Collaborative monitoring, evaluation, and impact assessment: Experiences assessing the impact of improved fallows and biomass transfer in western Kenya

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Introduction

There is considerable literature available on assessing the impact of rural innovations from the perspective of a particular discipline, e.g., economics or sociology, and from the farmers' own perspective, e.g., participatory monitoring and evaluation. But little has been written about collaborative monitoring, evaluation, and impact assessment, that is, how a group of diverse stakeholder organizations working in a particular location promoting similar innovations can work together to monitor and evaluate their work and assess their impact.

The objective of this paper is to assess the experience of 30 organizations working together over a four year period, 1999-2003, to assess their impact in helping farmers to develop, adapt and adopt two soil fertility practices aimed at improving household livelihoods in western Kenya. The two practices were biomass transfer (cutting leaves and applying them as green manure) and improved fallows (enriching or replacing natural fallows with planted, nitrogen-fixing shrubs). Researchers of ICRAF, the Kenya Agricultural Research Institute (KARI), and the Kenya Forestry Research Institute (KEFRI) in partnership with farmers developed the practices in the mid-1990s, in response to farmers' soil fertility problems and their lack of cash for buying mineral fertilizer. The following section describes the study area, and research and dissemination activities concerning the two practices. Next the collaborative exercises on monitoring, evaluation, and impact assessment are described, followed by the results of the assessments of biomass transfer and improved fallows. Finally, the impact of these exercises is discussed, highlighting the effect of the process and findings on the participating organizations.

Methods

Description of the study area

The highlands of Western Kenya cover an area of about 85,000 square kilometres and have about 12 million inhabitants, about one-third of the country's population (Niang et al, 1998). Altitude ranges from 1250m to 1600m and the topography is undulating with moderate slopes. Soils are of generally good physical structure but are nutrient depleted: N, P and K, are all deficient. Infestation of the parasitic weed, Striga (*Striga hermonthica*), is common and increases with declining soil fertility.

The population pressure is high and in some of the most densely populated areas, there are estimates of about 500-1200 persons per square kilometre (Hoekstra and Corbett, 1995). Annual crops are grown during 2 rainy seasons: the major cropping season is from February to June and the minor one, August to November. Maize is the major food crop and it occupies the largest percentage of land under crops. Other crops grown include sorghum, millet, cassava, kale, tomatoes and beans. Trees are also common, especially *Eucalyptus* spp, which are generally grown in woodlots. The main types of livestock found are zebu (local-breed) cattle and goats. Off-farm income and remittances account for most of household income; income from crops accounts for only one-third (Argwings-Kodhek et al. 1999).

Due to the land pressure, average farm size has fallen to below 1 ha (Wangila et al, 1999). Nevertheless, fallowing is common; over half of the farmers fallow some of their land for at least one season (DeWolf et al., 2000). Land holdings consist mainly of a single piece of land and land tenure is relatively secure. Land pressure has resulted in high rates of urban migration and about one-third of households are female-headed. Crop yields are low and most farmers are not able to produce more than 1 tonne of maize per hectare. Poverty rates are among the highest in Kenya, exceeding over 50% of the population in many areas (Place et al., 2002).

Research and dissemination of soil fertility practices

Diagnostic surveys conducted in the late 1980s and early 1990s indicated that poor soil fertility was an important problem faced by farmers (Minae and Akyaempong, 1988; Ohlsson et al., 1998). Two agroforestry practices, biomass transfer and improved fallows, were tested and promoted in western Kenya in the 1990s by ICRAF, KARI, and KEFRI.

Biomass transfer involves collecting leaves from shrubs grown on the farm (usually along boundaries) or off the farm (such as along roads and paths) and applying them to fields as green manure to improve soil fertility. The most common species used by farmers for biomass transfer is *Tithonia diversifolia*, which is plentiful in the area. Although it is not a nitrogen-fixing plant tithonia contains relatively high levels of nitrogen, potassium, and phosphorus. On-station and on-farm trials demonstrated the high yield responses of maize and vegetable crops (kale and tomato) to applications of tithonia. Moreover, the residual effect of the biomass lasts through 2-3 cropping seasons (Niang et al, 1996; ICRAF, 1996; Jama et al., 2000).

Improved fallows involve the enrichment or replacement of natural fallows with planted shrubs. In western Kenya, farmers plant the shrubs into an existing crop, usually by broadcasting the seed or planting in rows at weeding time. Following the harvest of the crop, the shrubs are allowed to grow for a second season. Just before the third season begins, the shrubs are cut and the leaves are incorporated into the soil during land preparation. The field is then planted to crops. During the fourth season, crops are again planted and the shrubs are planted into the standing crop, and the rotation begins again (Amadalo et al., 2003).

The tree fallow species contribute high levels of nutrients, both through incorporation of leafy biomass and underground root biomass. Farmers have experimented with 6 species; *Crotalaria grahamiana* and *Tephrosia vogelii* are the most popular. Maize yields increase significantly and the system provides much higher returns to land and labor than continuous cultivation or natural fallows. Establishing, maintaining, and cutting the fallows require minimal extra labor and over a four-season cycle, the improve fallow system requires 17% less labor than continuous cultivation. In addition, many of the species have important by-products, such as firewood and stakes (DeWolf et al., 2000; Place et al., 2002)

Collaborative impact assessment exercises

In 1999, ICRAF, KEFRI, and KARI invited representatives of about 30 organizations[1] promoting biomass transfer and improved fallows to a workshop on collaborative monitoring and evaluation. Over a five-year period, 1999-2003, the organizations jointly conducted a series of exercises:

Planning workshop
Representatives of 27 organizations met in a workshop in 1999 to (1) share experiences in monitoring and evaluation, (2) generate common indicators to monitor, focusing on those identified as important by farmers, and (3) determine who should collect which information, when and how (Aluoch et al., 2000). The organization was facilitated by a representative of CARE-Kenya and financing for the workshop was provided by ICRAF. A range of different types of organizations attended – government extension services, national and international non-governmental organizations (NGOs), community-based organizations (CBOs), and international and national research organizations (Table 1). All of the organizations present were promoting the use of biomass transfer and improved fallows and many were monitoring farmers' uptake of the practices. But none, except ICRAF, KARI, and KEFRI, had reports on their monitoring or impact assessment activities to share with others. ICRAF had conducted reports on farmers' experiences in testing the practices and these were shared with participants. In addition, ICRAF shared the results of village workshops on farmers' expectations about impacts from using the practices (Place, 1998; Kristjanson et al., 2002).

All agreed that a joint monitoring of impact was preferable to uncoordinated, individual endeavors. Besides, each organization was free to continue monitoring in the way it saw fit but still participate in the joint monitoring exercise. Advantages of the joint effort cited by participants included:

- CBOs, NGOs and extension services lacked the staff, resources, and expertise needed to do technical studies on profitability, adoption, and impact studies. Yet they needed the results of these studies, to know whether they should continue promoting biomass transfer and improved fallows, which management practices should be promoted, and to show to their donors the impact of their efforts.
- Research organizations lacked the day to day contact with farmers using biomass transfer and improved fallows that CBOs, NGOs, and extension services had. These latter organizations could provide valuable information about their experiences, even without conducting surveys of the farmers they worked with.
- Joint efforts would be more efficient as organizations could divide up tasks instead of repeating the same studies.
- Representatives of several of the smaller CBOs and NGOs expressed their lack of knowledge about monitoring impact and their strong interest in learning about it from more experienced organizations.

Participants also cited several constraints they felt might limit their participation in the exercise. First, some said their managers did not understand the need for joint monitoring of impact and may not be willing to allocate staff time and resources for the exercise. Others noted lack of staff and transport for collecting and assembling the needed data. Finally, many staff were already overstretched and may not find the time to participate.

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[1] Units of large organizations, such as district offices of the Ministry of Agriculture, are considered as separate organizations in this exercise

Table 2 shows the breakdown of tasks agreed upon by participating organizations. Representatives agreed that each organization would be responsible for assembling lists of farmers who had used the practices during the last year. These lists would be useful for finding out how many farmers were using the practice and over the years, would provide information on the spread of the practices.

In addition, organizations would collect information on numbers of farmers trained, farmers' problems, assessments, management practices, and innovations. Researchers would conduct special studies on numbers of farmers testing, adopting, and discontinuing, farmer to farmer spread of the options, farm and household characteristics associated with adoption, especially wealth and gender, and assessment of economic benefits of using the practices. A comprehensive impact assessment showing the effects of the practices on farmers' livelihoods was felt to be important but should be conducted some years hence as farmers were still testing the practices. An 8-person committee was established to develop the forms for the organizations to use in the "organization-level survey" that is, assembling lists of farmers and collecting other data about the practices. The committee also assisted the organizations in completing the forms.

Organization-level surveys

The organizations promoting biomass transfer and improved fallows assembled farmer lists and collected data on the other required information in 2000 and updated them in 2002. Information collected included the organizations' extension messages and management practices being promoted, the numbers of farmers they had trained and that were using the practices, and the farmer innovations identified and being promoted. Other topics included farmers views on the advantages and disadvantages of each practice, the organizations' information sources, extension methods and messages, and problems limiting adoption. An ICRAF staff member analyzed the data collected in the 2000 survey and wrote a report on the results (DeWolf 2000). For the 2002 survey, an MSc student from Egerton University assembled the data and wrote the report (Nanok, 2002).

Special studies

Four studies led by ICRAF researchers or graduate students examined the adoption and profitability of biomass transfer and improved fallows. The study of the adoption of biomass transfer involved monitoring the uptake of the practice among farmers who had participated in on-farm trials, a second group who had learned about the practice from extension services, and a third group in a pilot zone comprising 17 villages where researchers and extension staff were promoting the practice (Obonyo, 2000). Two studies on improved fallows examined uptake among farmers in the pilot zone (Dewolf et al., 2000; Pisanelli et al, 2002). A fourth study examined the profitability of improved fallows and biomass transfer among farmers participating in on-farm trials (Rommelse 2001). All of the studies involved informal focus group discussions, participatory appraisal methods, and formal questionnaire surveys.

Stakeholder workshops and e*valuation of the collaborative M&E process*

Stakeholder workshops were conducted in 2000 and 2002 to share results and to plan further studies. Results of the organizational surveys and special studies were presented at these workshops and summaries of the studies were circulated. There was considerable discussion of the study results and participants clearly appreciated the opportunity to hear and discuss them, as well as asking questions about the practices. Full-length reports were also made available to those who wanted them.

The participating organizations also evaluated the impact assessment tools and the joint process being followed. A graduate student visited each of the participating organizations to solicit their views.

Findings of the organization-level surveys

Between 1,867 and 2,533 used biomass transfer and improved fallows during 1999 and 2001 (Table 3). Numbers of farmers using improved fallows increased about 35% during the two years while numbers using biomass transfer remained about the same. The proportions of women users appeared to decline, from 52%-59% to 42%-48% but this change was probably due to a change in the number of organizations reporting a gender breakdown of users, rather than a real change in the proportion of women users. That over 40% of the users were women attests to the attractiveness and accessibility of the practices to women, as this proportion is much higher than the proportion of women using other soil fertility practices in western Kenya, e.g., mineral fertilizers or farmyard manure.

Biomass transfer's main advantages to farmers, as reported by the organizations, were that it improved soil fertility and crop yields with no cash cost (Table 4). But its main disadvantage was that it required a lot of labor to implement. The proportion of organizations citing lack of information about biomass transfer declined from 31% in 2000 to 13% in 2002, reflecting, in part, a better flow of information about the practice because of the joint monitoring system.

Improved fallows' main advantages were increased soil fertility, firewood production and weed control. Only about one-quarter of respondents mentioned increased crop yields, in contrast to the frequent adage of researchers that improved fallows double maize yields (Place et al. 2003). The difference in perception is because researchers are only comparing the crop yields *after* the fallow with the adjacent control plot whereas farmers are painfully aware that they have missed a cropping season while the improved fallow was being established. The proportion of organizations claiming that lack of information about improved fallows was a problem remained constant at about 20% between 1999 and 2001, probably reflecting confusion because of the large number of shrub species (5) available and that some had similar names (e.g., *Tephrosia vogelii* and *Tephrosia candida*).

The organizations' awareness of farmer innovations increased; the number of organizations reporting such innovations increased from 7 to 12 between 1999 and 2001 (Table 5). More importantly, the organizations substantially increased their promotion of these innovations. The most widely promoted innovations included using tithonia biomass in compost, using improved fallows with crops other than maize, using tithonia to make liquid manure, and using tithonia to control pests. The number of organizations promoting specific farmer innovations increased from 4 in 1999 to 10 in 2001. It is likely that the strong emphasis given to identifying and promoting farmer innovations in the joint monitoring exercise played an important role in the increased awareness and promotion of innovations. In fact, the description of these innovations, their merits and demerits was one of the most time consuming and interesting parts of the stakeholder workshops. Participants were eager to test and share ideas on these with their farmers.

Findings of the special studies

This section summarizes a few selected key findings of the special studies. The findings were presented to the participants at the stakeholder workshops and were summarized in 3-4 page briefs, written in non-technical language for an extension audience. It is unlikely that most of the findings would have been available to the representatives had there been no collaborative M & E process. Representatives appreciated hearing and discussing the results and highlighted two important reasons. First, by learning about the benefits and problems that others experienced, they could speak with more authority about the practices to their clients (farmers), their colleagues, and their donors. This was especially important for participants who lacked experience with the practices. Second, as mentioned above, participants enjoyed hearing about and discussing the farmer innovations that the researchers identified in their studies.

Adoption and farmer assessments of biomass transfer

Obonyo (2000) found that 15% to 23% of farmers who learned about the practice from researchers and extension staff were strong adopters, that is, they used the practice every season. About one-fifth of the farmers who had learned about the practice from extension staff had planted tithonia on their own farm. They had shifted from using biomass mainly on maize/beans to using it mainly on kales and other vegetables. This is logical, as labor requirements are high, vegetable plots are much smaller than maize plots, and the value of yield increases on vegetables is much higher than on maize. Moreover, farmers report that applications on vegetables improve the quality of their produce and extend the harvest season, so that they can take advantage of higher prices. Farmers' main problem in using the practice was its high labor demands.

The average size of field on which biomass transfer was used increased from $196m^2$ to $252m^2$ over five seasons for extension farmers and from $79m^2$ to $344m^2$ for research farmers. In the pilot zone, most users of the practice were in middle wealth categories; only 15% of farmers in the two lowest categories had tried the practice while about 45% of farmers in the three highest categories had tried. The labor demands for the poorest and female farmers were probably constraining them from adopting the practice. Two key farmer innovations were preparing liquid fertilizers using tithonia and adding leaves to compost. The main incentive in both cases was to reduce labor requirements.

Adoption and farmer assessments of improved fallows

Seventy-nine percent of farmers planting improved fallows reported increased crop yields after the fallow. Farmers' reported main benefits included improved soil fertility, reduced weeds (especially striga), increased crop production and firewood. Areas planted to fallows among the initial testers increased from 363 m2 to 511 m2 between 1998 and 2000. Among testers, the poor were adopting at similar rates as the other wealth groups. Females had smaller plots than males but they increased their area planted at a higher rate than men. Main farmer innovations included mixing shrub species, leaving the fallow plots for less time than recommended before cutting the shrubs, and early planting of the shrubs.

Profitability of biomass transfer

Applications of tithonia leaves to maize had mixed results. In one study, the leaves increased yields by 60% but the benefits were not sufficient to compensate for the labor used to cut, carry, and apply the leaves. In a second study, application of the leaves increased yields and profits substantially, especially when combined with phosphate fertilizer. Applications of tithonia biomass to kales and tomatoes were much more profitable for farmers than applications to maize (ICRAF 1997; Rommelse 2001).

Profitability of improved fallows

Crotelaria and tephrosia improved fallows generally gave higher returns than continuous cropping but not in all cases. Risks were relatively low as overall labor requirements of the improved fallow systems were lower than for continuously cropped maize (Rommelse 2001).

It should be noted that during these years, no comprehensive impact assessment was undertaken of either practice, because it was considered to be too early. Plot sizes were still small and it was unlikely that any impact on household welfare could be ascertained. The first comprehensive impact assessment of biomass transfer and improved fallows in western Kenya was reported in Place et al., 2004. They reported that while the practices were used and appreciated by many farmers, no impact on such variables as household assets, welfare, food security could be ascertained, due to the small size of the plots where the practices were applied.

Participants' evaluation of the collaborative M and E experience

Participants generally appreciated the M& E exercises, as demonstrated by their increasing involvement between 2000 and 2002 (Table 1), the high participation and level of discussion at stakeholder meetings, and the high scores they gave in evaluating the process (Table 6).[2] The main benefits of the process were, according to the participants, that it documented the spread of the practices, that it brought out farmers' views and innovations, and that it brought shareholders together to share experiences. Many also appreciated the skills they learned in designing monitoring forms, keeping records and identifying farmer innovations. Participants also cited two weaknesses of the process: the time and resources required to participate and the need for more leadership from ICRAF to facilitate the process.

Assessment of the collaborative M & E experience

The exercise proved useful in a number of ways:

- Many of the participants, especially those form farmer organizations and community based organizations reported that they learned valuable skills in monitoring, evaluation, and impact assessment. The quality of the information was enhanced because a range of different types of organizations were involved in evaluating it. Participants reported that their knowledge about biomass transfer practice increased during the period the M & E exercise was conducted

- Researchers from national and international organizations were obliged to produce simple, easy-to-understand summaries of their studies, which they would not have done had they not been involved in the collaborative process. These contributed to increased information flows, not only from researchers to other participants but in terms of feedback supplied by these participants.

- The process provided clear evidence of the increased awareness among participants of farmer innovations and the increased degree to which participating organizations promoted the practices. Extension organizations became more interested in
    - identifying innovations,
    - finding out from farmers, colleagues, and researchers about their value, and

[2] Participants received no per diems or sitting allowances for contributing to M&E exercises or participating in meetings. Their overall satisfaction with the process was therefore not due to increased material benefits from participating.

- if valuable, promoting them

That these innovations were then adopted by farmers is confirmed by data of other studies conducted later, after the collaborative M&E exercises ended. For example, Kiptot (personal communication) assessed farmers' use of tithonia in compost among farmers who had tested improved fallows or biomass transfer in the pilot zone referred to above. She found that the proportions of those using tithonia in compost increased from 0 in 2001, to 3% of farmers in 2002, to 20% of farmers in 2003.

- The farmer innovations identified in the M & E process also led to changes in researchers' priorities. Several trials were initiated on mixing shrub species in improved fallow trials, in collaboration with farmers who had started their own investigations. These trials led to recommendations for mixed fallows that increased farmers' returns and reduced the risk of a single species failing because of pests or disease.

- Finally, the collaborative impact assessment served to improve partnerships among the organizations across a range of research and development activities, not just in impact assessment. In 2003, all of the participating organizations joined in the formation of the Consortium for Scaling Up Farm-Improving Options and Agricultural Productivity (COSOFAP), a consortium of partners seeking to better coordinate their assistance to small-scale farmers.

Interestingly and contrary to what was expected, the organizations most involved and committed to the collaborative impact assessment process were the community based organizations, government extension staff, and local NGOs. Several of the larger national and international NGOs declined to participate or to share data; they had their own monitoring and evaluation procedures and saw little to gain from collaborating with others.

And finally, as successful as participants thought the M&E process was, it proved to be unsustainable. ICRAF funded the process until 2002, when a project that included funds for it ended. Participants had the opportunity to propose that COSOFAP take over funding collaborative M&E and impact assessment, but decided not to do so. Rather, the members decided to give priority to activities that they felt would more directly benefit their members, such as development of a market information system, staff training, and expansion of field school learning sites (Njui and Wambwile, 2003).

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Table 1. Numbers and types of different organizations participating in the monitoring and evaluation exercises

	1st workshop 1999	1st M&E Exercise 2000	2nd M&E Exercise 2002
Government extension services[1]	4	14	12
NGOs (international)	3	2	2
NGOs (national)	5	4	11
Community-based org. (CBOs)	10	10	13
International research org	2	1	1
National research org	3	1	1
Private sector	0	0	0
Total no. of organizations participating	27	32	40
Total no. of organizations contacted	--	48	56
Total no. of districts covered	--	15	14

1. Numbers of extension services refer to the numbers of district offices of the Ministry of Agriculture involved in the exercise

Table 2: Master list of monitoring and evaluation information required

	Organisation Questionnaire	Farmer List	Special Studies
1. No. of farmers trained, by gender, place	✓		
2 No. of farmers planting in the last year (gender place) testing, adopting, discontinuing.		✓	✓
3. Farmers' problems, their relative importance	✓		
4. Farmer –to –farmer spread of options			✓
5. Farm and household characteristics associated with adoption, especially wealth and gender			✓
6. Farmers' assessment of techniques Management practices Innovations	✓ ✓ ✓		
7. Economic benefits			✓

Table 3. Numbers of farmers using biomass transfer and improved fallows

	No. farmers 1999	% women[1]	No. farmers 2001	% women[1]
Biomass transfer	2077	59	2027	48
Improved fallow	1867	52	2533	42

1. Data on gender was available for about half of the farmers in 1999 and about one-third of the farmers in 2000.

Table 4. Advantages and problems when using biomass transfer and improved fallows, from perspective of farmers as reported by organizations supporting them

	Biomass transfer 1999	Biomass transfer 2001	Improved fallows 1999	Improved fallows 2001
	% of organizations reporting			
Advantages				
Increased yields	34	43	28	25
Inexpensive	31	38	16	0
Improved soil fertility	40	31	53	64
Locally available	22	26	0	0
Improves soil structure/moisture retention/reduces soil erosion	12	15	12	23
Better weed control	9	0	53	41
Firewood and stake production	0	0	50	56
Strong residual effect	0	0	28	0
Problems				
Labor intensive	72	77	0	0
Tithonia unavailable	0	20	0	0
Suitable only for small plots	9	13	0	0
Lack information	31	13	19	20
Land scarcity	0	0	56	67
Insect pests	0	0	25	43
Lack of seed	0	0	34	41
Poor germination	0	0	31	23

Table 5. Farmer innovations and those promoted by the organizations

	Number of org. reporting farmer innovation		No. of org. promoting the innovation	
	1999	2001	1999	2001
Biomass transfer				
- Applying as a topdress	1	0	3	0
Using in compost	2	7	3	9
Mixing into water for	1	4	1	4

liquid manure				
Using for pest control	1	6	0	3
Mixing with manure or fertilizer	2	0	0	0
Total	7	17	7	16
Improved fallows				
Planting on boundaries, terrace bunds	4	5	1	0
Interplanting with cassava, sweet potato	0	2	2	6
Planting on untilled land	0	0	1	0
Changing timing of fallow	1	3	0	2
Raising seedlings	2	0	0	
Mixing or adding fallow species	0	2	0	1
Incorporating farm yard manure	0	0	0	1
Total	7	12	4	10

Table 6: Respondents' scoring of the Collaborative M&E Process, 2002

	Low or insufficient (1-2)	Medium (3)	High or sufficient (4-5)
1. Degree to which process was participatory	11%	26%	63%
2. Understanding of questions in M&E forms	8%	22%	70%
3. Resources available to conduct M & E	42%	35%	23%
4. Staff available to conduct M & E	26%	39%	35%