Community-Based Adaptation Costing:

An integrated framework for the participatory costing of community-based adaptations to climate change in agriculture

Working Paper No. 16

CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS)

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CLIMATE CHANGE
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Abstract

Understanding the cost associated with climate change adaptation interventions in agriculture is important for mobilizing institutional support and providing timely resources to improve resilience and adaptive capacities. Top-down national estimates of adaptation costs carry a risk of mismatching the availability of funds with what is actually required on the ground. Consequently, global and national policies require credible evidence from the local level, taking into account microeconomic dynamics and community-appropriate adaptation strategies. These bottom-up studies will improve adaptation planning (the how) and will also serve to inform and validate top-down assessments of the total costs of adaptation (the how much).

Participatory Social Return on Investment (PSROI) seeks to provide a pragmatic, local-level planning and costing framework suitable for replication by government and civil society organizations. The 'PSROI Framework' is designed around a participatory workshop for prioritizing and planning community-based adaptation (CBA) strategies, followed by an analysis of the economic, social and environmental impacts of the priority measures using a novel cost-benefit analysis framework.

The PSROI framework has been applied in three separate pilot initiatives in Kochiel and Othidhe, Kenya, and Dodji, Senegal. This working paper seeks to outline the theoretical and methodological foundations of the PSROI framework, provide case-study results from each pilot study, and assess the strengths and weaknesses of the framework according to its robustness, effectiveness and scalability.

Keywords

Climate change adaptation; agriculture; costing; community-based adaptation; participatory action research; resilience; social return on investment.

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Contents

Tables and figures

Acronyms

ABCD	Asset-Based Community Development
AI	Appreciative Inquiry
CBA	Community-Based Adaptation
CFA	Central African Francs
CCAFS	CGIAR Research Program on Climate Change, Agriculture and Food Security
CGIAR	Formerly the Consultative Group on International Agricultural Research. CGIAR is now a global research partnership for a food secure future
CIAT	Centro Internacional de Agricultura Tropical (International Center for Tropical Agriculture)
COP	Conference of the Parties
CRS	Croix Rouge Senegalese (Senegalese Red Cross)
CSA	Climate-Smart Agriculture
CSH	Critical Systems Heuristics
ECI	Environmental Change Institute, University of Oxford
GHG	Greenhouse Gas
IPCC	Intergovernmental Panel on Climate Change
KES	Kenyan Shillings
LAPA	Local Adaptation Plan of Action
MB	Marginal Benefits
MC	Marginal Costs
NAPA	National Adaptation Programme of Action
NGO	Non-Governmental Organization
NMV	Non-Market Valuation
NPV	Net Present Value
NRM	Natural Resource Management
PSROI	Participatory Social Return on Investment
ROI	Return on Investment
SALM	Sustainable Agriculture and Land Management
SCC-ViA	Swedish Cooperative Centre - Vi Agroforestry Programme
SROI	Social Return on Investment
UNFCCC	United Nations Framework Convention on Climate Change

Introduction

There is consensus within the scientific community that even if we stop all greenhouse gas (GHG) emissions today, average global temperatures would continue to rise for some time due to lags in the Earth's natural processes. A warmer world will experience more intense rainfalls, droughts, floods and other extreme events. Developing countries will be the hardest hit by the negative effects of climate change due to their geographic location, their reliance on resources sensitive to climate change—such as agriculture and fishing—and their relatively low adaptive capacity.

Households, communities and planners will need to enact adaptive initiatives in order to cope with these expected and unexpected climate change effects. Doing so will bear a cost. Already inundated with significant development deficits, developing countries often lack the ability to meet the additional costs of adapting to climate change (Stern et al. 2006). Understanding the extent of additional investment required for new projects and reorganization of existing initiatives—and determining where those funds would be best allocated—is thus an important undertaking for effective economic, social and environmental impact planning. The current efforts to identify the costs and benefits of climate change adaptation use top-down, econometric-based methodologies (Sova 2011). Several estimates of adaptation costs from various sources such as Oxfam, The World Bank, Stern (2006) and the United Nations Development Programme (UNDP) have emerged in quick succession, post Kyoto, ranging from US$4 billion a year to well over US$100 billion (Parry et al. 2009).

These global and national estimates, although useful in mobilizing high-level funding, have been criticized as biased, preliminary, incomplete and subject to a number of caveats. Studies on the costs of single adaptation options, while few in number, indicate that top-down models grossly underestimate the cost of adaptation (Parry et al. 2009). Used alone, they carry a risk of mismatching the availability of funds with what is actually required on the ground.

The economics of adaptation affects all levels, from the global to the local. Global and national policies require credible evidence from the local level, taking into account microeconomic dynamics and community-appropriate adaptation strategies. Despite this, there are significant gaps in adaptation costing literature at the sub-national level. Studies that identify how communities can most appropriately adapt given their available resources—accompanied by rigorous assessment of the costs and benefits—are needed not only to improve adaptation planning (the how) but also to inform or validate top-down assessments of the total costs of adaptation (the how much).

Practical, high-resolution studies of this sort have begun to emerge in recent years, most notably the National Adaptation Programmes of Action (NAPAs) and their counterpart, Local Adaptation Plans of Action (LAPAs). These studies/decision-making tools are relatively few in number, particularly so in the agricultural sector. This gap, combined with inherent complexities in scaling up and out site-specific findings, and agriculture's lack of bargaining power as compared to other competing sectors such as energy and transport have slowed the mainstreaming of practical adaptation strategies.

It is at this stage in the growing body of planning and costing literature that this paper presents a framework for local-level adaptation cost analysis: Participatory Social Return on Investment (PSROI). It reflects the need for a more integrated and inclusive approach to adaptation planning and costing that captures the complexity of local-level dynamics while still maintaining the transferable/replicable qualities that inform regional and national adaptation plans.

Justification

The emergence of practical, high-resolution adaptation studies in agriculture have come at an important time in global climate change negotiations and in global development in general. In the lead up to the 17th Conference of the Parties (COP17) to the United Nations Framework Convention on Climate Change (UNFCCC), in Durban, South Africa, the important role of Climate-Smart Agriculture (CSA) in both mitigating and adapting to the effects of climate change was emphasized via a strong, unified message originating from farmers and agricultural development organizations worldwide. The result saw incremental progress in situating agriculture on the international climate change agenda. This outcome is shaped in part by an increasingly acute awareness of growing food demand driven by population growth and changes in consumption patterns. Whatever the cause, funds for climate change adaptation in agriculture are increasingly available, with pledges continuing to grow.

Addressing the disconnect between high-level (international/national) financial resources and local priorities is thus vital to improving the delivery of climate funds to those most vulnerable. The underlying challenges, though, are not purely the lack of communication between levels of decision makers and stakeholders (questions of scope). The national-local interface is further complicated by difficulties in distinguishing between sectors such as adaptation and development, which are especially interlinked at the household level but are more polarized at the international/national level. Consequently, the international community finds itself at a critical juncture in shaping the role of climate funds and their relationship with existing development initiatives. “Far less attention [as compared to development funds] has been paid to the delivery mechanisms required at country level for climate actions to be effective, efficient and equitable. Nor is there clarity on what kind of investments will be made with climate finance” (Bird and Glennie 2011). Moreover, determining what is required on the ground is no simple task. Because adaptive capacities are different for nearly every community, so too are the most appropriate adaptation and financing strategies. These subtleties and cross-sector considerations are not captured in top-down planning and costing models alone, whose estimates reflect a one-size-fits-all approach to adaptation.

The PSROI framework presents an opportunity to contribute to the discussion on the best ways for bottom-up and top-down initiatives to meet. Global planning and costing estimates can then be looked at alongside local estimates to form targeted decisions. Cross-sectoral actions can be explored, especially between development and adaptation. These will improve the effectiveness, efficiency and equitability of adaptation plans and finance.

Situating PSROI in adaptation literature

Analyses of climate change adaptation have been undertaken for a variety of purposes. Broadly speaking, adaptation studies to date have focused on:

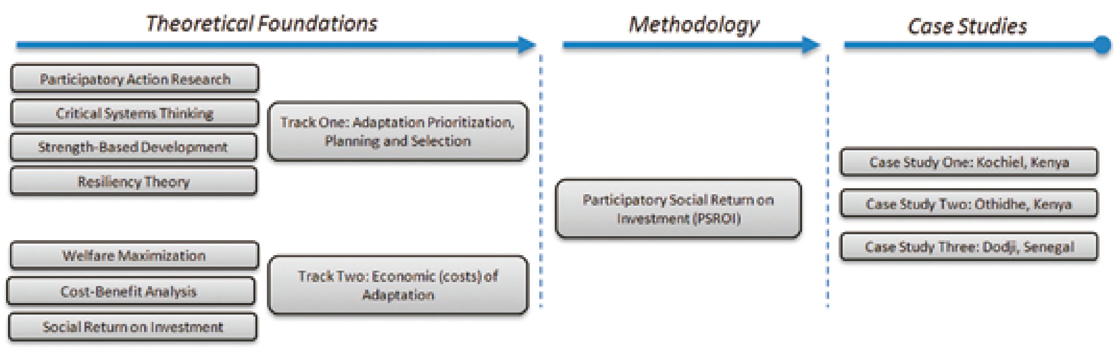
a. estimating the degree of modeled impacts with and without adaptation (equilibrium or statistical models);
b. selecting a suite of potential adaptation options through the application of common principles or criteria (cost-benefit, cost-effectiveness and so on);
c. determining adaptive capacity or vulnerability for the purpose of comparative analysis; and
d. the planning and implementation of practical adaptation initiatives (Smit and Wandel 2006).

The PSROI framework represents the convergence of multiple categorizations, particularly 'b' (prioritization) and 'd' (practical implementation) from the summary above. Consequently, PSROI draws its theoretical and methodological principles from two parallel and highly complementary tracks that reflect the evolution of adaptation analysis and its antecedents.

Track One: Adaptation prioritization, planning and selection
Track Two: Economics of adaptation

The remainder of this working paper will outline the theoretical foundations of both tracks, introduce the PSROI methodology resulting from the convergence of the tracks, and provide the results of three case studies where the framework was applied (see Figure 1).

Figure 1. PSR01 working paper structure



Source: Authors

Theoretical foundations

Track One: Adaptation prioritization, planning and selection

Situating the PSROI framework within the existing development and economics literature requires, firstly, defining climate change adaptation. Intuitively, adaptation refers to all actions that can be taken to offset or reduce the impacts of climate change. The Intergovernmental Panel on Climate Change (IPCC) defines adaptation to climate change as an "adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities" (IPCC 2007). Adaptation can be assessed related to whether it was planned or not (autonomous) or whether it happened before a change (anticipatory) to the system or after (reactionary).

Within the PSROI framework, adaptive interventions are seen as those that build resilience, that is, move systems towards a desired state (referred to as 'adaptation towards resilience' throughout this document). It is worth highlighting the complexity of the evolving concepts of adaptation and resilience. As research in these areas has grown, many interpretations of what can be considered adaptation and resilience to climate change have been developed, creating difficulty globally in reaching consensus on the specific scope of adaptation and measures of resilience.

Resilience in this paper utilizes aspects from multiple definitions dominant in the literature. Walker et al.'s definition of resilience as "the capacity of a system to experience shocks while retaining essentially the same function, structure, feedbacks, and therefore identity" (Walker et al. 2006) includes the major components of resilience as it is used in this paper. This definition, by discussing components of identity, allows for those using the term resilience to decide on the key characteristics of identity and allows for identity to be fluid over time. Resilience can be thought of as maintaining or moving towards desired system characteristics, even if there are changes in the behaviour of parts of the environment (Anderies et al. 2004). Systems can shift, as long as these shifts are seen as beneficial and desired. To achieve these states, resilient systems can also be seen as those with the "ability to adapt within the resources of the system itself, and the ability to learn, innovate, and change." (Adger et al. 2011).

Resilience can only be meaningfully assessed when there is a clearly defined scale or system in question (resilience of what), reference to a change in the system at a specific time (resilience to what), an explicit understanding of future desired states and how these states were determined (from whose perspective), and a selected time frame for change to be measured over (Helfgott

2011; Smit et al. 2000; Brand and Jax 2007). Where system boundaries are drawn, the factors included in the analysis, the features of the system allowed to change, what must be preserved and to what degree, and what is perceived to constitute improvement within those boundaries completely determine what is interpreted as adaptation, resilience, vulnerability or collapse and so forth. The interpretation of resilience and adaptation, or vulnerability and collapse, is thus highly dependent on perspective and values for any particular system. Systems can be resilient or adaptable to one type of disturbance but vulnerable to another. Planned adaptation to one type of disturbance can even lead to increased vulnerability to other types of disturbance. Addressing adaptation and resilience requires the identification of what is harmful and beneficial, which requires incorporation of perceptions, boundary judgements, and values.

Employing a participatory approach to adaptation planning and policy addresses many of these challenges and provides additional strengths. Resilience being defined as desired future states relies on norms and values, and therefore it is crucial to define resilience with stakeholders when planning and costing adaptation interventions (Helfgott 2011). Adaptation policy creates outcomes at the small-scale, local level. Therefore, discussing adaptation and visions of resilience with affected communities is especially important. Policies situated within local institutions, norms and values that allow for local realities to be incorporated are also more likely to reach intended results (Mosse 2004). The PSROI approach uses methodologies, such as Participatory Action Research, to incorporate stakeholder perspectives and address power dynamics while researching adaptation and actively planning interventions.

Systems thinking

Climate change adaptation interventions do not occur in isolation, rather they are integrated into complex systems with physical, social, economic, political and ecological components across all scales. Planning for adaptation requires recognition of the complex iterative links that exist between adaptation processes within and between levels. There are multiple stressors within systems that result in multiple consequences (O'Brien et al. 2004). Since we can only ever have a partial view of the relevant problem context, there will always be some unanticipated consequences of any intervention, but incorporating analyses of these links will assist in achieving intended outcomes of adaptation interventions.

Due to the interdependence and interconnectedness of social, economic, political, physical and environmental issues at all scales, adaptation planners face the challenge of not being able to include everything in their assessments despite the potential for every intervention to have an ever expanding reach across scales and levels. Adaptation planners are then forced to make system boundary judgements, as we have limits to our ability to understand and to work across the vast interconnectedness and complexity of systems (Churchman 1968; Ulrich 1987; Midgley 2000). This is difficult and often highly contentious. They must also recognize that these system boundary judgements are normative and that there is not objective representation of the structure of reality, and that these boundaries are affected by disciplinary backgrounds, social and cultural values, purpose of the analysis, and a multitude of intangible factors. Essentially, what belongs to the "system" is dependent on and relative to the inquirers' choice of a conceptual boundary (Ulrich 1987). This is crucial since—as highlighted in the previous section—the way that boundaries are drawn around scope, scale and time frame, which disturbances are considered and what the notions of desirability or improvement are for whom and by whom, often completely determine the conclusions and recommendations for action. The framing of a system determines problem definition, possible solutions and measures of success, that is, what is considered resilience versus degradation or collapse.

Accepting that boundary judgments are inevitable, normative, and affect our conclusions and recommendations for action about adaptation implies that we should progress with humility and reflexivity, and involve those whose lives might be affected in whatever intervention we might propose. This further necessitates the use of participatory methods for adaptation planning and decision-making. Accordingly, our approaches must be reflectively assessed and improved through an iterative process of feedback loops. This understanding forms the basis of participatory action research and of our research approach.

Critical Systems Heuristics (CSH), a systemic methodology for addressing the issues flagged above, seeks to explicitly identify boundary judgements of different actors in a way that can be incorporated into practical application. Ulrich (1987) developed a series of questions that address both the situation as it is and how it ought to be from the perspective of planners and those affected, focusing on differences in boundary judgements around motivation, control, knowledge and expertise, and legitimacy. These core areas of questioning are incorporated into the workshop methods (see Methodology Step One) and follow-up interviews. They build in reflexivity by practitioners and a dialogical process among the diverse stakeholders regarding values and norms as they relate to the question of local adaptation to climate change.

The PSROI approach employs theoretical and methodological pluralism, recognizing that different theories assume different boundaries of analysis and that different methodologies and methods make different theoretical assumptions. Drawing on multiple methods for different purposes and applying multiple lenses to situations can then allow for analysis across disciplines and sectors.

Strength-based development

Over the course of several decades the development sector has been undergoing a paradigm shift from problem-based approaches: focusing on what is lacking in societies and the provision of external resources, expertise and solutions; to strength-based approaches: focusing on the strengths in societies and building on the capacities that exist, empowering people for their own development from the inside out (Helfgott 2008). The foundational principle of strength-based approaches is that, although there are both capacities and deficiencies in every community, a capacity-focused approach is more likely to empower people and mobilize citizens to create positive, meaningful and sustainable change from within (Foster and Mathie 2001).

In the PSROI workshop, the question of what makes success is addressed with respect to the societies own value systems. The community looks to the past for where they did well before, articulating a history of success and description of what it is. Then the community looks to the future for where they want to get to. The community is engaged in deep processes that honour each participant's capacity for creative self-determination to develop plans and action to get from where they are to where they want to go. Each society has a unique set of skills and capacities to channel for development. The role of external intervention is to support local actors in being drivers of change in a given community, through an iterative process of articulating visions, goals and community capacity as they evolve. The strength-based approach of the workshop is designed in part to address the 'paradox of choice' (Schwartz 2004) around adaptation options by encouraging the community to prioritize those adaptation interventions most achievable given their assets and resources.[1]

Two methodologies for strength-based development are drawn upon in the PSROI research methodology: Asset-Based Community Development (ABCD) and Appreciative Inquiry (AI). ABCD maps completely the capacity and assets of individuals, local associations and institutions. Assets that can be included in an assets map are, for example, social, human, natural, built or financial capital (according to the Sustainable Livelihoods Framework) (Twigg 2001). Part of ABCD is to ensure that as broadly representative group as possible is convened for the purpose of building a community vision and plan as well as leveraging activities, investments and resources from outside the community to support asset-based, locally defined development. AI is a flexible approach based on the theory that positive change comes from appreciating what exists and focusing on the successes of the past. It focuses on asking questions that "strengthen a system's capacity to apprehend, anticipate and heighten positive

[1] The paradox of choice is a concept popularized in Barry Schwartz's 2004 book, "The Paradox of Choice: Why More is Less", based on an earlier notion of 'analysis paralysis'. Both concepts suggest that when decisions are treated as overcomplicated, they often result in the decision never being made.

potential” (Cooperrider and Whitney 1999). While looking to the past to determine future adaptability to climate change has been criticized, it is a crucial way for a community to identify its own strengths while moving forward to address future challenges, even if that means identifying how they have responded to specific or unknown elements in the past.

These approaches fit seamlessly with the insights from resilience, adaptation and systems thinking. Involving as diverse an array of stakeholders as possible in the process of defining the purpose, scope, time frame, measures of success, and so forth of any proposed intervention is crucial to adapt to climate change and minimize unanticipated negative side effects. Local ownership is crucial for success and sustainability, so that the society does not lose faith in themselves or the intervention or not know what to do as circumstances change. It is important to note that the specific application of methods within the specific theoretical and methodological frameworks will be unique to each study, as the workshop and interviews must be co-designed as appropriate with the communities and local partners.

Track Two: Economics of adaptation

The theoretical foundations of *Track Two: Economics of Adaptation* must also be consistent with the definition of ‘adaptation towards resilience’. This suggests that the framework’s underlying economic principles will be aligned with a stakeholder-driven assessment of what constitutes the desired state. In this section, the origins of PSROI costing principle and methodology are introduced, with particular emphasis on *Track Two’s* antecedent framework, Social Return on Investment (SROI).

Costing principle

A prevalent challenge of scale in the economic analysis of climate change adaptation is highlighted in this paper’s introduction. That is, at the macroscale concepts like climate change adaptation, food security, water security, health and other key drivers of development are addressed in isolation from one another in both rhetoric and policy. Chambwera and Stage (2010), however, remind us that households consider the need to adapt to climate change in their overall strategies and not in isolation. As the goal of households is to maximize welfare, climate change is just one factor affecting their consumption and saving decisions. Stern et al. (2006) express the economic dimensions of climate change in welfare terms as well, that is, moving from the existing state to an altered state, with climate change presenting a loss of welfare that is attenuated by adaptation. Finally, Ingham et al. (2006) represent the choices about how much to adapt and mitigate, given the costs and benefits of each strategy, from an economic perspective of maximizing welfare. These approaches collectively raise the question of 'what is the cost of adaptation to maximize welfare?'

Given its inherent compatibility with stakeholder-defined desired states, this framework takes forward the definition of the adaptation costing principle as a welfare maximization strategy for the reduction of residual damage. To the extent that residual damage is compensated for by adaptation, original welfare is restored.

PSROI Adaptation Costing Principle:
Marginal Benefit > Marginal Cost (MB>MC)

The welfare maximization approach of MB>MC is the core principle of the costing framework and will assume that households will only invest in adaptation strategies to the point where net benefits are positive. Which strategies are ultimately chosen will be shaped by each individual's perception of their own desired welfare state, or the collective welfare state of their community.

Costing methodology

Economic analysis for the purpose of decision-making in natural resource management (NRM) and related fields has historically drawn on a fixed toolbox of valuation techniques. These include cost-benefit analysis, cost-effectiveness, cost-utility, social accounting, sustainability reporting, and several variations of these foundational techniques. Having established a costing principle founded in welfare maximization and dependent on an assessment of net costs and benefits, cost-benefit analysis is considered as an appropriate framework on which to establish the PSROI costing methodology (Agrawala and Fankhauser 2008; Metroeconomica 2004; Lecocq and Shalizi 2007). The underlying assumption is that households will continue to maximize their welfare irrespective of the planned adaptation strategies. Climate change and planned adaptation may affect their behaviour, but it would not impact their objective of welfare maximization, only the extent of the households' success in reaching their objectives.

While cost-benefit analysis is seen as a valuable decision-making tool in a variety of contexts, there are valid concerns—particularly concerning its opacity, reinforcement of existing inequalities and translation of 'immeasurable impacts' into monetary values—that must be addressed. One prevailing contradiction relevant to climate change adaptation in agriculture is that while cost-benefit is strongly rooted in welfare theory (Tol 2006), it largely ignores *who* bears the costs and experiences the benefits or non-benefits of the intervention being analysed. 'McKinsey-style' graphs that show the cost per unit of benefit of potential adaptation strategies have recently been produced by several organizations. The results recommend the widespread implementation of high-return interventions, sometimes showing negative costs per unit of benefit. These numbers can be deceiving, however, in that the costs and benefit figures are aggregated across a wide range of stakeholders with inevitable winners and losers between the stakeholders. Opponents of cost-benefit analysis rightly note that vulnerable groups are more frequently on the losing end of this spectrum, reinforcing existing patterns of economic and social inequality (Ackerman and Heinzerling 2002). The methodological implications of these shortcomings suggest that *who* wins and *who* loses is ultimately as important as the net impact produced. Transparency in economic analysis is in part addressed by ensuring the most vulnerable stakeholders are identified to participate in the Track One workshop (see PSROI Methodology), but also by selecting the most appropriate valuation tool.

Valuation tools

While prequalifying cost-benefit analysis as an appropriate overarching methodology, this paper maintains a healthy scepticism of cost-benefit's perceived status as a decision-making panacea. Consequently, we turn now to examine the relatively nascent Social Return on Investment (SROI) methodology. The immediate appeal of SROI is its ability to mitigate the prevailing limitations of cost-benefit analysis while still producing rigorous, quantitative outputs for enabling decision-making. Additionally SROI's stakeholder-centered approach is in line with the welfare maximization and adaptation towards resilience principles outlined in the theoretical foundations of this paper.

This section introduces the SROI framework and outlines the necessary modifications of SROI when applied in the context of agricultural climate change adaptation. The following chapter then introduces the PSROI framework that is built on the modified SROI methodology.

Social return on investment

Developed in 2000 by The Roberts Enterprise Development Fund (REDF) in the US (Zappalà and Lyons 2009), the SROI methodology has evolved over the last decade through several iterations. This analysis uses the latest version of the framework 'A Guide to Social Return on Investment' (Nicholls et al. 2009) that is being promoted by the Office of the Third Sector (OTS) in the UK. A term originating from Return on Investment (ROI) used by traditional investors for valuing purely financial returns, SROI is a framework for measuring and accounting for a broader concept of value by incorporating social, environmental and economic costs and benefits (Nicholls et al. 2009). Like ROI, it gauges the magnitude or quantity of value created compared to the initial investment; for example, an investment of US$100 may have returned US$10 value in one year or 10% (S)ROI.

SROI is not a new valuation framework but has its roots deeply embedded in the traditional cost-benefit analysis (Arvidson et al. 2011). Similar to cost-benefit analysis, in SROI analyses, costs and benefits are quantified and compared. In practice, since costs are often upfront and benefits achieved over time, it is necessary to discount the value of future benefits and costs using an appropriate discount rate to arrive at the net present value (NPV). What distinguishes SROI from CBA is its holistic approach of capturing impact. In contrast to the traditional CBA, SROI measures change in ways that are relevant to the people or organizations that experience or contribute to it. This enables a benefit-cost ratio to be calculated based on success indicators chosen by the stakeholders themselves. This can help to assuage concerns over misleading or over claimed returns that can occur when cost analyses are conducted in isolation from stakeholders as it limits assumptions made remotely in regards to costs and benefits.

SROI is about value, rather than money alone. The SROI process involves reviewing the inputs, outputs, outcomes and impacts made and experienced by stakeholders. Using a visual 'Impact Map', SROI tells the story of how change is being created by measuring and putting a monetary value on social, environmental and economic outcomes. While traded goods are valued using the prevailing market price, estimating the positive (or negative) social value of non-traded, non-market goods that are common in the environment is a more reflective process. SROI thus requires the use of financial proxies to achieve these quantifications.

SROI also gives values to outcomes that are more difficult to value and for which proxies are not easily identified. These outcomes are routinely left out of traditional economic appraisals, but can theoretically be incorporated by using contingent valuation methods such as *willingness to pay* and *willingness to accept* compensation and revealed preference such as *hedonic pricing* (Mitchell and Carson 1993; Layard and Glaister 1994; Malpezzi 2003).

The SROI is a six-step analysis process (See Box 1), based on the following seven principles:

1. Involve stakeholders
2. Understand what changes
3. Value the things that matter
4. Only include what is material
5. Do not over-claim
6. Be transparent
7. Verify the results

Box 1 SROI Six-step process

SROI Six-step process
Step one: Establish scope and identify key stakeholders. This step relates to establishing clear boundaries about what the SROI analysis will cover, the people that will be involved in the process and the nature of their involvement.
Step two: Map outcomes. Develop an Impact Map or theory of change that demonstrates the links between inputs, outputs and outcomes.
Step three: Evidence the outcomes and value them. This stage relates to finding data that will show whether outcomes have occurred and then giving them a monetary value.
Step four: Establish impact. Having collected evidence on outcomes and given them a monetary value, this step involves discounting the impact by those aspects of change that would have occurred in any case or resulted from exogenous factors.
Step five: Calculate the SROI. This step involves adding up all the benefits, substracting any negatives, and comparing the result to the investment made. Test the sensitivity of the ratio.
Step six: Report, use and embed. Sharing the findings with stakeholders, responding to any questions they may have, embedding good outcomes, processes, and verifying the SROI report.

Source: Adapted from: Cabinet Office, Office of the Third Sector, A Guide to Social Return on Investment (Nicholls et al. 2009)

Forecast and evaluation

The guide to SROI (Nicholls et al. 2009) identifies two types of SROI:

> *Evaluative:* SROI analysis conducted retrospectively and based on actual outcomes that have already taken place.
>
> *Forecast*: SROI analysis which predicts how much social value will be created if the activities meet their intended outcome.

Since the need for adaptation cost analysis has evolved out of the paradox of choice that defines climate change adaptation, the analyses are necessarily forward-looking, and driven by the need for decision-making and prioritizing tools. Consequently, this paper focuses on forecasting

SROI analyses, while bearing in mind that forecasting and evaluation are mutual components of a broader framework, and not inherently separable. All reference to SROI (and later PSROI) implies forecasting, unless otherwise specified.

Comparative decision-making

One way that SROI differs from other costing frameworks is the order in which the cost analysis is conducted in relation to the intervention selection. Traditional cost-benefit analysis is applied, for example, by first determining the costs per unit of benefit of competing initiatives, and using the resulting scores as a rationale for an ultimate selection. While it can be a valuable tool for broad prioritization in many settings, cost-benefit analysis in the agricultural climate change adaptation context is less useful given the sheer number of adaptation options and unique characteristics of each community. As categorized by the UNFCCC adaptation fact sheet (2010), climate change adaptation can include behavioural changes, adaptive management strategies, technological and engineering options, risk management or risk-reduction strategies, financial instruments and ecosystem management. In a world with finite implementation budgets and competing investment opportunities, there is a natural tendency to rank and invest in projects offering the highest returns, but costing all of the alternatives is simply not feasible.

This limitation is not directly addressed in SROI's design. The purpose of the SROI framework is not to value the complete spectrum of intervention options for cost-benefit comparison. *Rather, it seeks only to provide a structure for community participation in the valuation process.* In fact, the participatory nature of SROI analyses creates a unique composition of stakeholder groups for each application of the framework and consequently, the SROI guide discourages the use of the SROI ratio as an investment rating or selection criteria (Nicholls et al. 2009). Nevertheless, an analysis of the different judgements and decisions made in completing an individual SROI analysis and the proposed changes gives invaluable insights into the value creation process. Similarly, comparing the changes in a project's ratios over time informs the funders about the progress of the project and its impacts, both positive and negative.

It is this inherent inability to compare competing adaptation strategies where this framework necessarily diverges from SROI. While traditional SROI analysis begins with a predefined intervention, this framework requires a prioritization process in accordance to the principles defined in *Track One:* Prioritization, planning and selection. It is here at the confluence of the contextual limitations of SROI, *Track One* and *Track Two* foundations that we introduce the Participatory Social Return on Investment (PSROI) methodological framework.

PSROI methodology

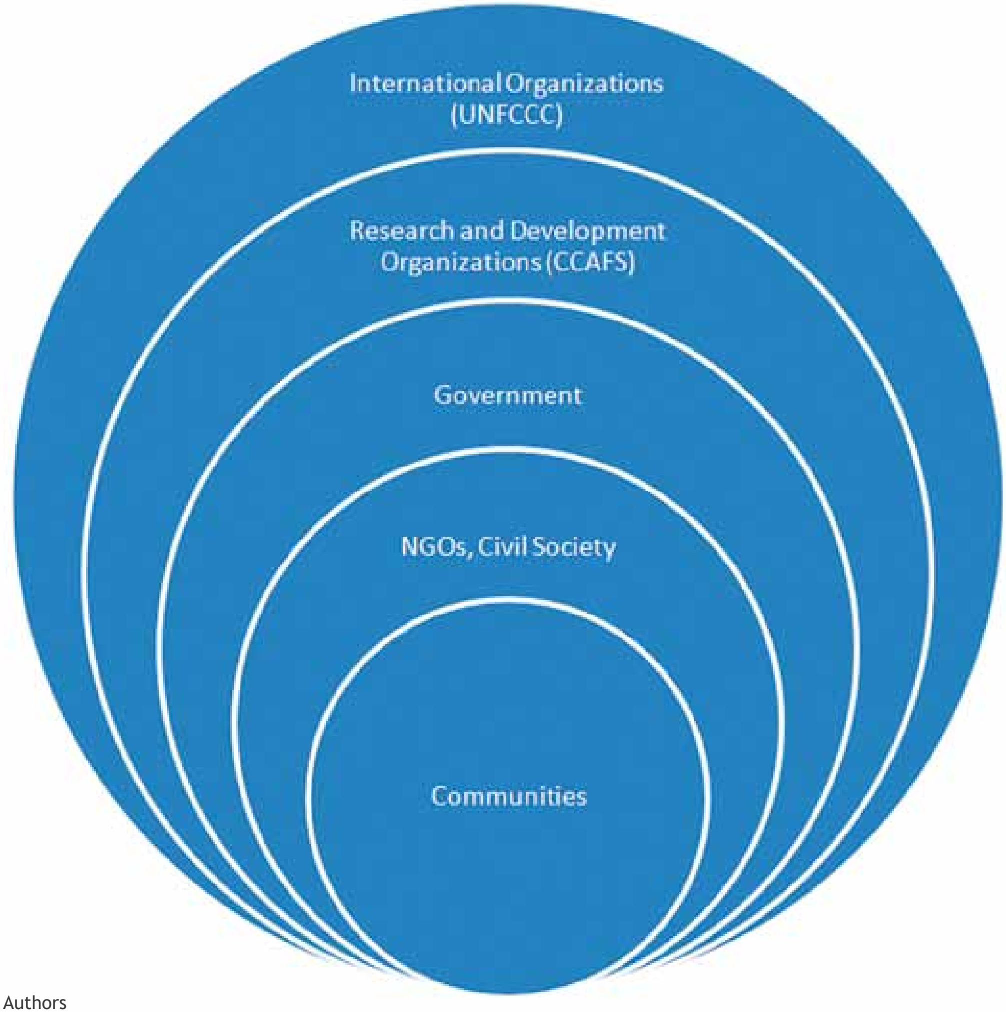
The PSROI methodology is derived from the integration of the theoretical foundations discussed in *Track One* and *Track Two* above. That is, an understanding of adaptation in the context of resilience, systems thinking and strength-based development theory at work in *Track One,* combined with principles of welfare maximization, cost-benefit analysis, and Social Return on Investment of *Track Two*. In this context, we present the PSROI framework—a term coined by Oxford researcher Abrar Chaudhury (2011)—bringing together both theoretical tracks and linking adaptation prioritization and planning with economic analysis. This section will broadly outline the PSROI methodology, the details of which can be found in the forthcoming PSROI toolkit. This will be followed by the description of three case studies through which the framework was developed and refined.

PSROI actors and stakeholders

Before discussing the methodology in detail, it is important to define the stakeholders relevant to the PSROI framework. The authors of the SROI Guide (Nicholls et al. 2009) define *stakeholders* as the people, organizations or entities that experience change, whether positive or negative, as a result of the activity that is being analysed. As with any definition, this view implies a certain boundary judgement. In the case of SROI in its traditional context, this boundary is driven in part by the use of the Impact Map, which includes as stakeholders only the actors for which impact data (economic, social and environmental) are collected and displayed.

In the PSROI context, however, the stakeholder boundary is drawn wider due to the framework's potential place within a broad scale of institutions operating in agricultural adaptation to climate change. Actors interested in the prioritization and economic analysis of adaptation strategies can range from the communities implementing the measures to international bodies, with a host of research, planning and funding organizations in between. Consequently, the PSROI framework refers to 'stakeholder' as any actor involved in the framework implementation (practitioners), incorporated in the impact map of prioritized adaptation strategies (SROI stakeholders) or any actor/organization interested in the outcomes of the framework. Figure 2 illustrates the complete scale of PSROI actors and stakeholders.

Figure 2. PSROI actors and stakeholder scales



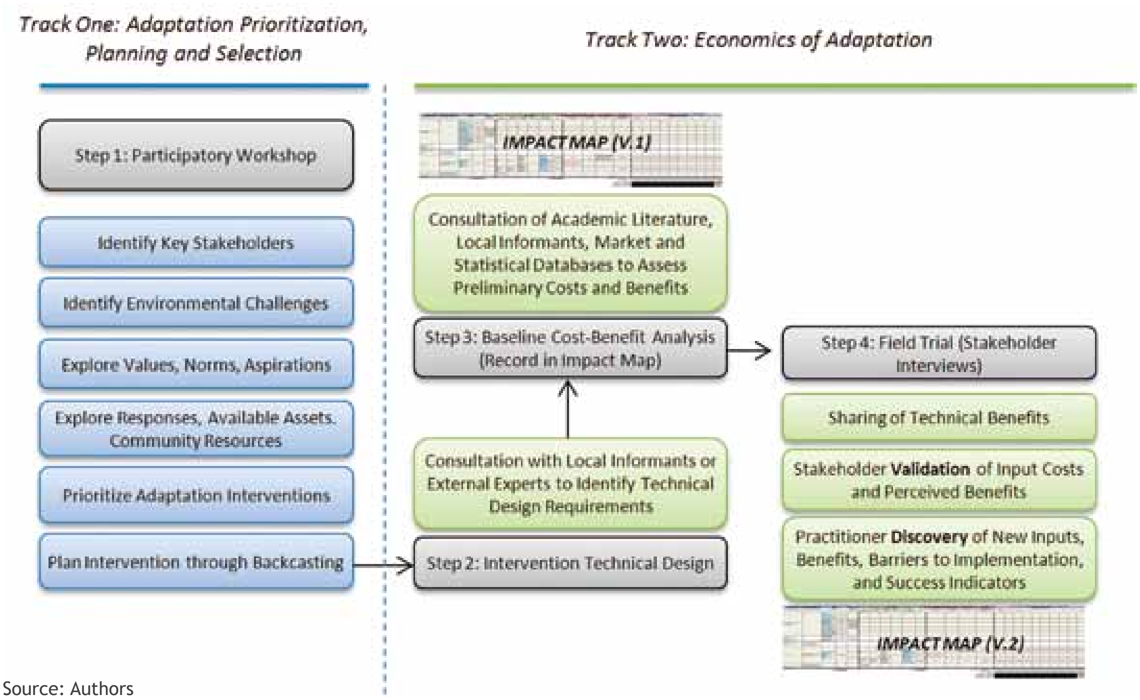
Source: Authors

The scale for the on-ground 'application' of the framework is found at the community level. This is where the PSROI framework is applied, reflecting the theoretical foundations of community-based adaptation (*Track One*) and household welfare maximization (*Track Two*). Practitioners are seen as actors that implement the PSROI methodology either for one-off analyses or in a series of studies to draw aggregated findings. Practitioners can range from organized community groups to research and development organizations, NGOs, or government bodies—any institution with community connectivity and sufficient technical capacity to carry out the analysis. Finally, 'interested groups' includes all actors interested in or influenced by the results of the analysis. This will necessarily include the participating community and can extend to international bodies involved in adaptation planning and/or funding. Scaling issues related to stakeholders will be explored further in the discussion following the Case Study findings.

Methodology

The PSROI methodology, as undertaken by the practitioners, is visually outlined in Figure 3. The figure presents the four-step process as it occurs sequentially and identifies the tracks under which each activity occurs. It also includes the points at which Impact Maps are used to store and present cost-benefit data (See Box 3. SROI / PSROI Impact Map).

Figure 3. PSROI methodological framework



Source: Authors

It should be noted that many of the methodological principles outlined below are applicable to a wide range of planning and prioritization initiatives, not solely those related to climate change adaptation. While the PSROI framework in this paper has been situated within theoretical foundations specific to adaptation, the authors maintain that many emerging concepts—particularly related to the incentives, adoption and values/norms—that shape decision-making in adaptation are highly relevant to other development themes, particularly that of climate change mitigation. For example, the PSROI framework can be useful in promoting climate-smart agriculture (CSA) initiatives of many sorts, as evidenced from the Case Study One results (analysis of an agroforestry intervention) in the next section.

Step 1 – Participatory workshop

PSROI analysis starts with a three-day participatory workshop aimed at incorporating community values and priorities in the selection of adaptation interventions. The activities focus on identifying community visions of resilience, discussing specific environmental challenges, identifying historical responses and coping strategies to environmental change, and prioritizing and planning an appropriate adaptation intervention or theme.

A stakeholder analysis forms an important first activity within Step 1. Transect walks are conducted and key informants (or 'gatekeepers') are identified to ensure that members of socially differentiated groups within the community—including marginalized groups—are identified to participate in the workshop. Particular emphasis is placed on achieving equal gender representation, but considerations of age, economic status, education, geographic distribution within the community, profession and other locally relevant categorizations also play a role in determining the workshop composition. Approximately 40 community members are selected for participation in the workshop, but the facilitation and specific methods could be adjusted as needed.

An example activity schedule and timetable for the planning and prioritization workshop is annexed in this paper (see Annex 2). Scoping activities include the listing of key community values ('what's important to you?' exercise), environmental challenges and responses mapping and a livelihood assessment. Physical outputs include a collage of aspirations, institutional map, map of current/future village and the backcasting results. The actual workshop timing and composition will be designed together with local partners drawing on the specific theoretical foundations found in *Track One.* The workshop can, nevertheless, be generally divided according to the broad themes organized by day.

- **Day 1**: Understanding local values and norms, identifying key environmental challenges and historical responses;
- **Day 2**: Exploring visions of the future and identifying currently available assets and resources;
- **Day 3**: Voting on high-potential adaptation strategies and planning backwards (Backcasting – see Box 2. Workshop highlight on backcasting) from the community's prioritized aspects of the future vision back to the resources that they have today.

The workshop is conducted in a combination of large group activities and break-out groups depending on the activity. Break-out groups are often mixed, but can also be selected according to gender and social differentiations if necessary.

Box 2. Workshop highlight on backcasting

Workshop highlight on backcasting

Workshop Day 3: Having generated a shared vision of the future and mapped the current status quo, backcasting is a process of systematically stepping backwards from the future until we reach the present. This is a normative planning technique. It is usually implemented using a long sheet of paper and many post-it notes. The representations of the desired characteristics of the future are placed at the right end of the sheet, and the representations of the current state placed on the left. Certain key features of the present and future are listed on post-it notes. We move successively from the right to the left continuously asking the question: "what would we need to do to achieve this?" The backcasting exercise forms the foundation of the PSROI economic analysis of key adaptation strategies (Steps 2, 3 and 4) as it identifies barriers to intervention implementation, incentives for participation, and reveals agreed market values for key adaptation inputs and benefits.

Source: Authors

Step 2 – Intervention technical design

The participatory workshop produces either a specific intervention designed by the community through the backcasting exercise or an adaptation theme for which the community has defined the broad desirable characteristics. In both cases, technical design characteristics must then be specified through consultation with local partners or expert consultants to facilitate *Step 3*: Baseline Cost-Benefit Analysis (for example, the spacing of trees in agroforestry systems). This second stage is based on both design and technical theory, particularly that of Khwaja (2004) suggesting that a good design is one that incorporates a balance of what is financially feasible, sustainable and desired by users (Brown 2009). It is in this technical design phase that predicted climatic impacts can also be considered for their impact on the intervention design. *Steps 1* and *2* collectively help to provide ownership over the prioritized adaptation intervention, improving implementation rates and ensuring a more accurate assessment of return on investment, calculated in *Steps 3* and *4*.

Step 3 – Baseline cost-benefit analysis

Following the completion of the technical design phase, a baseline (market potential) cost-benefit valuation is undertaken using secondary data from academic literature, industry standards and key informants. The technical and monetary data produced in this step are referred to as the 'known benefits' (see Box 4 below). The intention is to document the magnitude of the technical impacts of the intervention, particularly in cases where the community does not have prior experience in its implementation. This may include the use of benefit-transfer techniques, where the documented results of similar interventions carried out in different communities are extrapolated to the study community (for example, yield increases from a new crop variety). This phase also serves to assign market-based assumptions to the intervention, which will be tested during stakeholder interviews in *Step 4*. Where stakeholder and market perceptions diverge, key insights into success measures and community value assumptions are revealed. The results of the baseline CBA analysis are stored in an Impact Map which has been adapted from the model used in the traditional SROI framework (see Box 3).

Box 3. SROI / PSROI Impact Map

SROI / PSROI Impact Map

The Impact Map is SROI's primary tool for recording and presenting the costs and benefits of adaptation interventions. The map, operated in Microsoft Excel, consists of four main sections running horizontally across columns (Inputs, Outcomes, Adjusting Impact and Discounting) and vertically down rows for each stakeholder group included in the analysis (farmers, NGOs, input providers and so on).

The Impact Map is used in two instances in the PSROI *Track Two*: Economics of Adaptation; first to record technical and market data for *Step 3*: Baseline Cost-Benefit Analysis and again to realign the baseline costing with community perspectives following *Step 4*: Field Trial. The last two sections of the map, Adjusting Impact and Discounting, are dependent upon primary and secondary source data originating from the Inputs and Outcomes sections.

Here we list several terms—adapted from Nicholls et al. (2009)—useful in reading an SROI Impact Map:

Attribution: An assessment of how much of the outcome was caused by the contribution of other organizations or people.

Deadweight: A measure of the amount of outcome that would have happened even if the activity had not taken place.

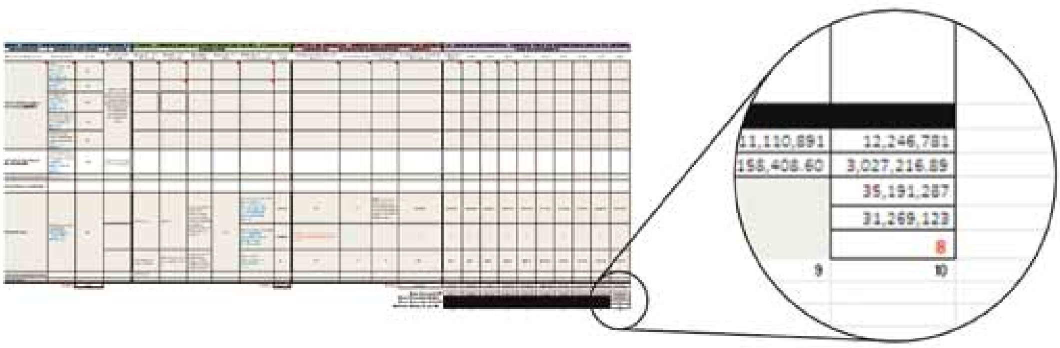
Discount rate: The interest rate used to discount future costs and benefits to a present value. In SROI, the Return on Investment (ROI) figure is produced in terms of its Net Present Value—that is, the cumulative return on investment over the duration of the study period, adjusted from the discounted return value of benefits/non-benefits occurring into the future.

Displacement: An assessment of how much of the outcome has displaced other outcomes. In many cases, the benefits/losses that one stakeholder experiences means losses/benefits for another. If significant displacement occurs in the analysis, another stakeholder experiencing the effects may need to be added.

Drop off: The deterioration of an outcome over time.

Financial proxy: An approximation of value where an exact measure is impossible to obtain. Proxies are typically products or services that have an accepted market value that can be used as a substitute, although imperfect, for a non-monetized indicator. Proxies are often described using terms like ‘cost of’, ‘amount that’ and ‘value of’.

Indicator (of change): A measurable unit of reference to suggest that a change has happened. Measurability means expressing the outcome indicator in terms that are measurable, rather than finding an indicator that is easy to measure. Indicators often use terms like ‘more’, ‘fewer’, ‘less’ or ‘increased’.



Source: Authors

The Impact Map is designed to lead the user towards the ultimate monetization of economic, social and environmental impacts experienced by each stakeholder. The resulting return on investment figure has been highlighted on the above image. The monetization is accomplished by providing a linear, sequential process for identifying outcomes, indicators of change, and proxies for valuing non-market goods and services. It should be noted, however, that not every practitioner will choose to identify proxies and undertake Non-Market Valuation (NMV) techniques. Instead, social and environmental indicators can be included qualitatively in the Impact Map appearing alongside monetized impacts.

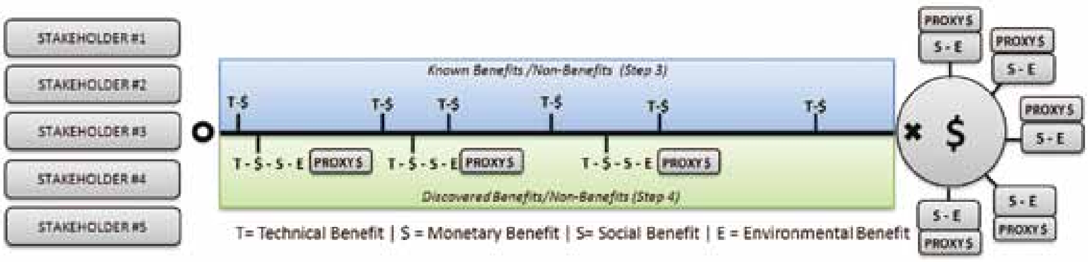
Source: Authors

Step 4 – Field trial

The final stage of the PSROI methodological framework is intended as a process of *validation* and *discovery*. Semi-structured interviews are conducted with a representative sample of the study community, including some workshop participants and others that did not attend. The interviews aim to validate the incorporation of workshop findings, intervention technical analysis and market assumptions included in the baseline costing analysis. Discovery of new benefits, household consumption and behavioural data, and alternate community interpretations of technical or market assumptions also accomplished in the fourth stage (referred to as 'Discovered Benefits/Non-Benefits' in Box 4). The perceptions collected in this stage are compiled in a second Impact Map. This allows for the comparative analysis of market assumptions and community perceptions, and the resulting changes to the ROI score.

Box 4. PSROI impact assessment process

PSROI impact assessment process



This figure presents the PSROI *Step 3* and *Step 4* data collection and impact assessment process. *Step 3* involves the identification of existing secondary data sources (for example, the Known Benefits) that can be used to identify impacts experienced by each stakeholder group. *Step 4* then validates the secondary data and discovers new impacts through a field testing process involving semi-structured interviews with stakeholders (for example the Discovered Benefits). The data collected during *Step 3* will be primarily of Technical (T) and

Monetary ($) nature, revealing the research and market assumptions related to the intervention. *Step 4* primary data will include Social (S) and Environmental (E) benefits/non-benefits, as per the perceptions of the stakeholders themselves in relation to the intervention.

For Social and Environmental benefits/non-benefits especially, financial proxies can be identified to monetize these impacts. Proxies are best developed in participation with the stakeholders themselves and are thus considered in *Step 4* Field Trial.

Finally, while benefits/non-benefits often occur while the intervention is being implemented, others will continue to occur into the future once implementation has been completed (indicated by the 'X' above). Consequently, there may be monetary benefits/non-benefits that continue to accrue, having ongoing social and environmental consequences. Proxies can be used to quantify the magnitude of these consequences.

Source: Authors

We have presented the PSROI framework to this point in the form of its individual components: two tracks and four steps. For practical purposes, however, the framework should be viewed collectively, as the sum of its parts. While the tracks and steps occur in sequential order, they nevertheless inform one another directly or through feedback loops. *Track One* participatory workshop, for example, provides the contextual values, norms and community resources and establishes the relationships that are built upon during *Track Two*. Likewise, *Track Two* validates the community-led planning activities in *Track One*, establishing implementation pathways based on technical and market realities. Together, the tracks create a robust framework for prioritizing, planning and costing adaptation initiatives that cannot be achieved through the application of any one track alone.

Table 1 compares key features of the PSROI methodology as it relates to the foundational SROI framework.

Table 1. Comparing SROI and PSROI features

FEATURE	SR01	PSR01
Scope Setting	Boundary selected by practitioner	Boundary selected through participatory scoping, interviewing key informants, transect walks, and so on.
Adaptation Intervention	Known intervention	Designed and selected through participatory approach by the stakeholders (Track One)
Intervention Design	Pre-designed	Designed or selected from a menu of interventions and/or localized to meet specific objectives
Stakeholders	Active role	Active role
Valuation	Based on Cost-Benefit Analysis - MB>MC	Based on Cost-Benefit Analysis MB>MC
Valuation Testing	Stakeholder consultation and taking assumptions	Stakeholder-driven to improve design features of intervention and implementation plan

Source: Authors

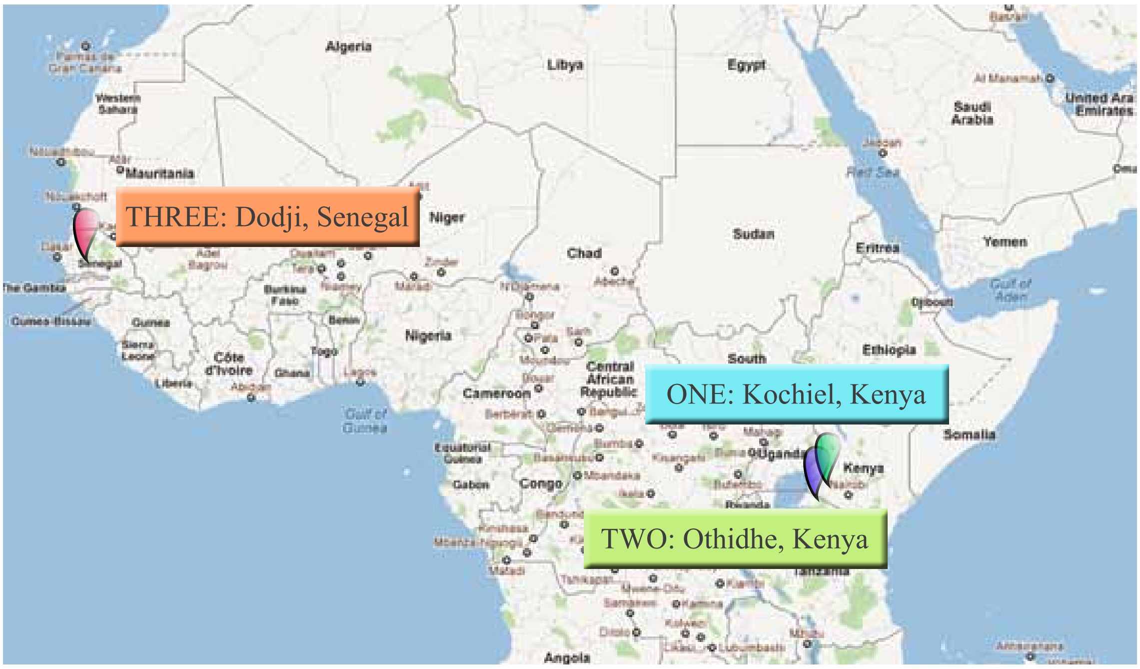
Case studies

A series of three field tests served to develop, evaluate and refine the PSROI framework. The pilot initiatives were conducted in Kochiel and Othidhe, Kenya, and Dodji, Senegal, from July 2011 through November 2011. The field work was conducted in partnership with the International Center for Tropical Agriculture (CIAT), the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS) and the Environmental Change Institute (ECI), University of Oxford.

For each pilot, the central research team of four individuals partnered with a local NGO—SCC Vi Agroforestry, CARE International, and the Senegalese Red Cross, respectively—to introduce staff to the PSROI framework and to test its practical adoption by on-the-ground local partners. The methodology is the result of learned best practices in coordination with these NGOs. Although elements of the applied methodology evolved with each pilot, the core activities remained constant, ensuring comparable research outcomes between studies.

The following section provides an in-depth look at the first case study in Kochiel, Kenya, including key insights that emerged from the framework's application (referred to as 'lessons learned' below). A brief introduction of the second and third case study is also provided and full results can be found on the CCAFS website (www.ccafs.cgiar.org).

Image 1. PSROI case study locations



Source: Google Maps

Case study one: Kochiel, Kenya

Between July and October, 2011, two PSROI pilot studies were conducted in villages surrounding the CCAFS working area in the Nyando Basin in Western Kenya. Nyando is linked to the Lake Victoria Basin and is characterized by a humid to sub-humid climate. Local agriculture consists primarily of small-scale mixed rainfed crop-livestock subsistence farming systems (plots averaging less than 1 ha). The site suffers from poor agricultural potential due to low and erratic rainfall and is consequently marked by high levels of poverty and serious environmental degradation, including declining tree coverage, severe soil erosion and declining soil fertility (CCAFS 2011).

The village of Kochiel, the location of the first PSROI pilot, typifies the region's working description. Small farms of mixed maize systems dominate the landscape, and the hilly, eroded terrain is dotted with rock formations, replacing the trees that were once the defining feature. Kenya's Kombewa division, where you will find Kochiel, faces a nationally high prevalence rate of AIDS at over 22% (NASCOP 2005) and is a hotspot for malaria and other vector-borne diseases.

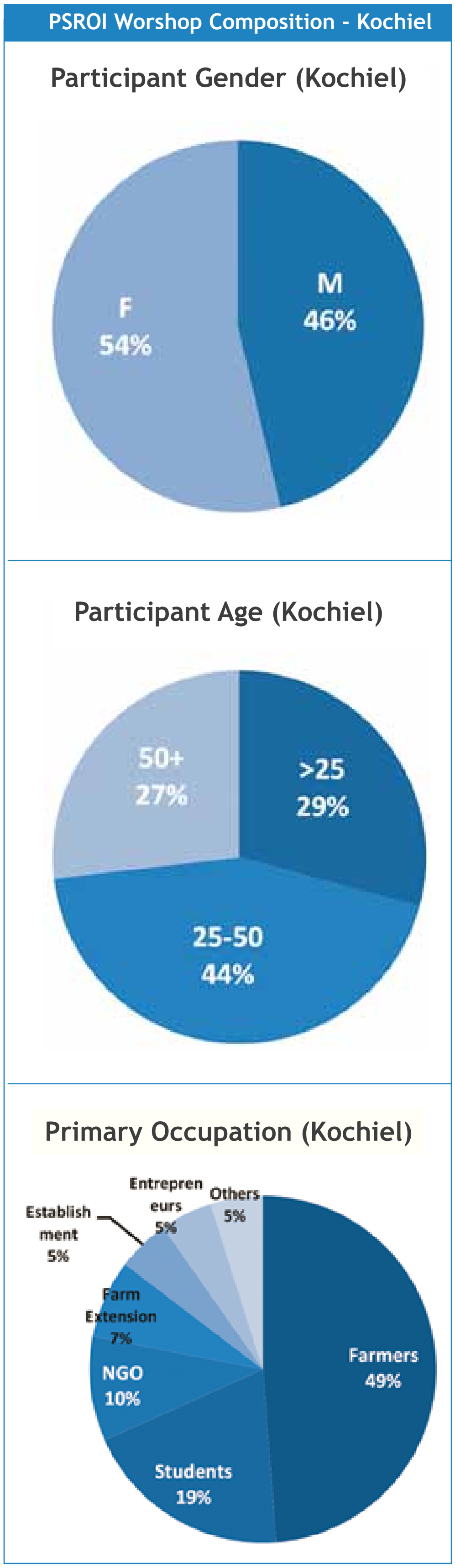
Kochiel is one of several villages in Western Kenya participating in Africa's first soil carbon project operated by the NGO Swedish Cooperative Centre - Vi Agroforestry Programme (SCC-ViA) in cooperation with The World Bank and the Kenyan Government. SCC-ViA was selected to partner in the first pilot given its history in promoting sustainable agricultural and land management (SALM) practices, its strong community-level relationships, and the resulting opportunity to pursue analyses of both adaptation and mitigation interventions.

Track One

The *Track One* Adaptation Prioritization, Planning and Selection workshop was attended by 41 community members from Kochiel. The demographic composition included 54% female participants, with 44% of total participants between the ages of 25 and 50. In terms of occupation, 49% of participants identified themselves as principally farmers, although nearly all participants engaged in agricultural activities to some extent. (see Table 2).

Day 1 of the workshop was designed to provide the context in which climate change adaptation is taking place in the community. An important step in this process is understanding where climate risks fit in the list of challenges faced by the community. Particular effort was made in the first pilot to avoid pre-framing the discussions of community challenges and responses in the context of climate change so that community's priorities were not influenced by the research team's agenda. Local partners were present only as observers to avoid the same effect caused by the influence of local NGOs.

Table 2. PSROI Worshop Composition - Kochiel

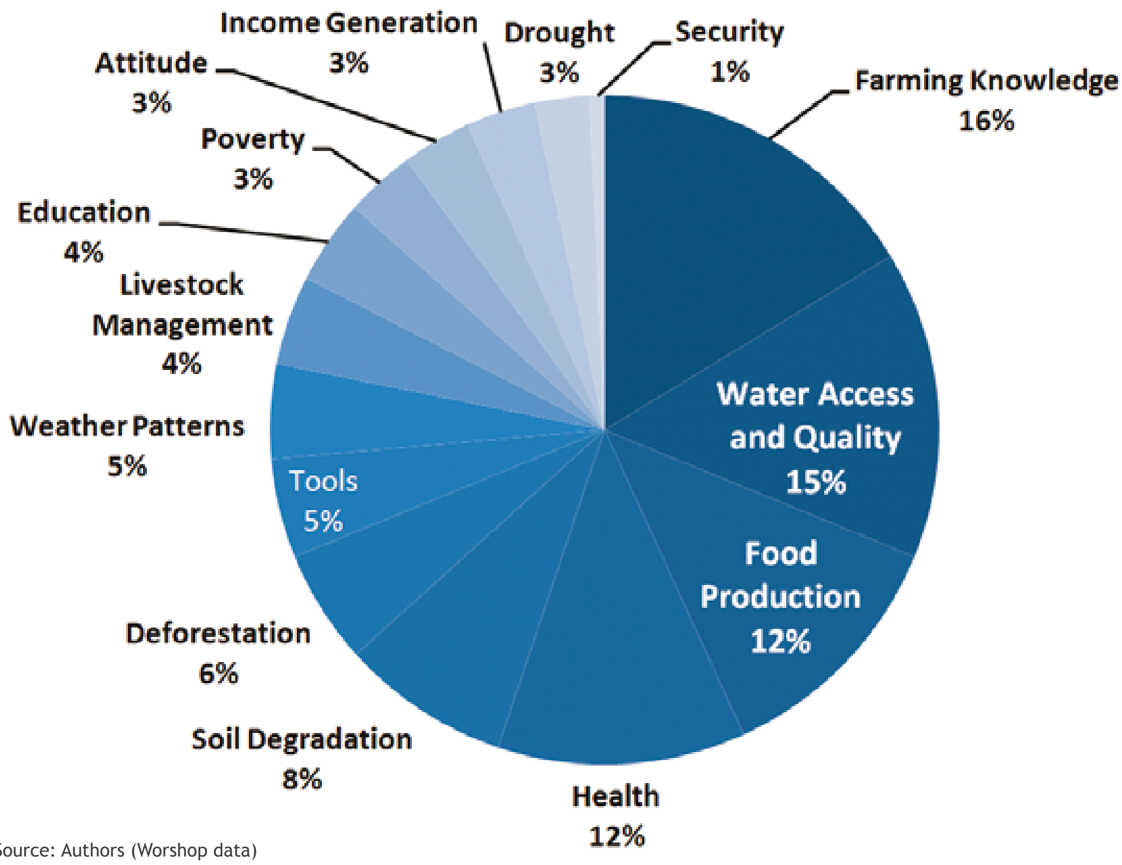


In Kochiel, the top self-identified challenges included inadequate farming knowledge (receiving 16% of total votes), water insecurity (15%), inadequate food security (12%) and poor health (12%) (see Graph 1). In total, the results suggest that over 50% of the community's challenges can be classified as agriculture- and/or climate-related.

Table 3. Key Community Data - Kochiel

Key Community Data - Kochiel
Location: Nyanza (Province) Kombewa (Sub-location)
Average Household Size (# people): 8
House Roof Type: Iron Sheet (86%)
House Wall Type: Mud (89%)
Plot Size (Acres): 2.3
Agricultural System: Mixed Crop (maize)-livestock
Distance to Drinking Water Source (m): 391
Primary Expenses: Food, School Fees

Graph 1. Challenges ranking - Percentage of total community voting (Kochiel)



Source: Authors (Worshop data)

Understanding how the community has coped with these issues in the past provides an important perception of Local Traditional Knowledge (LTK) and the community members from which it originates. Day 1 focus groups and event ecology story circles revealed that agricultural trainings, soil conservation techniques, development of water supply and irrigation systems, and tree planting had been applied in the past. These strategies have not endured, however, and are not widely applied.

Day 2 of the workshop was intended to assemble a comprehensive list of the assets and resources available within Kochiel, as a way to understand the current livelihood scenario. Visioning exercises of the future were also conducted on the second day, helping the community identify the characteristics that define their desired state and guide their development pathways. These inventories can be found in Table 4.

Table 4. Current and future assets - Kochiel

Current Assets and Resources	Future Characteristics/Aspirations
Land	Good Soil
Farm Animals	More Trees
Social Capital (each other)	Adequate Water Supply
Social Groups & Institutions	Surplus Food Production
Labour	Access to Knowledge
Knowledge (farming)	Agriculture Business
Water Sources - River, Rain, Borehole etc.	Good Attitude
Boma (Cow) Manure	Dairy Business
Seeds	Electricity

Source: Authors (workshop data)

The outputs from the Day 1 challenge and response activities and the Day 2 asset and visioning inventories were combined to produce a prioritized list of interventions to pursue via PSROI economic analysis. The list included tree planting, household water distribution systems, farm dams, rainwater harvesting with tanks and the drilling of new boreholes. A vote among all workshop participants provided the final prioritization, with tree planting emerging as the top vote-getter.

Box 5. Highlight - Maurice the 'madman"

Highlight - Maurice the "madman"

Photo by Neil Palmer (CIAT)

Maurice Kwadha—affectionately known as "Maurice the madman"—is an innovative small-scale farmer living in Kochiel, Kenya. We first met Maurice when organizing the *Track One* participatory workshop in Kochiel. We asked our local partner, SCC-ViA, to help us bring together a community to participate. There was only one call to make, and it was to Maurice. As a leader, innovator and entrepreneur, Maurice had no trouble assembling 40 of his neighbours. One visit to his farm and it's no wonder that his call to participate was so convincing. Maurice's one-acre plot is home to a wide range of crops and management practices. It's diversity at its best, with maize, papaya, beans, cow peas and several varieties of fruit trees all within meters of one another. His farm is a true showcase for sustainable agriculture, highlighted by a composting area, hybrid dairy cow, hand-dug pond for water collection (which he pumps from a seasonal river near his property), and an EcoSans composting toilet. Maurice is also avidly practicing agroforestry. Interspersed within his crops are a variety of short- and long-term trees. They help to ensure water retention, provide fodder for his cow, serve as wind blocks to limit top soil erosion and, in a few years' time, will provide Maurice with firewood and fencing/building poles.

Following the first PSROI pilot, several blog posts and articles were written, highlighting Maurice's farm and sharing his success story in climate-smart agriculture with the rest of the world. One post entitled "Kenya: A glimpse of climate-smart agriculture" quickly went viral and was picked up by Reuters Alertnet. Links to several of these stories can be found here:

www.ccafs.cgiar.org/blog/nyando's-army-madmen

www.ccafs.cgiar.org/blog/kenya-glimpse-climate-smart-agriculture-bad11

www.trust.org/alertnet/blogs/climate-conversations/a-glimpse-of-climate-smart-agriculture-in-kenya

Backcasting was conducted in three break-out groups to establish a plan for using the available community resources to implement the tree-planting intervention, keeping in mind the desired state that community hoped to achieve. The backcasting exercise intended not only to reduce the scope of the intervention to a manageable starting point, but also to identify barriers and incentives for the community's participation. The backcasting of the tree-planting intervention revealed that a lack of knowledge concerning the best trees to plant and the appropriate spacing between trees were key limitations to the adoption of this initiative. Concerns over seed availability and inadequate land requirements were also identified. Key cost-benefit data were provided through the exercise as well, including seed prices, maturity rates for key tree species and the market value of timber. A technical description of the resulting planned adaptation intervention is found in Box 6.

Box 6 Intervention description - Kochiel

Intervention description - Kochiel

AGROFORESTRY (TREE-INTERPLANTING): The intervention chosen by Kochiel was the interplanting of short-term (*Calliandra* and *Grevillea* robusta) and long-term (*Sesbania sesban* and *Markhamia lutea*) tree species with maize crops. The cost analysis of the intervention was facilitated by a 'model farm', designed by the research team in collaboration with SCC-ViA and using academic literature. The one-acre (63 x 63 m) model plot consists of a total 9000 short-term trees planted along 10 rows as seen in the diagram below. A total of 100 long-term trees (represented by X and O) are planted at a 6-meter spacing along the row, with 6 m of vertical space between each row. The images below the diagram provide an approximate visualization of the interplanting scheme.

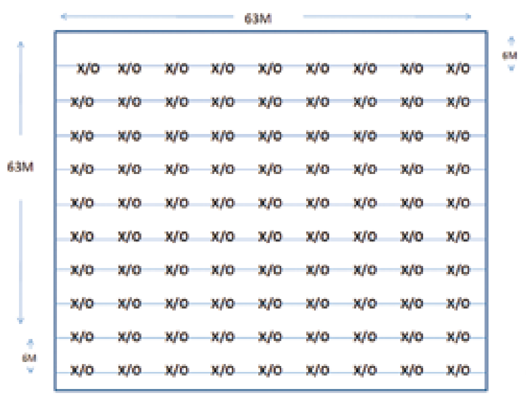


Photo by Christian Dupraz

Source: Authors

Track Two

Prior to conducting the PSROI *Track Two* field testing interviews, a baseline cost-benefit analysis of the one-acre model farm was conducted through the consultation of available agroforestry literature and key informants. This baseline costing serves to represent a traditional 'desk-study' cost-benefit analysis. The baseline analysis suggested that the interplanting of short- and long-term tree species with maize crops would yield a return on investment (ROI) of nearly 47 Kenyan Shillings (KES) Net Present Value (NPV) over a 20-year period on every 1 KES invested.[2]

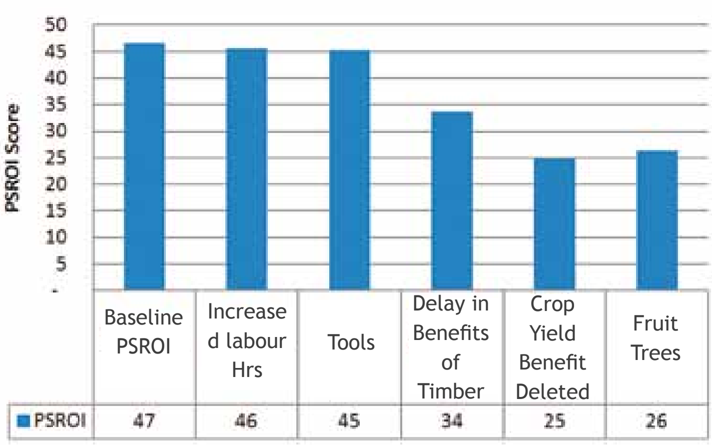
Lessons learned: Reconciling secondary sources and community perceptions

Data collected through *Step 4* Field Trial with 23 households revealed that, according to stakeholder perceptions, the baseline cost-benefit analysis overestimated the 20-year ROI by nearly 21 KES NPV. Key insights emerging from the interviews suggested that the community perceived that increased labour (time) and tool inputs would be required to implement the intervention when compared to the baseline study, reducing the PSROI score by 2 points.

More significant disparities were found in the areas of timber sales and crop yield benefits. The stakeholder interviews discovered that benefits from timber sales would take longer to materialize than suggested by secondary sources, and were consequently discounted at a higher rate in the *Step 4* PSROI analysis. This reflected the resounding perspective of farmers who suggested that there was a low probability that the trees would reach maturity before being cut. This adjustment resulted in an 11-point drop of the PSROI score, as timber sales represented a considerable portion of the baseline analysis.

[2] The PSROI cost-benefit results identified in this working paper should be considered highly preliminary. The aim of this research is to assess how local level perceptions of value can be captured in a replicable framework, not to pursue a rigorous analysis of any one intervention.

Graph 2. Impact of Step 4 validation and discovery on baseline PSROI score



Source: Authors (workshop data)

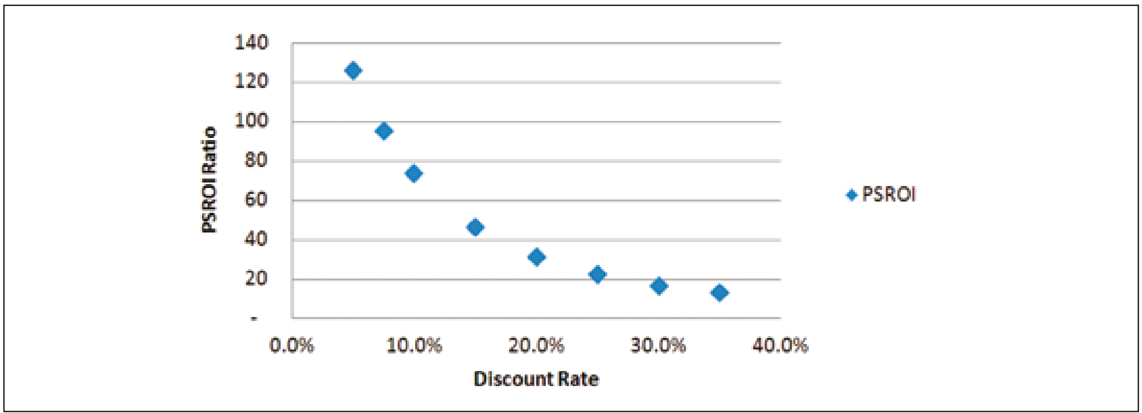
The field testing also revealed that stakeholders did not anticipate any benefits from crop yield increases, reducing the perceived PSROI score by an additional 9 points over the study period. The elimination of crop yield benefits from the Field Trial PSROI analysis reflects the majority view of farmers, who see the trees in competition with their crops. The microclimate effect, produced by certain tree species and promoted in agroforestry literature, does not reflect the farmers' perspectives.

The combined effect of the Field Trial PSROI analysis reduces the baseline PSROI score by 21 points (to 26 KES from 47 KES). The results suggest that the baseline analysis was overly optimistic in recording long-term timber sales, and that improved emphasis on crop yield benefits during trainings and outreach could help to increase interplanting uptake by local farmers. The timber sales in particular reflect an important lesson learned in Kochiel, concerning discount rates.

Lessons learned: Discount rates and intergenerational obligations

Duration and intergenerational obligation are much-debated topics in the global climate change negotiations for determining the costs and obligations of nations. At the community level, especially in highly vulnerable areas, it is much more difficult for communities to visualize benefits over long periods of time. Needs are usually immediate and the opportunity cost of delaying benefits is high. This invariably results in the community placing a low value on far-off benefits thus making long-term interventions less attractive. This is evident in a comment made by one Kochiel's farmer in respect to timber sales who, despite recognizing the potential value of mature trees, was cutting his trees prematurely. "If you have a tree and you need to feed the family, you have to cut it and sell", he said.

Graph 3. Discount rate impact on baseline PSROI score



Source: Authors

Graph 3 demonstrates the powerful effect that discount rates can have on ROI analyses, particularly those with a long study period. In Kochiel, for example, the premature cutting of trees was a reality faced by most farmers, discounting more heavily the distant benefits that mature trees could provide. If the practitioner fails to give proper weight to discount rates, the resulting effect can be a drastic miscalculation of intervention returns.

By understanding and analysing the specific needs of the different stakeholders, the intervention can be more aptly designed to match the segmented needs, instead of offering a generic solution to all stakeholders. A tailored project design that can match the needs and yet improve long-term adaptive capacity is better set up to succeed. For example, by promoting planting of short-term maturity trees that offer accelerated benefits of animal fodder and firewood along with long-term timber trees may protect the long-term trees from premature cutting.

Lessons learned: Influence of stakeholders

The value of change from the stakeholder perspective is central to the PSROI framework. Through an iterative adaptation process, the scope of the intervention and inclusion of stakeholder is balanced to capture the wider impact of the intervention. In this process, the influence of a dominant stakeholder could perversely impact the scope of the system and selection of the intervention to benefit particular stakeholders disproportionately. Through the interview process, the Carbon Finance Project (CFP) of The World Bank (CFU-WB 2010) was identified as an additional stakeholder for inclusion in the PSROI analysis. The PSROI valuation reveals that while the CFP has a negligible contribution of 0.1% to the overall benefits of the agroforestry intervention, it has a strong influence through promotion of its recommended intervention through SALM menu in partnership with a dominant local NGO. While this is not to say that interventions promoted in the SALM do not offer benefits to the community, there is increased risk of bias towards exclusion of non-carbon-focused interventions that may offer higher welfare maximization. The PSROI through a valuation analysis can match the role of the stakeholders with their contribution, hence allowing for better analysis to rationalize the role of the stakeholders.

Lessons learned: Adaptation ownership

The SROI framework was selected for use in the PSROI methodology for its emphasis on perspectives gathered directly from stakeholders and the use of success measures relevant to those experiencing the impact of a given intervention. This necessarily requires ownership from stakeholders, as in many ways, they themselves are analysing the intervention. Entering a community with predetermined adaptation interventions for analysis, as is frequently the case in adaptation studies, runs counter to the principles of the PSROI process.

The first pilot in Kochiel built a community workshop program which included methods complementary of the existing SROI structure and necessary data inputs. An emphasis on constructing visions of the future, for example, helped to identify the indicators and monetary proxies that the PSROI Impact Map utilizes in measuring and quantifying success. The first pilot clearly demonstrated that PSROI's two tracks cannot operate in isolation from one another.

Non-Market Valuation (NMV)

Quantifying social and environmental impacts is an imperfect process. The pilots further highlighted the challenges inherent to contingent valuation, hedonic pricing, benefit transfer and other non-market valuation tools. The SROI framework implies that these NMV strategies can be employed when direct proxies cannot be determined (for example, a direct proxy for improved health may be the number of hospital visits per person, per year, while the proxy for the value of the shade that a tree provides is not as easily identified), but provides little direction in applying these tools; and understandably so. NMV remains specious in the eyes of decision makers, who view these results often reluctantly. This implies that significant rigor must be applied in determining NMV values, adding time and cost constraints to the analysis. In addition, many observers highlight the complexity of translating unique cultural and value-based objects/practices into predefined Western categories which are deemed universal, one being monetary value (West 2005).

Given these limitations, the PSROI framework avoids the application of the most contested NMV strategies (contingent valuation), and employs other less rigorous strategies like benefit-transfer (transferring available information from previously completed studies in different locations and/or contexts). Social and environmental impacts for which proxies cannot be determined are included in the Impact Map, together with anecdotal evidence to support their inclusion. The Map structure allows these important impacts to be displayed alongside traditional economic indicators so that they can be taken into account in the decision-making process.

Case study two: Othidhe, Kenya

The second case study was held in the village of Othidhe, Kenya, a small agricultural community in Kenya's Nyando Basin, set against the backdrop of the eastern branch of Africa's Great Rift Valley. Othidhe was founded shortly after Kenya's independence in 1963 and is the product of a targeted land reform program. The settlers in Othidhe received ten hectares of land from the government with the explicit purpose of developing the region into a sugarcane production zone. Today, vast fields of sugarcane dominate the treeless landscape (removed over several decades to expand cane production), disturbed only by the smoky chimney of the Muhoroni Sugar Factory (see http://ccafs.cgiar.org/blog/adaptation-or-development for CCAFS blog post written on Othidhe). The research was undertaken in cooperation with CARE Kenya, with field staff from CARE's Kisumu office.

Four potential adaptation interventions emerged from the three-day workshop, including tree planting, road improvements, health facility construction and a water distribution system—all selected for their potential for strengthening food security via improved agricultural output and market access. A vote among all workshop participants provided the final prioritization, with health facility construction emerging as the top vote-getter followed by road construction and tree planting. PSROI analysis was conducted on the health facility in an effort to test the framework on a 'hard' infrastructure investment.

Box 7 Highlight - Kenyan farmers share priorities in life

Highlight - Kenyan farmers share priorities in life

A major focus of PSROI's *Track One* participatory workshop is learning about farmers' priorities in life to better understand their climate adaptation needs. Understanding these priorities allows for a more robust and community-driven economic analysis of priority adaptation needs. During the second pilot in Othidhe, CCAFS communications team joined the PSROI researchers to meet the farmers and document the participatory process. The photos were featured on *The Guardian*'s Global Development section (www.guardian.co.uk/global-development/gallery/2011/dec/02/kenyan-farmers-priorities-in-pictures).

Plant trees – **Tekla Awandu**, 63. Many Kenyan farmers believe that trees bring rain, and many have adopted agroforestry practices—the planting of certain beneficial tree species among food crops. Some agroforestry trees help to fix nitrogen, provide fodder for livestock, help to stabilise the soil and provide shade for crops and animals.

I like to try to dig a green vegetable – **Pilister Odago**, 65. In Kenya, nutritious, green vegetables like kale are prized for their ability to continually produce profitable leaves for sale at market. But increasingly unpredictable rains mean that some farmers are hesitant to take the risk of planting such high-value crops.

Good health – **Margaret Awiti**, age unknown. Illnesses such as HIV can reduce farmers' productivity, and can leave families without adults to manage their farms. Many households adopt orphaned children after their parents die from HIV and AIDS-related illnesses. Programmes to prevent and treat HIV, particularly in rural areas, are crucial.

Lessons learned: Adaptation vs Development

The story of Othidhe, the second PSROI pilot, lends itself to a much broader discussion on the sometimes tenuous distinction between adaptation and development. Especially so in agriculture, where a large number of off-farm factors contribute to production and food security, the line where development *ends* and climate change adaptation *begins* can be unclear. In Othidhe, the roads were in such poor condition that community members were unable to seek medical attention, which was identified locally as linked to agricultural productivity, well-being and education. Addressing health was thus seen as the critical first step towards building resilience and addressing other priority issues.

This has important implications for the practitioners and the organizations that they represent. The CCAFS program, for example, has obligations to donors and to the centers that it represents to provide credible research in the agriculture and food security areas as they relate to climate change impacts. At the community level, where adaptation, mitigation and development are not viewed in isolation from one another, there is potential for researchers' and local partners' agendas to lose traction (referred to as 'objective drift'), particularly during the PSROI *Track One* participatory workshop.

The effects of this phenomenon can be assuaged to a certain extent through improved collaboration with local partners before the methodology is applied. That is, local partners should actively participate in the site/community selection, applying a demand-driven process that identifies communities experiencing serious agriculture- and climate-related development issues. Also, although there can be a risk of "agenda-pushing" when framing the community discussions around a particular topic (to truly understand the community's challenge hierarchy, this should be avoided), the framework can be applied in a more targeted, sector-specific way. This should be a decision made prior to the Day 1 challenge and response activities, so that the discussion can be framed at this crucial starting point.

Case Study Three: Dodji, Senegal

The third and final PSROI pilot was held in the village of Dodji, Senegal, approximately 20 km north of the town of Kaffrine, CCAFS's baseline site located in the southern Peanut Basin of Central Senegal. The area is in the transition zone from the Sahelian towards the Sudanian Savanna zone. The research was undertaken in cooperation with the Senegalese Red Cross (CRS) based in Dhakar, with field staff from CRS's Kaffrine branch.

Two adaptation interventions emerged from the three-day workshop including the construction of a *forage* (water tower), and a rent-to-own scheme for agricultural tools (plows and seeders).

The *forage* was ultimately voted by the community to undergo a detailed cost analysis, allowing for application of PSROI in water-use/conservation setting.

The need for clean water for domestic and agricultural use during the long dry season justified the *forage*'s selection by the community. Dodji presently has four principal sources of water: wells, neighbouring *forage*, a lake and rainwater. There are four working wells in the community which households use for the majority of their needs (drinking, preparing food, washing and animals). A *forage* has been constructed in the neighbouring village of Sorokogne, located 6 km southwest of Dodji towards the town of Kaffrine. The community managing that *forage* charges 10 CFA per 20-L withdrawal, and the households in Dodji use this source in times of water stress. A seasonal lake is also located approximately 1.5 km north of Dodji, and is typically used for watering animals and washing clothes. Finally, an intense 2-3 month rainy season offers the potential for rainwater harvesting that is not currently being met by the community. The homes in Dodji are primarily grass-walled and roofed, limiting the potential for rooftop harvesting via corrugated metal sheets and gutters.

The *forage*, then, offers an opportunity for improved water and food security. It would provide year-round access to a water source that the community expressed interest in utilizing in home gardens for vegetable production.

Lessons learned: Leveraging support

The PSROI framework places emphasis on strength-based development theory to drive adaptation intervention selection. The available assets and capital (human, financial, environmental) within a community do not always keep pace with the accelerated need for adaptation. As a result, the community may need to leverage support from broader channels (both public and private) available for financial support.

In Othidhe and Dodji, for example, this meant identifying the necessary human capital and institutional processes to solicit support in constructing a health dispensary and a *forage* in the villages. The PSROI outputs (*Track One* Backcasting planning exercises and *Track Two* Impact Maps and intervention designs) can be beneficial in this context by providing rigorous empirical impact evidence to garner support. This is, in large part, the major contribution of the PSROI framework in the adaptation fund delivery structure.

Framework evaluation

This section discusses the PSROI framework as it relates to a three-part evaluation criteria model: *robustness, effectiveness,* and *scalability*. Broad lessons learned relating to these criteria are introduced, highlighting important considerations in the framework's application and areas requiring continued research and refinement.

The PSROI evaluation criteria were selected for their relevance to adaptation planning and economic analysis, particularly in the context of the multilevel decision making and implementation that characterizes climate change adaptation in agriculture.

Robustness (R): The framework's ability to assess a wide range of adaptation strategies (the "paradox of choice") from the perspective of multiple stakeholder groups.

Effectiveness (E): The framework's performance in identifying community-appropriate adaptation strategies and credibly valuing their related inputs and outcomes.

Scalability (S): The potential for the scaling-out (horizontal transfer) and scaling-up (vertical transfer) of the framework or its outputs, and its ability to do this over diverse time scales (temporal). Scalability also includes the framework's compatibility with existing multilevel planning, funding and implementation frameworks.

Table 5 provides an overview of traditionally problematic areas in adaptation planning and costing and their relevance to the evaluation criteria. The comments section of the table is meant to provide justification for the criteria application and a brief description as to how PSROI performs in these areas. A full blue circle indicates that the framework performs strongly with regard to the indicated criteria, and a half circle signifies only moderate performance or suggests that certain caveats apply. Where the evaluation criteria are not applicable to a costing concern the space is left blank. Comments related to a particular criterion are denoted by the abbreviations 'R', 'E' or 'S' in parentheses following the justification.

Table 5. Key PSROI evaluation findings

	Relevant evaluation criteria			
Adaptation planning and costing concerns	**Robustness**	**Effectiveness**	**Scalability**	**Comments**
Adaptation diversity	●			The PSROI framework can measure the impacts of policy, management and infrastructure interventions (hard vs. soft), originating from both public and private sources; any intervention for which perspectives can be gathered (R).
Agroclimatic and socioeconomic diversity	●		◖	PSROI identifies community-appropriate adaptation strategies through a participatory workshop. The value of those interventions is then identified using indicators selected by stakeholders, representing their perceptions of value (R). Because the adaptation strategies are based on local resources and assets, they are *not* intended to be transferred, even between seemingly similar communities (S).
Sector specificity (agriculture)		◖		The participatory strength-based approach used during PSROI Track One encourages communities to identify and rank their perceived environmental challenges. This is an important step in understanding where climate change fits among existing development challenges, but can lead to "objective drift", with the community identifying interventions that are not necessarily aligned with the practitioner's or other interested organizational agendas (E). This concern can be assuaged in part by adopting a demand-driven model that selects communities targeting a specific development challenge and by framing the *Day 1* challenge rankings to include a narrower, predefined scope.
Cost-benefit analysis utility and relevance to stakeholders		●		PSROI is not a new form of economic analysis. It is built on proven, mainstream costing methodologies such as cost-benefit analysis and return on investment (E). Its primary contribution to adaptation cost studies is its local-level, perspective-based approach and the format in which inputs and outcomes are presented, allowing for qualitative data to complement quantitative assessment (See Box 3. SROI / PSROI Impact Map).
Local practitioner requirements		◖	●	PSROI is designed to be implemented by local-level organizations (communities, NGOs, government) with the technical capacity to conduct cost-benefit analyses or contract these services. This requires the presence of strong, funded NGOs or local government (S). In some cases, practitioners can be identified as key stakeholders in the cost analysis, and their long-term presence in the community is then vital to the success of the intervention (E).

Contributions to national adaptation planning and adaptation fund delivery			◐	PSROI analyses are necessarily local in scale. For the framework to contribute to higher-level adaptation planning (on more than a case-study basis), it would need to be adopted by a local-level practitioner capable of consistently applying the framework between communities in a way that feeds national planning and funding schemes while still maintaining the community-specific considerations (S). The emphasis, then, should not be on scaling-up or -out the framework's (or similar frameworks) findings, but on scaling-up/out the framework itself.
Time constraints		●		The PSROI analyses highlighted in the above case studies were conducted by a consultative team, working with local NGO partners over the course of 10-15 days. The team was able to apply the framework successfully over that time period, but if conducted by a long-term local partner, these time periods can be extended, allowing for a more robust planning and cost analysis (E). The PSROI framework operates in two distinct formats: one for forecasting anticipated impacts of an intervention, and other for evaluating ex post impacts using the success indicators identified in the first. This paper has addressed only forecasting PSROI analyses, but evaluation is an important step that could be facilitated by the local partner after the implementation period has ended (E).

Conclusions

Robustness

It can be concluded that PSROI performs strongly according to the *robustness* criterion. The framework was able to value both hard (clinic and water storage structure) and soft adaptation strategies (agroforestry management), originating from both private and public sources. The framework is designed to be applied at the community level and thus is capable of taking into account the agroclimatic and socioeconomic diversity found at this level. In addition, the *Track One* workshop allows stakeholders to self-identify community-appropriate adaptation strategies. This ensures ownership over those interventions, promoting active participation in identifying relevant impacts and success measures and quantifying the perceived benefits and non-benefits during the *Track Two* analysis.

Effectiveness

The PSROI framework also performs well according to the *effectiveness* criterion, with a few important qualifications. The framework is built on commonly applied costing methodologies and consequently benefits from the learned best practices related to these existing frameworks (for example, Cost-Benefit and Cost-Effectiveness Analyses). The local-level application of PSROI helps to assuage concerns over the inequities that can result from cost-benefit analyses. The PSROI Impact Map also helps in this regard, associating inputs and outcomes to each stakeholder, avoiding the deceptions of aggregation. The Impact Map allows for the inclusion of broader social and environmental outcomes to complement economic and monetary indicators of change, either valued through proxies or placed qualitatively on the map. Finally, the self-identified nature of the intervention impacts also helps to improve the effectiveness of the framework, ensuring that success indicators are relevant to stakeholders.

The effectiveness of the PSROI framework, however, rests heavily on the practitioner. It requires implementation by capable practitioners (sufficient technical skills and financial resources) who can facilitate the diverse methods required by the framework, in a consistent manner that avoids objective-drift and allows for the comparison of case study or aggregate findings. In cases where the selected adaptation strategies require resources that exceed the community's capacity to provide them or where the practitioner is identified as a key stakeholder in the intervention, the practitioner's long-term presence in the community is vital for the success of the measure. As suggested by Gonsalves (2000), the practitioner's role is not just replication of technologies or approaches, but expansion of principles and knowledge, such that people build capacity to make better decisions and influence decision-making authorities. Finally, in PSROI, practitioners also play an important role in the iterative process of evaluation, measuring the success of the intervention using the criteria established in the forecasting study (the focus of this paper).

Scalability

It is scalability that offers the greatest challenge for adaptation planning and costing frameworks, and PSROI offers no exception to this rule. Accordingly, significant attention is paid here to the discussion on the *scalability* criterion.

The agricultural sector in particular does not easily lend itself to the scaling-out (*horizontal*) and scaling-up/down (*vertical*) of policies and management strategies, nor to the ability to do these things over distinct time periods (*temporal*). This complexity has been an important stumbling block in agriculture's inclusion in the UNFCCC agenda and in adaptation planning in nearly all contexts.

The scaling-out of adaptation interventions (for example, the transfer of climate interventions between sites) is complicated by agriculture's site-specific nature. Distinct growing seasons, soil composition, management practices and cultural norms limit the potential for the widespread adoption of standardized adaptation strategies. These challenges are compounded by uncertainties with respect to how these already unique agroclimatic zones will change, increasing the risk of maladaptation if interventions are widely adopted. The PSROI framework reflects these important considerations and consequently discourages the transfer of adaptation strategies—or their perceived costs and benefits—directly to other communities. The same holds true for the extrapolation of any one resulting intervention across the national landscape.

Take for example the agroforestry intervention identified in the first PSROI pilot. Suppose that the Kenyan government scales out the calculated PSROI ratio of KES 47:1 across several districts in the Nyando basin, applying a linear adoption rate. Assuming then that for every KES 1 million is invested, a return of KES 47 million should be generated over a 10-15 year period. This assumption is too simplistic as it ignores the economies and diseconomies of scale and assumes symmetry of decision-making. In Kochiel, the pilot location, a strong agroforestry NGO presence exists as the result of well-funded soil carbon initiatives in the area. This has resulted in the development of significant agroforestry knowledge and seedling production capacity that would not exist in other communities, even those directly neighbouring Kochiel. Scaling out the findings in such a way could then seriously misinform decision makers, diverting funds from other adaptation measures more appropriate to the surrounding communities. As in any financial decision-making, caution is needed in using the PSROI framework exclusively, without making realistic location-specific adoption adjustments (Chaudhury 2011).

Likewise, the scaling-up of climate change adaptation in agriculture is quite often problematic. This has implications for the delivery of adaptation funds, but is also relevant to the discussion of adaptation planning at multiple levels. Challenges to scaling-up are attributable to several concepts previously addressed in this paper, including the macro/micro decision-making divide (adaptation as one aspect of overall household welfare), the cross-sectoral nature of adaptation, site-specific agroclimatic and socioeconomic characteristics, and the general paradox of choice facing decision makers in agricultural policy. Consequently, it is envisioned that for the PSROI framework to contribute to the improved dissemination of adaptation funds (the 'how much') and the initiatives that they should go to support (the 'how'), the framework must be situated within in well-coordinated cross-scale institutions. In other words, these results suggest that government agencies/research and development organizations should aim to promote the scaling-up and out of processes that build adaptive capacities rather than broad prescriptions for adaptation strategies.

Continued research

Fortunately for the climate change adaptation in agriculture, there is a growing body of research on how scalar complexity can be addressed in institutional arrangements. This is particularly so in the area of natural resource management (NRM) and strong potential exists to transfer lessons learned between these closely related fields.

Since Hardin's *Tragedy of the Commons* (1968), academics have been investigating the institutional structures which set the rules for our relationship with the environment around us. Environmental governance, like climate change adaptation, has typically taken a scaled approach to decision-making, with each 'level' (individual, community, national) representing a specific group of actors and interests. Elinor Ostrom (1990) is perhaps most widely known for her work in this area, and has been instrumental in establishing a series of 'design principles' for local-level governance and cross-scale institutions.

Further research into similar design principles for local-level adaptation schemes, together with the strategies for scaling-up/out the findings (or processes) through nested institutional scales, is needed in climate change adaptation in agriculture. The established set of National Adaptation Programmes of Action (NAPAs) and emerging Local Adaptation Plans of Action (LAPAs) provide a strong testing ground to see where we have been successful to this point, and the ways in which we can improve, potentially using frameworks like PSROI.

Other areas for continued research may include:

- Comparison of stakeholder valuation using a participatory approach to intervention selection versus valuation of predetermined interventions.
- Application of PSROI at multiple overlapping boundary settings (for example, different geographic locations, community sizes, to see boundary change impact on PSROI).
- Application of PSROI for a 'basket' of multiple interventions to examine how synergies/non-synergies between measures affect the valuation and implementation process.
- Continued application of non-market valuation techniques—particularly contingent valuation—to improve their credibility and the cost-effectiveness of their application.

PSROI Toolkit

The observations in this paper's conclusions have attempted to address broad theoretical and methodological considerations. It is understood, however, that more practical, implementation-oriented recommendations are needed for the framework to be adopted in a consistent manner.

Consequently, a PSROI Toolkit is being developed in an effort to consolidate the organizational/logistical considerations of the methodology and will provide practical advice on site selection, local partnerships, *Track One* workshop agendas and other practical matters.

Recommendations

Adaptation to climate change is as much about empowering communities through capacity building as it is about finding matching solutions to protect against the dangers of climate change. Participation is at the heart of the PSROI process, as it attempts valuation from the community's perspective, driven by the desired state as they see it and the maximization of their own welfare.

As demonstrated in the summary of three case studies, the PSROI framework was successful in producing credible cost-benefit results, contributing to our improved understanding of a key challenge in the climate change debate; namely, how to bridge the divide between national- and international-level resources and local-level priorities. In doing so, it has also shed light on other important considerations, including the need to support long-term, locally based adaptation initiatives, the importance of cross-sector collaboration and the value (and hazards) of economic assessment.

The lessons learned from these experiences demonstrate the valuable role that communities themselves can play in adaptation planning and economic assessment. In particular, it displays the importance of improving our understanding of the common obstacles and incentives for climate change adaptation at the local level and of identifying success measures that are relevant to the most vulnerable stakeholders. To do this, we must make serious efforts to build cross-scale institutions that allow these valuable insights to reach the macrolevel planning and funding schemes that dominate the adaptation landscape.

In the end, when facing a challenge on the scale of climate change, we will need to employ a wide range of tools, programs and technologies to ensure that those most vulnerable are protected from the climate impacts that are sure to come. Involving those vulnerable populations in the decision-making processes that will ultimately affect their livelihoods and welfare is an important step in arriving at sustainable solutions that improve adaptive capacities today and into an uncertain future.

Annexes

Annex 1: PSROI Impact Map (Kochiel, Kenya)

ADAPTATION STRATEGY: INTER-CROPPED SHORT- AND LONG-TERM TREE SPECIES
TIME PERIOD: 2011 PLANTING (BENEFITS OVER A 20-YEAR PERIOD)
UNIT OF ANALYSIS: MODEL 1-ACRE PLOT

STEP 1: INPUTS "WHO CONTRIBUTES TO ADAPTATION, AND HOW MUCH?"					
STAKEHOLDERS	**INTENDED/UNINTENDED CHANGES**	**INPUTS**			**OUTPUTS**
1. Who will be affected, who will affect?	2. What will change for the stakeholder?	3. What is invested?	4. Value (KES)	Notes	5. Summary of the activity in numbers
FARMERS	Improve Livelihoods & Food Security	Time (Labour)- Initial Planting and Maintenance	4,550	1	Intercropped Tree Plantation (Agroforestry) - 100 Long-Term Trees (*Grevillea/ Markhamia*) + 9,000 Short-Term Trees (*Sesbania/Calliandra*)
		Land (Already exists) - Does not compete with crops for space	0		
		Seedlings - 100 *Grevillea* Long-Term Tree + 9000 *Sesbania* Short-Term Tree	1025	2	
		Water - Rainfed (No additional cost is assumed)	0		
		Tools (Spade, water can, etc)	1,000		
	Environmental Benefits	As above			
	Energy Security	As above			
NGO's (Agroforestry Training)	Training to sensitize farmers to benefits of agroforestry and capacity-building exercise to transfer planting skills	Cost to train one farmer- Including administration, capacity building, logistical and provision of seeds (USD 17)	1,530	3	
FARMER GROUP (CARBON PROJECT)	Carbon Offsets	Time	0		
CARBON PROJECT - World Bank	Carbon project	Cost of setting up and operations of carbon project (approx $1/acre)	90	4	
KOCHIEL VILLAGE POPULATION (Kombewa)	Overall Improved well-being, benefits captured above				
		Total:	**8,195**		

STEP 2: OUTCOMES “WHAT ARE THE RESULTS OF ADAPTATION, AND HOW DO WE MEASURE THEM?”

OUTCOMES											
6. **Description:** How would you describe the change?	7. **Indicator:** How do you measure the change?	Technical Description:	Source	(a) Market Value	(b) Financial Proxy	(c) Non-Market Valuation	8. **Quantity:** How much change occurred?	9. **Duration:** How long does it last?	10. **Financial Proxy:** What would you use to value the change?	**11. Value of the change** (KES)	Source
Diversification of income - Trees provide additional source of income	Sale of Trees per Year after reaching maturity in year 10 (10%)		Via Team (2011)				10	1 year (but after year 10)	Timber value of each tree	10,000	Market Price/ Farmers
Improved Yield of Crop because of soil improvements	Increased Yield of Maize		Research (Selishi 2008) - Via Team (2011)				0.5/ ton/Acre	1 Year	Market price of Maize per ton (@KES 33/Kg)	33,000	National Cereal & Produce Board
Improved yield and income leads to better nutrition and improved health	Lower number of hospital trips		(SCC 2011)				4 (1 trip every 3 months)	Indefinite (10 years)	Hospital Charges per Trip	500	Hospital Charges - Inquiry
Community empowerment through train the trainer programmes	Increased capacity & knowledge - The benefits captured above		(SCC 2011)				N/A	Indefinite (10 years)	Increased livelihoods	N/A	
Animal fodder generated from short-term trees	Cost saving on purchase of fodder for typical homestead		Via Team (2011) + Key informant farmer				365 bundles (1 bundle per day)	Indefinite (10 years)	Market Price of Fodder	50	Key informant
Reduction of soil erosion and improvement in soil productivity by acting as organic fertilizer	Cost saving on purchase of fertilizer										
Water Productivity - Improved absorption of water	Benefit captured in increased yield but also cost savings of water										
Shade & reduced heat stress	Improvement well-being for humans and livestock - Value difficult to capture										
Firewood from short-term trees	Cost saving on purchase of firewood		SCC (2011)				365 bundles (1 bundle /day)	Indefinite (10 years) but after 1 year	Market Price of Firewood	30	Market Price - Inquiry
Time saved by young girls in collecting firewood- Now can attend school	Value of education - Benefits covered above										
Carbon sequestering	Amount of CO2 sequestered		SALM (WB 2010)				1 Acre	Till the duration of trees but will commence after 9 years	Carbon finance revenue - WB ($1.6/acre)	144	SALM (Carbon Finance)

STEP 3: ADJUSTING IMPACT "WHAT ELSE CONTRIBUTED TO THE CHANGE?"				STEP 4: DISCOUNTING "WHAT IS THE VALUE INTO THE FUTURE?"										
DEADWEIGHT (%)	ATTRIBUTION (%)	DROP-OFF (%)	IMPACT	DISCOUNT RATE (15%) - KES										
12. What would have happened without the adaptation?	**13.** Who else contributed to the change?	**14.** Does the outcome drop off in later years?	**15.** Quantity times (*) Financial Proxy minus (-) deadweight, attribution and drop-off	**16.** Year 1 (after activity)	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11-20
0	0	0	100,000										100,000	
0	0	5%	16,500		16,500	15,675	14,891	14,147	13,439	12,767	12,129	11,523	10,946	
0	0	0	2,000		2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	
0	0	0	18,250		18,250	18,250	18,250	18,250	18,250	18,250	18,250	18,250	18,250	
0	0	0	10,950		10,950	10,950	10,950	10,950	10,950	10,950	10,950	10,950	10,950	
0	0	0	144									144	144	
		Total:	**147,844**	-	**47,700**	**46,875**	**46,091**	**45,347**	**44,639**	**43,967**	**43,329**	**42,867**	**142,290**	
			Present Value:	-	**36,068**	**30,821**	**26,353**	**22,545**	**19,299**	**16,529**	**14,164**	**12,185**	**35,172**	**176,520**
			Total Present Value:										**213,137**	**389,657**
			Net Present Value:										**204,942**	**381,462**
			Social Return KES for KES:										**25**	**47**

Annex 2: Sample PSROI Workshop Schedule

CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS) and the University of Oxford

<table>
<tr><th>TIME</th><th>DAY 1: CURRENT</th><th colspan="3">DAY 2: FUTURE VISION</th><th>DAY 3: PLANNING</th></tr>
<tr><td>10:00-10:15</td><td colspan="5">Welcome, introduction and guidelines. Prayer where appropriate</td></tr>
<tr><td rowspan="2">10:15-11:30</td><td rowspan="2">What is important?
Clustering and ranking exercise
Stop clustering at 11:15, do ranking and report back.

Whole Workshop</td><td>Collages
</td><td>Map of village in 2030
</td><td>Visioning exercise 2030
</td><td rowspan="2">Backcasting in break-out groups
</td></tr>
<tr><td colspan="3">3 Groups</td></tr>
<tr><td>11:30-11:45</td><td colspan="5">Morning Tea</td></tr>
<tr><td rowspan="2">11:45-12:30</td><td rowspan="2">Challenges and responses: List environmental challenges and cluster into categories. Ranking of titles of challenge clusters. Discussion is of primary concern not outcome of ranking.

3 Groups</td><td colspan="3">Groups report back to each other for 10 minutes each followed by a 15-minute facilitated discussion that culminates in a list of key features of the future being selected to focus on for planning purposes.
</td><td rowspan="2">Backcasting in break-out groups
</td></tr>
<tr><td>Livelihoods Analysis
</td><td>Map of village now with well-being ranking</td><td>Organizational and institutional mapping
</td></tr>
<tr><td>12:30-13:30</td><td colspan="5">Lunch</td></tr>
</table>

TIME	DAY 1: CURRENT	DAY 2: FUTURE VISION			DAY 3: PLANNING
13:30-14:15	Challenges and responses: Create a mind map of the linkages between challenges resulting from discussion around ranking. *3 Groups*	Livelihoods Analysis (cont) 	Map of village now with well-being ranking (cont)	Organizational and institutional mapping (cont) 	Groups report back for 15 minutes each
14:15-14:30	**Afternoon Tea**				
14:30-15:30	Challenges and Responses: List and cluster responses. Do not create clusters that mirror challenge clusters, instead cluster around types of responses. Story circles around response clusters – who has tried any of these responses? What is working and what isn't working and why? Map synergies and tradeoffs between individual adaptation options – capture multiple stressors and multiple consequences. Collection of success stories to report back. *3 Groups*	Groups report back to each other for 10 minutes each followed by a 15-minute facilitated discussion that culminates in a list of key features of the future being selected to focus on for planning purposes. 			Backcasting all together 
15:30-16:15	Groups report Back on mind maps and response success stories.	Groups report back, summary created			Groups report back
16:15-16:30	**Close**				

Source: Helfgott (2011)

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