermined safe minimum standard (see Technical Note 3) has been reached. Hence, accepting only higher offers would be associated with a reduced probability of actually being awarded a conservation contract.

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By contrast, accepting lower offers would increase that probability but farmers need to be aware of the importance of ensuring that those offers are indeed adequate to cover their opportunity costs of participating. The opportunity costs are associated with what the farmer would have to forgo in terms of a different millet or non-millet crop, in order to be able to plant the conservation variety plus the donation of 2 vallam of quality seed to the community seed bank. There would also be other transaction costs associated with participating in the programme, mostly related to information provision requirements and verification activities.

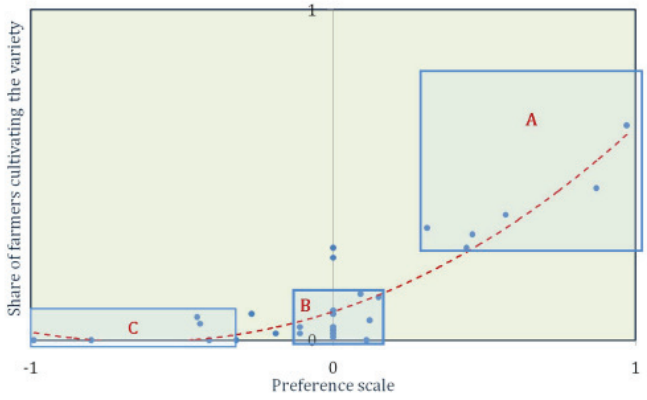
Farmers were told that the (hypothetical) payments offered would be paid 50% up-front on signing the conservation contract and the remaining 50% only upon completion (where contracts are not completed this second payment would not be made). Farmers were first asked about their WTA with regard to their MPV and then with regard to their LPV. After that higher or lower offers (depending on the initial reply) were proposed with regard to the MPV and then the LPV, respectively. In this manner, each farmer responded to 4 CV questions.

So as to ensure that the estimated values are strictly positive (given the assumption that WTA value cannot be negative), a log-linear function was estimated. Two models were run: one, in which the WTA value was estimated for the MPVs as a whole and a second model in which the values were estimated for all the varieties separately.

Results

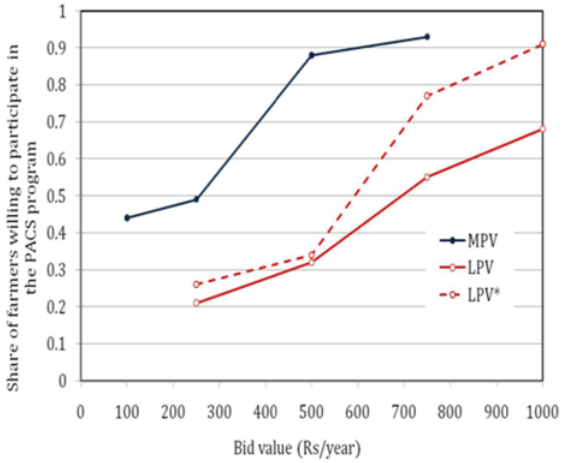
As can be seen in Figure 1, there is strong correlation between farmers' stated preferences and the share of farmers actually cultivating given varieties. Those varieties with high preference levels (group A) are cultivated by a relatively large number of farmers, while the opposite is true of those in group C.

Figure 1. Farmer preference of varieties: stated and actual



It would be expected a priori that the higher the initial offer, the higher the proportion of farmers likely to accept the offer. Furthermore the opportunity cost of cultivating a LPV would be expected to be higher than that of a MPV and hence farmer WTA for cultivating the LPV would be higher. As can be seen in Figure 2, both of these hypotheses are confirmed, with the difference in WTA values between MPV and LPV being approximately Rs. 600/acre p.a.

Figure 2. Impact of bid values on share of farmers WTA a conservation contract



As can be seen in Table 1 (amended from Research Findings 1), the models reveal significant intra-crop and inter-varietal preference variations, as can be seen from the range of WTA estimates in the final column. These range from approximately Rs.650–Rs.14,000/acre p.a. or Rs. 2,250-5500/acre p.a. for only the area threatened varieties excluding the kodo millet. In general, once again it is clear that those varieties which are most preferred and most widely cultivated (i.e. the finger millets) have a lower average WTA (Rs. 1,900/acre p.a.) than do those species/varieties at risk. Average WTA for little, Italian and common millets is approximately Rs. 3,300 – 4,300/acre p.a. Kodo millets, the least preferred variety, has a much higher WTA of over Rs. 14,000.

Policy Implications

Three types of conservation approach may be considered.

1. *De facto in situ* conservation through sustainable use, taking place in the absence of any conservation programme intervention;
2. *In situ* conservation supported through the development of external incentive mechanisms such as PACS
3. *Ex situ* conservation

As can be seen in Figure 3, those varieties that are found in group A, characterized by a high farmer preference and cultivated widely (e.g. the finger millets) are not currently at risk and are being *de facto* conserved in farmers' fields. Interventions associated with niche product and market chain development could also support the continued existence of these varieties over the long-term.

By contrast, those found in group B are associated with only medium farmer preferences and are cultivated only to a limited extent both in terms of area and farmer numbers. For these threatened landraces, the creation of incentives (e.g. through a PACS mechanism) for farmers to maintain them for the public good may well be justified.

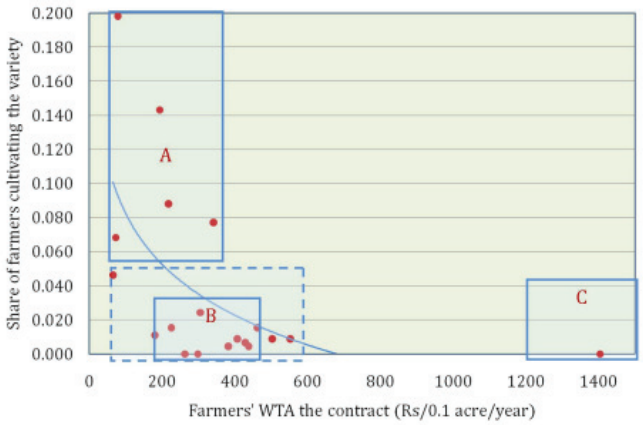
Those landraces found in group C, currently only the Kodo millet Thirvaragu, would be extremely expensive to maintain *in situ*. Given that 3-4 times as many varieties of other landraces might be conserved *in situ* for the same amount of conservation funding, a cheaper *ex situ* conservation option might be considered. Alternatively, *in situ* conservation in other locations where similar Kodo millets are found (e.g. other parts of Tamil Nadu) might be an alternative option.

Table 1 Status of Minor Millet Varieties and Average WTA across 5 Kolli Hills Panchayats

	2008			Estimated 2009		
	Average Farmer Numbers	Area (Acres)		Average Farmer Numbers	Area (Acres)	Average WTA Rs./ Acre p.a.
Finger millet						
Sundangikelvaragu	279.7	89		227.7	98.2	790
Perungelvaragu	176.7	82.4		143.8	90.9	2,170
Karunguliyankelvaagu	102.4	40.2		83.4	44.4	4,048
Arisikelvaragu	107.2	31.7		87.2	35	730
Sattaikelvaragu	70.5	23.3		57.4	25.8	650
Karakelvaragu	31.9	8.5		26	9.4	3,040
Total	**768.4**	**275.2**		**625.6**	**303.7**	**1,904**
Little millet						
Vellaperumsamai	184.9	127.1		120.4	96	1,930
Kattavettisamai	11	12.8		7.2	9.7	1,800
Karumsamai	20.3	3.8		13.2	2.9	4,620
Malliasamai	9.8	2.7		6.4	2	4,371
Thirigulasamai	13.8	1.2		9	0.9	4,060
Sadansamai	0	0		0	0	2,982
Total	**239.8**	**147.6**		**156.1**	**111.5**	**3,294**
Total excluding Vellaperumsama	54.9	20.5		35.7	15.5	3,567
Italian millet						
Perunthinai	13.5	7		7.6	4.8	5,524
Koranthinai	24.1	5		13.6	3.5	2,252
Senthinai	4.4	3		2.5	2.1	3,818
Mookanthinai	11.6	2		6.5	1.4	5,025
Palanthinai	0	0		0	0	2,622
Total	**53.7**	**17**		**30.2**	**11.7**	**3,848**
Common millet						
Panivaragu	10.3	0.9		0	0	4,280
Total	**10.3**	**0.9**		**0**	**0**	**4,280**
Kodo millet						
Thirivaragu	0	0		0	0	14,030
Total	**0**	**0**		**0**	**0**	**14,030**

= Varietal areas with < 5 acres in total; = Farmer numbers < 30 in total

Figure 3. Conservation Options



Overall Conservation Costs

In order to calculate the costs of a conservation programme for the threatened millets listed in Table 1, a number of assumptions would need to be made. As previously noted in Research Findings 1, firstly the degree of dissimilarity between the landraces identified as threatened in the 5 panchayats studied compared to those that might be found elsewhere would have to be carefully considered before concluding that all the threatened landraces identified here are really threatened at larger spatial scales of analysis. Secondly, even if sufficient levels of spatial dissimilarity existed, we would need to further assume that all the varieties under consideration are sufficiently dissimilar from each other and that there is a valid public good argument for the maintenance of each one of them. Thirdly, the definition of a conservation goal capable of securing such public good values would be required. Finally, it would be necessary to consider the frequency with which an incentive would need to be provided i.e. whether seeds can be stored for more than one agricultural season.

However, assuming that all 10 of the above area threatened varieties (yellow cells in final column of Table 1, excluding the kodo millet) remain threatened following a wider spatial scale analysis and that they would indeed need to be planted every single year, then a "ballpark" estimate of the overall conservation programme incentives required (excluding management/administration costs) would total approximately Rs.39,500/acre (US$880) or Rs. 198,000 (approximately US$4,400) for a 5 acre safe minimum population of the 10 threatened varieties.

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