Supplementary S2 : Protocol for Participatory Cost-benefit Analysis; Outline Notes for a Method.

Background
A cost-benefit analysis of agricultural technology or 'option' is used to judge whether the inputs or investments (the costs) are worth making given the outputs or returns (the benefits) they will generate. The analysis is often done to compare one or more new technologies with some current practice. Economists have many tools for collecting the data, making the calculations and expressing the results. Indices of the results include: cost-benefit ratio, net present value, internal rate of return, returns to land or labour.

The problem
The key problems with standard economists' cost-benefit analyses of a new technology (and there and many versions of them, with different levels of sophistication) are:
1. It is hard to collect the data required and to ensure its quality.
2. It is even harder to collect data that allows you to provide analyses that (a) are broken down to give results for different contexts (types of farmer, types of land) (b) allow you to look at risk and variation, not just means.

All the standard economic analyses focus on means even though no farmer experiences means. The methods generally require you to put money values on all inputs and outputs, even when there is no market for them and farmers do not see them in terms of money.
The results of standard economic analyses often fail to reflect farmers interests and decision making. It is easy to find examples where farmers adopt things that, according to our analyses, do not make economic sense and fail to adopt things that do. So whether the focus is on our understanding the system or providing actionable information for farmers, the standard analyses can miss the point.

An alternative
A participatory and (semi-)qualitative method that overcomes these problems is outlined below. The basic framework is the same for a qualitative economic analysis – estimating the costs, the benefits and the balance between them for each option (Fig 1). But these are not turned into money values, and the balance is decided by participatory discussion rather than by adding and subtracting.

Fig 1 Framework for participatory cost benefit analysis. Both the rows of the table and the contents of each cell are elicited by participatory discussion. Contents of each cell can be qualitative comments or scores, but do not have money values.

Item	Option 1 (eg new practice)	Option 2 (eg current practice)
Costs		
Inputs		
Labour		
Land		
…		
Benefits		
Products (listed)		
Services (listed)		
…		
Balance		
Context 1		
Context 2		
…		
Shifting the balance		

Process

1. Assemble a group of farmers who have tried the new technology or option. It should include those that dropped out of the trial early on.
2. Elicit lists of benefits of the technology, relative to specific alternatives (either 'current practice' or other options tested)
3. For each item in the list, get the group to give some sort of score as to how important that benefit is, for each of the options.
4. Repeat B and C for costs.
5. Now discuss how the costs and benefits balance.
6. Get a score or overall balance, perhaps on a scale from 'I would never use this again' to 'I want to convert all my farm', or something similar.
7. For each score, elicit information on what social or biophysical changes would make it greater or smaller – how could the benefits be increased and the costs be reduced, and how could the balanced be changed.
8. Explore how the balance in F depends on context – for who and where is it more positive or more negative. Explore how they might evolve over time.
9. Look for apparent inconsistencies between the data in D and E and the data in H and try to resolve them – allow data to be updated by this further reflection.
10. Repeat from A with some independent groups of farmers