Understanding Rural Poverty and Investment in Agriculture: An Assessment of Integrated Quantitative and Qualitative Research in Western Kenya

Frank Place*
World Agroforestry Centre, Nairobi, Kenya
Email: f.place@cgiar.org

Michelle Adato
International Food Policy Research Institute, Washington DC
Email: m.adato@cgiar.org

Paul Hebinck
Wageningen University, Wageningen, The Netherlands
Email: Paul.Hebinck@wur.nl

*Authorship has been assigned equally.
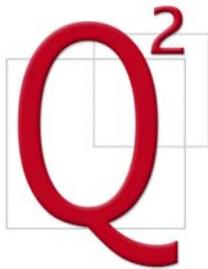
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1. Introduction

The development challenge addressed by this study is whether an agroforestry technology for enriching soil fertility is being used by poor people in a way that improves their welfare. This article addresses the methodological complexities inherent in research on poverty. The research challenges lie in how to differentiate the poor; and how to assess whether, which, and how factors symptomatic of poverty affect the use of the technology by the poor. Our hypothesis is that a combination of specific types of quantitative and qualitative methods is needed to understand the complex interactions between poverty and technology adoption. By combining methods we can be more confident about what we are observing, measuring, analyzing and finding.

The combined use of quantitative and qualitative methods is still a new, though growing, practice in the field of poverty studies.[1] Poverty studies remain largely compartmentalized in disciplines and methodologies. In assessing agricultural technology adoption and impacts, the use of combined methods is even more rare. What was unique about this study was that it formed part of the first multi-country research project attempting to use integrated economic and social analysis to assess the impact of agricultural research/new technologies on poverty. Until this study, impact assessment was largely focused on measuring adoption, yields, and economic gains —poverty reduction was assumed to follow.[2] Little attention was given to differentiating between farmers with different levels of assets and different social characteristics that determine their social and economic status, ability to adopt, and the ultimate outcomes of adoption. This multi-country study recognized that understanding poverty impacts in this way

would require mixed research methods. It was thus the first study of its kind to undertake this approach in a systematic way.[3]

This article attempts to analyze how and when to combine quantitative and qualitative research methods to improve our understanding of how to identify the poor, the nature of poverty, its causes, and its consequences for agricultural practices. In section 2 we briefly describe the study areas and the background of technology dissemination in the region. Section 3 describes the different research methods combined, including their sequencing and interaction. Section 4 discusses how different methods were used in generating the key empirical findings. The final section evaluates the areas in which integration of methods was instrumental in achieving key empirical results, followed by a critical analysis of why other envisaged benefits from integration did not occur.

2. Context of the research

Western Kenya is one of the most densely populated areas in all of Africa, and densities of over 1,000 per square kilometer are not uncommon. It is also one of the poorest, with the percentage of the population living below the poverty ranging from 58% to 68% in the districts in which this research takes place (Republic of Kenya, Central Bureau of Statistics, 2003). Much of western Kenya is considered to have good potential for agriculture, is in the highlands (elevation 1,100 – 1,600 meters above sea level), with deep, well-drained soils, and relatively high rainfall (1,200 – 1,800 millimeters per year) that permits two growing seasons. These favorable conditions, coupled with safety from malaria, attracted people to settle in these areas in large numbers. Despite recent

increases in mortality rates due to AIDS, the absolute number of rural people continues to grow, in large part due to the dismal performance of the urban employment sector. As a result of this population growth, farm sizes are nowadays small to very small, averaging between 0.5 to 1 hectare per household, across different sites (Wangila *et al.*, 1999; Mango, 2002; Francis, 2000).

The history of farming in the area is characterized by low external inputs with low output farming, based mainly on maize and beans. Recent studies have found that crop productivity is generally very low (less than 1 ton of maize per hectare per year and that land is highly depleted of nutrients (Stoorvogel & Smaling, 1990). This in turn has led to situations whereby members of many households, often the male, would seek income earning opportunities off the farm. Labor migration often implies the withdrawal of labor, further reducing agricultural productivity. Where the migrant is employed in a low paying job, which is common because many are low-skilled jobs, few remittances are returned to the rural area and this once again inhibits investment in agriculture.

The somber result of these conditions is a staggering rate of rural poverty in the region. The poverty line was determined by the Government of Kenya (GoK) to be 1,240 ksh per person per month (at the time, this was equivalent to $0.60 per day).

3. Quantitative and Qualitative Methods used: Description and Sequencing

This article is the result of research undertaken in several stages in research sites selected from Luo (Siaya and Rachuonyo) and Luhya (Kakamega, Vihiga, Busia) communities. The original study was designed ultimately to assess "the impact of soil fertility replenishment practices on the poor in Western Kenya." The study built on some

quantitative baseline data but was designed to combine quantitative and qualitative methods in order to uncover important non-economic factors and paths of explanation and to take into account the institutional context of research and the implications this has for social and economic outcomes (Adato and Meinzen-Dick 2002; MacKay and Horton, eds. 2003). If done properly, economic and social analyses would be integrated to generate insights on the impact of a new technology on poverty. The social analysis was given substantial weight in terms of the research design, staffing and budgets. The team of researchers were from four different research institutions on three continents, primarily economists and sociologists, with additional inputs from other disciplines, government departments, NGOs and other stakeholders.

In order to understand poverty impacts, it was first necessary to understand what poverty means to different people, why it arises, and how it differs across different contexts. The study thus addressed the following questions: How do meanings of poverty vary? Who are the differentiated groups among 'the poor' and vulnerable? How do the poor receive information about new technologies and how do they respond to these different sources of information? How do the poor use new technologies? Why do not they not adopt or abandon technologies? How do the poor benefit from new technologies, or not?[4] Different types of quantitative and qualitative methods were all intended to contribute toward answering these questions, though 'sub-questions' would be investigated emphasizing different methods.. We constructed a 'research design matrix' that mapped the broad research questions to more specific ones, and to the different method/s that would be used to answer each one.

In order to take into account ethnic variations in poverty and adoption, the study covered both Luhya and Luo highland areas. The quantitative analysis selected households from as many as 25 villages across 5 districts (Vihiga, Busia, Kakamega, Siaya and Rachuonyo). The qualitative analysis selected a small sub-sample of villages from the survey sample in Vihiga, Siaya, and Kakamega Districts. Four villages were selected for the case studies, and six for focus groups on methods of technology dissemination, with some overlap between them.

In an earlier project during 1995-1997, participatory wealth ranking exercises had been undertaken to assist in the identification of the poor and of indicators important for any research program to attempt to affect. Group discussions in selected villages generated lists of criteria for wealth ranking and a listing of households falling into the different wealth categories. Shortly afterward, quantitative surveys were implemented to capture many of the stated wealth indicators over wide areas. These later formed the basis for stratification and sampling of households for both the qualitative and quantitative[5] research carried out from 2001-2002 (the subject of this article). To design the research questions for this new study, a stakeholder workshop invited researchers, government departments, NGOs, extension agents, local officials and villagers, and questions were then further structured by the research team. At the launching of a new round of studies in 2002, another stakeholder workshop was held to discuss, *inter alia*, concepts of poverty, its symptoms, causes, and consequences.

The qualitative study of poverty and impacts used mainly what we refer to as 'household case studies,' as well as some supplemental focus groups. This approach derives from the "extended case study method," a form of ethnography that uses participant observation to understand everyday life, but in its extralocal and historical context. It emphasizes the inter-subjectivity of the researcher and subject of study (Burawoy 1998). Forty individuals and their households were selected from the quantitative panel study for the household case studies, examining how they see their lives and the changes occurring around them. Fieldworkers resided in the villages and interacted with local people over a six-month period. Of particular importance was the collection of contextual data about the individual and household and a historical assessment of livelihoods, shocks, vulnerability, coping mechanisms, and welfare. This extended interaction included some focus groups discussions used to follow up on certain findings of the household case studies, and to include and cross-check findings with other individuals not included in the case studies.

Within each village, households were selected to capture variation: first stratifying across poor and non-poor, and adopters and non-adopters. Across these categories, other variations were sought: female-headed, male-headed, and child-headed households; those with different relative dependence on agriculture for family income; 'young' and 'older' households; and monogamous and polygamous households.

A second set of focus groups was conducted to collect information specifically on methods of technology dissemination used by government and NGOs, and the ability of

these methods to reach different social categories of people. In addition to discussions, these groups used selected visual (PRA-type) exercises that were carefully designed to yield information directly relevant to the research questions, and generated both qualitative and quantitative data. The subset of villages selected for these groups were chosen to include Luo and Luhya, and to represent a range of different technology dissemination methods and institutions. Within each village, four separate groups were conducted, disaggregated by poor and non-poor (again, using the survey data for selection), and then further disaggregating by men and women, to discern different general patterns of responses across these groups. These PRA/focus groups were different from those generating the initial wealth ranking exercises and from the focus groups conducted in the poverty/impacts component of the study above. They were the main data collection method for the dissemination study, rather than a supplemental method. The dissemination study also involved key informant interviews with representatives from the organizations responsible for the dissemination design and activities.

Quantitative analyses relied on data collected from surveys. Samples of 1,600 households in pilot sites and 360 households in non-pilot sites[6] were used to study use and adoption of the agroforestry technology. Starting in 1998, the 1,600 households were visited once a year to monitor their use of the technology. Rigorous measurement of assets, expenditure, and food consumption was done for 103 of the 1,600 households[7] within the pilot sites in 1999-2000 and then again in 2002, thus creating a 'short' panel dataset.

The panel was constructed by visiting households at two different periods of the year. The first was after harvest of the long rainy season crop (in September) and a second was just prior to the harvest of the long rainy season crop (in May). As expected, variations in poverty indicators across households were more pronounced in the pre-harvest period and that time period was selected for the analysis. Expenditures pertained to non-food items covering the previous three-month period. Food consumption data were ascertained for the household as a whole, using the 24-hour recall method and visiting the household for three consecutive days. The non-pilot village households were also used to analyze poverty and its link to technology adoption and impact, but this was based on a one-time survey. Poverty indicators from these data are not as rigorously measured as in the case of the panel and are based on assets, enumerator ratings, and farmers own assessments.

4. Key empirical results and methodologies that generated them

This section reviews seven major findings from our study, looking at indicators and causes of poverty, its consequences for agricultural practices, and how these results emerged from the different qualitative and quantitative methods research used. We provide illustrative examples in each case.

4.1 "Poverty" is perceived and experienced differently by different individuals, is often relative, and alternative ways of asking questions receive different responses.

The qualitative methods were better able to identify a wide range of poverty attributes, some of which have been found through earlier poverty studies, others that are new. The indicators mentioned in the case studies are given in Table 1; those mentioned in wealth ranking exercises are listed in Table 2. Differences between the two sets were most likely due to the fact that the wealth ranking exercises were guided processes in which facilitators asked for measurable indicators—with some preconceptions about what type of indicators were sought—while in the case studies individuals were asked in more informal settings with less guidance. The wealth ranking exercises helped to sharpen differences between types of households, because they also sought cut-off levels of the indicators that could sort households into different wealth groups. The wealth ranking and case studies thus had different relative strengths and weaknesses.

The most commonly cited indicators of poverty were familiar to poverty researchers — lack of food and lack of income, lack of various assets, and inability to meet important needs such as educating children—though many implications of lack of income were specific to the circumstances of the respondent. It is possible to use surveys to generate a list of many of the same poverty criteria, but this is not necessary. A combination of focus groups, PRA and individual interviews are more efficient for this purpose— describing poverty concepts can be done using relatively few respondents.

There are also more contextual indicators, however, that are harder to capture through surveys. In a village in Siaya District, a woman approached the researchers at the end of the meeting saying that "if you want to meet a poor person you have to see that lady (while pointing in a certain direction). She is poor." When asked why, she replied that the other woman was poor because she does not have a daughter. A daughter represents an opportunity or a springboard when the bride price is being paid after marriage. A daughter is also someone that helps cultivate your fields and somebody that looks after you when you are old. While a survey can obviously capture whether someone has a daughter, trying to determine in a survey what relation this has to poverty, and how people perceive these relations, is difficult and qualitative methods are more helpful here.

One point often made by the villagers was that "we are neither poor or rich." Poverty is socially constructed, and not only relative (poor in relation to whom?) but also private— people are not always willing to discuss this in public. We found that poverty carries a stigma, and many people in our research sites did not want to be labeled this way.[8]

Table 1: Indicators of poverty from case studies

Indicators of Poverty	% of households
Lack of food	56
No source of income/ money	41
Lack of basic needs	19
No or little land	19
Cannot send children to school	15
No limbs and senses	15
Depending on relatives	7
No workable ideas	7
No cow	7
State of mind	4
Lack technology	4

Table 2: Indicators of poverty from wealth ranking exercises

No grade or local cows	Poor soil fertility
No growing of napier grass	No use of hybrid maize varieties
No use of fertilizer	No cash crops grown
Grass thatched house	Small farms
No hiring of labor	Low quality and tattered clothes
Work on other farms	Long periods of food deficiency
No formal off-farm employment	Severe problems with alcoholism
No secondary schooling of children	

Table 3: Distribution of poverty in non-pilot villages of western Kenya (column % of 360 households) using alternative classifications

4.2 Who is classified as poor depends what poverty means and who is asked.

Once criteria are selected, households or individuals can be classified on the basis of poverty status. But changing the criteria (variables and their cutoffs) can significantly change the resulting estimated distribution of poverty—and thus measured poverty impacts—even among purportedly related measures. This can be seen in comparing alternative measures of poverty. In Table 3, we show the results of a comparison between three different poverty assessments, one based on value of assets owned, a second on farmers own relative ranking, and a third on enumerator evaluation of the asset and welfare conditions of the household.

Table 3: Distribution of poverty in non-pilot villages of western Kenya (column % of 360 households) using alternative classifications

	Months sustained by assets	Farmer relative ranking	Enumerator evaluation
Wealthier Group	15.0	10.0	9.4
Middle Group	43.8	40.1	48.8
Poorer Group	41.3	49.9	41.8

Although the percentage of households in each category is very similar, further analysis found that few households fall into the same category for all three different classification

methods. We found, for instance, that although all methods show that more than 40% of the households are poor, only 13.2 percent of the households were placed in the poorer group under all three classification measures. However, the vast majority received the same ranking in at least two of the three classifications, including 28 percent who were listed as poor in two of the three classification measures. Among the three approaches, the enumerator ranking did a better job in differentiating among households in terms of livestock holdings, farm size, and food consumption indicators. The asset classification did not actually correspond at all to food consumption indicators.

Using qualitative methods for classification, involving researchers, groups and individuals, led to distributions of households that were different across these different assessors. Such assessments often include criteria difficult to capture in surveys, such as perceived social position within the village. Assessments of one's own poverty status or sorting of households by villagers are tricky to compare within and across villages, because definitions and criteria may vary, resulting in non-comparable distributions.

The case study approach did not easily lead to labeling of households as poor, non-poor, or somewhere in between, because of the absence of a fixed 'poverty line' when poverty is defined by multiple variables. It did, however, bring in a longer-term perspective on poverty dynamics than did our quantitative panel. The case studies show that households go through growths and setbacks. People highlight negative shocks and outcomes and these tend to overshadow indications of growth, leaving one with a disproportionately negative picture. On the other hand, the qualitative research minimized possible

misperceptions of idiosyncratic and transitory income gains in contrast with the surveys'
snapshot that picked up short-term movements in income. Shocks such as death or
illness, sudden changes in prices, or retrenchments of migrant workers change the face of
(relative) wealth quickly into poverty. The speed with which households can fall into
poverty and the long period of recovery are clear from the historical accounts given by
the case studies but not easily seen in the quantitative analysis. Panel surveys can also
capture these transitions over time, but sufficient rounds can carry considerable expense
and will miss events in between. The case studies further link such fluctuations in welfare
states with related internal and external changing conditions, and highlight situations of
vulnerability. Vulnerability, and the degree to which one can safeguard against it, form
an important attribute distinguishing who is 'poor'. The case studies brought these
underlying social processes to the fore.

*4.3 Causes of poverty identified vary widely, from shocks to attitude; cause and effect
are not always distinguished.*

Our case studies did a good job in identifying what the households believed to be the key
causes of poverty. Shocks and coping (in)ability emerge as strong factors. While shocks
are captured through surveys, this depends on the survey timing, and the effects of shocks
and their interrelationships, are hard to capture by single visit surveys. Table 4 displays
the frequency of various causes of poverty as identified by the case study respondents.
As can be seen, attitudes and poor behavior such as laziness or alcoholism are mentioned
by a large number of respondents. Although not mentioned explicitly as a cause of
poverty, theft, illiteracy, and old age arose in other parts of conversations as contributing
to or reinforcing states of poverty.

Causes and effects of poverty are often identified with the same indicators—all methods we used found that often people do not identify a linear relationship between cause and effect, and these are sometimes difficult to distinguish analytically. However, if probed people can distinguish; for example, they may identify that loss of their cattle or a job caused them to be poor, and they might identify dependence on relatives or tattered clothing as consequences of poverty. As a practical matter, however, whether e.g. lack of food is a cause or consequence of poverty does not really matter that much; it is reasonable that it is a cause of poverty for one household a consequence of poverty for another. The important point is to know that lack of food is at the top of poor people's concerns.

Table 4: Causes of poverty according to case study interviews

Causes of Poverty	% of households
Laziness	33
No children/relatives to help	30
No employment	30
Alcoholism	26
Drought/hail	15
Small farms	15
HIV/AIDS	15
Malaria	11
Too many children	11
Physical handicaps	11
Funerals	7
Church commitments	4
Wasteful expenditures	4
Witchcraft	4
Ignorance in agriculture	4
Having to work on other farms	4

The quantitative studies are able to show associations between household and individual factors and poverty levels, for certain variables. But because poverty processes are dynamic, the restricted period of coverage of our survey data limited the extent to which dynamic relationships could be tested. Many of the variables listed in Tables 1 and 4 would be difficult to measure through quantitative analyses. While some such as lack of food, income or land may be better measured through surveys, variables such as "no workable ideas," witchcraft" and "wasteful expenditures" would be difficult. Consider the response of "no children / relatives to help." Testing this quantitatively would require a complex stew of variables. One must investigate what constitutes 'help' and 'sufficient help,' which relatives are more valuable for which purposes, why and under what circumstances—asking about the existence of relatives would not be sufficient. Asking through a survey how relatives help would provide some insight, but would miss the give-and-take nature of social relations, processes of negotiation and where these lead. Finally, the current state of poverty would depend on assistance from family over many previous years. Qualitative research can examine all of these issues and thus establish causality in a fairly convincing manner Econometrics applied to large panel datasets can be used to establish causality according to standards within the discipline, but this often requires a collecting information on a large set of variables over a lengthy time period to capture relevant decision making periods. If the research is done well, qualitative methods can be more effective and efficient in for understanding these more complex relationships and interactions.

4.4 The types of households that are more likely to be poor are female headed, those whose heads did not have a secondary education, and those whose heads had no prior formal sector job.

This type of information was best established through our survey data, which contained a large enough number of cases to make generalizations. Our qualitative studies focusing on a small number of respondents could not do this. In fact, the case studies were selected after stratifying households on the basis of different household characteristics so that the sampling procedure itself can suggest relationships between household factors and poverty. While this was done to increase the variation of household characteristics, it was even less possible to make generalizations, since the number in each disaggregated 'cell' was extremely small and in some cases the cell was empty.

The case studies on the other hand, were able to provide insights into *why* female-headed households were more poor or how other factors such as lack of education rendered households vulnerable to poverty. For example, education provided access a wider choice of remunerative jobs that better cushioned these households against adverse shocks. Having said that, it remains difficult to establish causality between some types of household variables and poverty. And of course, the associations identified between poverty status and household structure depended on the particular measure of poverty used.

Table 5 shows an example of how different indicators of poverty have some influence over the characterization of who the poor are. In this quantitative analysis, we attempted to identify unique characteristics of the chronic poor, as compared to the transient poor and the non-poor, from the sample of 103 farmers. Some characteristics (e.g. education) were associated with being poor regardless of the poverty indicator, others (e.g. gender of household head) differed across poverty indicator, and others (e.g. farm size) seemed to be unrelated to poverty..

Table 5: Description of the chronic poor compared to transient poor and non-poor using alternative indicators of poverty status

	Chronic poor – protein intake	Chronic poor – non-food expenditure
Gender of household head	More likely to be women than other groups	Similar to transient; slightly more likely to be women than non-poor
Ethnicity	Slightly more likely to be Luos compared to transient and non-poor	More likely to be Luhyas than transient and non-poor
Farm size	Similar to other groups	Similar to other groups
Father's farm size	Similar to other groups	Slightly smaller than other groups
Family size	Similar to other groups	Similar to other groups
Education of household head	Less likely to have secondary education; otherwise similar	Less likely to have secondary education; otherwise similar
Formerly held formal sector job	Somewhat less likely to have held formal job than other groups	Less likely to have held formal job than other groups

4.5 The poor are engaged in a wide range of livelihood strategies and strategies compete for resources.

Both qualitative and quantitative methods made their own unique contribution to this finding. The quantitative survey systematically inventoried the many livelihood

strategies undertaken by all members of a household. But it was practically impossible to ask many follow up questions about these livelihoods so it provided insufficient understanding on the contribution of many of the livelihoods to household utility or how the different livelihood options relate to each other. Open-ended dialogues were found to be useful in uncovering lesser known livelihoods that were not included in the survey, which ones were vitally important, which were most vulnerable to shocks, and how they are linked in terms of seasonality or competition for resources. Some illegal livelihoods such as alcohol production and prostitution are mentioned in the case studies but were not specifically asked about in the formal survey, nor were we likely to get honest answers even if we had.[9]

Certain livelihood options compete with others. For instance, the biomass transfer agroforestry system increases and intensifies labor input for agricultural production. In this way, agroforestry competes with other livelihood activities that also rely on labor, either hired or drawn from the (extended) family. Stories about illness and death (particularly in the context of AIDS though this was not often specifically mentioned) contributed to our understanding of the difficulties imposed by additional labor demands. The case studies also showed how age and physical injuries prevented some individuals from pursuing certain livelihoods such as farming or trading in foodstuffs. On the other hand, the full breadth of livelihoods activities that households engaged in was not revealed by the case study analysis alone—the survey also helped to identify these. The survey was also essential to understanding the relative importance of different strategies for large numbers of households and villages.

4.6 The poor tend not to adopt higher value enterprises or inputs. They do test more feasible technologies at similar rates as the non-poor, but the reasons are not always the same.

As in result 4.4, large samples are preferred when investigating these questions. We were able to explore statistical links between several different poverty measures and uptake of new technologies, for samples of households ranging from 103 to 1,600 in number. From formal surveys, we were able to determine that the poor were less likely to grow a cash crop, to use hybrid seed, to use fertilizer, hire labor, and use credit. We also found that while the wealthiest tercile spends on average $103 on agricultural inputs per year, the poorest tercile invests only $5. On the other hand, as shown in Table 6, the poor are active testers of an agroforestry system to improve soil fertility.

Such tendencies could not be established through the case studies, again because of the small numbers. Also, in our study, different input and output practices were not systematically probed—they could have been, but we deemed the survey to be a better method for this. In fact, while the quantitative information did uncover significant differences in use of technology between the poor and non-poor these were not readily apparent from reading the case material. However, the factors considered by households in deciding to test or use technologies emerged more clearly from the case studies, despite the fact that the survey asked for advantages and disadvantages of the new technologies. The real meaning behind brief responses such as "too much labor required" in the survey was not clear, while these were more fully explained in the case studies, "I

am alone and I find it difficult to combine household chores, business and farming; furthermore the money my husband sends is not enough to hire labor." Furthermore, the case material showed the important differences between 'lack of labor'/'labor not available' and the difficulty of mobilizing labor. On the basis of the first, labor is a problematic production factor; the latter points to the set of social relationships in which labor is embedded.

Table 6: Early patterns of adoption of improved fallows by the chronic poor and other groups (% of 103 households)

	Never tried	Dropped	Testing	Adopted
Protein measure				
Chronic poor	44.4	8.3	8.3	38.9
Transient poor	49.1	16.4	3.6	30.9
Non-poor	25.0	33.3	16.7	25.0

Note that due to stratification, adoption rates are not indicative of general patterns in the villages (those are in the range of 15 to 20 percent)

The qualitative work revealed important findings around different reasons for testing technologies. The survey assumed that the adoption of agroforestry was due to interest in increasing maize yields. But many people adopted the system in order to make money from selling the tree seed to research and development organizations or to just increase their social networks, to perhaps eventually benefit in some other way. The case study households used the label 'ICRAF agents' to underscore that some benefited more from adoption than others; some directly (by being targeted) and some indirectly (by being mentioned and /or proposed to participate in development projects). The qualitative data, including such labels attached to social relationships, provided insights into why some people chose to use agroforestry or not. Both the case studies and focus group discussions

brought this to the fore. These 'other' reasons for adoption were missed by the formal survey methods.

4.7   Social status and social relationships within villages affect outcomes of different dissemination methods. The approach to dissemination of new technologies can also reinforce or transform these relationships.

Social status bears an important relationship to poverty. Low status can be an indicator of poverty but also perpetuates it; and the converse is true for the well-off. Qualitative methods were far better for uncovering the relationship between poverty, status and power. The focus groups held on technology dissemination methods found that the main feature of most dissemination approaches – group based 'participatory' methods – can strengthen human and social capital, and farmers of different social status have benefited from them. However, we also found that group-based approaches worked better for the non-poor than for the poor, sometimes disadvantaging farmers of lower social status, who are less likely to participate in or dominate groups. On the other hand groups exclusively for women have worked well for women. The dissemination analysis and case studies also found that the use of 'contact farmers' where one farmer is selected to work closely with the disseminating organization to test new technologies under local conditions, generated new social tensions, due to the amount of attention received by individuals from outsiders. This presents obstacles to reaching greater number of farmers, including poor farmers.

These findings point to the importance of using appropriate methods for understanding local power dynamics in designing dissemination interventions, if the objective is to reach poor people. Qualitative methods are better for this purpose. In addition to being better at enabling the expression of complex dynamics around status and power, they tend to be better at getting sensitive issues raised in the first place and encouraging candid opinions. Where time allows, longer-term engagement through case studies and participant observation is probably a better method than focus groups and PRA for understanding power, culture and other social relations, due to the length of engagement, the ability to develop trust and rapport, and enabling a more respondent-led as well as private conversation. However, in our dissemination study, people did not have trouble discussing these issues in groups, and provided many insights on these issues . The division of groups between poor and non-poor farmers, and between men and women, probably helped to some degree in this regard. While groups can have the effect of dampening participation by some, they also generated debates and responses that did not arise in the case studies.

However, quantitative methods were also useful for gaining information on dissemination methods. Regression analysis was done to examine the associations between different dissemination methods and major improvements in knowledge of several agricultural topics. Quantitative analysis was also used to examine the relationship between different disseminating institutions and knowledge acquisition. Given the much larger numbers involved and statistical analyses run, these relationships revealed are certainly more representative and were better able to systematically account for interactions among

variables than the PRA exercises that dealt with similar issues. However, the focus group discussions (aided by the PRA at the outset for some questions) were able to bring out *why* particular organizations and methods were preferred by farmers, and why they were or were not effective.

Another issue was the usefulness of generating numbers from PRA exercises. These exercises generated interest among the participants, and the numbers were useful in contributing specificity to relative assessments of different institutions, methods and knowledge acquisition within a given village. However, they were less useful, and difficult to compare and analyze, across villages because of the different meanings attached to numbers, and the fact that different categories for assessment were identified across villages. This could have been controlled by standardizing categories, but would then have undermined the participatory nature of the exercise, stifling generation of local categories. This is a dilemma of using participatory methods for comparative analysis. Still, there was enough comparability across categories to allow for meaningful comparison in some places, if in broad strokes.

5. *Assessment of integrating qualitative and quantitative methods*

5.1 How did integration of quantitative and qualitative methods contribute to the major results?

This section draws partly on the examples above, but also takes a broader view to distill and systematically compile the ways in which qualitative and quantitative methods were usefully combined in the study. The three major research phases in which qualitative and quantitative methods were integrated to the benefit of the research were: classification and sampling of households, questionnaire/checklist design, and analysis and interpretation. The successful integration in these different phases is akin to what Carvalho and White (1996) might call "systematic integration." We found many of the beneficial complementarities as found in other studies, such as Maxwell (1998).

5.1.1 Classification and sampling of households

Our methods of classifying households according to wealth for the purposes of stratification and sampling involved a series of qualitative and quantitative methods that interplayed in chronological sequence. The first activity conducted was a series of wealth ranking exercises. The village informants identified the number of meaningful wealth groups and then assigned households to each. The wealth ranking exercise provided a first cut on the relative ranking of households. The exercise also led to the development of criteria for wealth classification that were robust across all or most of the villages. These criteria were then used to form the basis for a rapid census of all households in a larger number of villages. This led to the generation of a wealth index for each household, based on several criteria identified by the wealth ranking exercises. Though this was a "quick and dirty" measure, the researchers felt that it would suffice for purposes of stratification.

In order to ensure that the case studies were able to analyze the interactions between wealth status and other social conditions, stratification was also made according to age and gender of household head, as well as other variables that were available from the census. This was important because wealth does not guarantee access to the stated land, labor, and livestock resources, particularly for women and young male heads. This method worked well, although the utility of the wealth stratification diminishes the further away from the date of the census.

5.1.2 Questionnaire / checklist design

Although most of the researchers had considerable experience in the study site, it was still necessary to conduct an open process for generating the key research questions and for developing data collection instruments. Such a process helped to foster a common vision and to reveal different assumptions held by the team members. As mentioned earlier, the first activity was to hold a stakeholder workshop that introduced the project and arranged for discussions around the concepts of poverty and livelihoods, and the focus and conceptual framework of the study. This workshop led to the formation of key issues related to poverty and the complex links to technology adoption. The workshop also helped to inform the development of data collection methods and instruments. For instance, it became clear that focus group and case study interviews would both be needed to address some of the concerns. Focus groups were selected as the appropriate method for eliciting information about how information flowed (or didn't flow) to and among poor households as compared to other social groups. Aspects of adoption and impact of technology were reserved for household level interviews.

After the launching of the study, there were several instances where analysis fed into the development of subsequent data collection exercises. Some initial quantitative analysis using the census revealed interesting differences in soil management practices among different wealth groups. It was thus decided that the qualitative case studies should attempt to discuss a range of practices with households, rather than honing in only on the agroforestry practices that were the subject of the study. When the initial case study analysis demonstrated the importance of shocks and coping strategies in determining household poverty levels, the team added a section to the survey examining perceptions of a range of risks and coping strategies to assess household vulnerability. Another major influence of the qualitative on the quantitative was the notion that poverty has many dimensions and that alternative measures were preferable to the development of a single indicator. The surveys thus included questions to estimate poverty in a number of traditional ways (e.g. assets, expenditures), and from the respondent's own perspective.

5.1.3. Analysis and interpretation

There were many instances in which results from one type of method were able to help in the analysis or interpretation of results from another type. Here are the main examples:

- Case study analysis helped to explain changes in poverty indicators found in the quantitative analysis. The quantitative analysis was straightforward in examining levels of poverty and linking it to structural household factors. But the case

studies identified drivers of poverty. By combining both, a greater understanding of poverty processes emerged.

- Quantitative assessments on adoption helped to distinguish between tendency and outlier cases (e.g. in terms of intensity of technology adoption). Quantifying the extent to which the poor and other groups actually adopted and benefited from technology established the context in which individual experience fit.

- The quantitative analysis treated technology adoption as a homogeneous process, focusing on the extent of adoption. The case studies developed a more nuanced approach to how people modified the technology. This enabled an analysis of how the poor adapted technology differently than other groups. Some of these modifications could be explored in future surveys.

- Case study analysis qualified the interpretation of survey findings by noting the different objectives households pursued in adopting technology. The poor sometimes adopted the technologies not for the intended effect on soil fertility improvement but to gain access to wider networks or to sell tree seeds. This was not previously known from quantitative analysis and helped to reinterpret some of the results.

- Quantitative methods are very suitable for determining mean or average strengths of relationships and since these are almost always anticipated with some

probability, they can be easily explained. Qualitative analyses more easily

demonstrated diversity in outcomes as well as contributed toward their

explanation. Many of the 'outlier' responses could not be fully anticipated and

therefore were not catered for by questions on the survey. These nuances helped

to explain why certain relationships did not emerge from quantitative analysis. For

example, the case studies showed why farm size was not highly related to poverty

level; other factors such as competing demand on time with off-farm jobs and the

ability to mobilize labor for agricultural tasks appear overridingly important in the

case study accounts (see also Mango, 2002).

- Quantitative analysis was better at convincingly demonstrating the wider

  relationships between certain variables, such as dissemination methods,

  institutions and knowledge acquisition outcomes. But the qualitative methods were

  necessary for explaining why these methods and institutions were more or less

  effective in reaching different categories of farmers, those poor or better-off

  farmers, men or women. These explanations involved complex issues of status

  and power, which are difficult to unearth, much less explore using survey

  questions.

- Qualitative data was better at providing insights into power and socio-cultural

  relationships that were particularly salient in the research on dissemination

  strategies. In our dissemination study, the focus groups yielded many insights on

  these issues. While groups can have the effect of dampening participation by

some, they can also generate debates and responses from individuals who might not raise points on their own. This seemed to be the case in comparing the focus group and case study data on dissemination. The survey analysis was not able to address the effects of socio-cultural relationships, but did benefit from these qualitative findings, testing for linkages between access to information and household poverty indicators.

There are many other potential powerful benefits from integration, but they were not prominent in our study for some of the reasons in (5.2) below.

5.2 For remaining empirical gaps, how could improved methodological integration help and what are the practical difficulties of integration that may inhibit filling those gaps?
One difficulty concerned the ability for the team to get together. There was ample time to prepare for the fieldwork and the team was able to meet several times to plan and refine the research design. There was much less time and budget in the scope of the project for analysis, and opportunities for qualitative and quantitative analysis to inform each other were thus limited. Moreover, fieldworkers could not be retained throughout the analysis phase of the project, so that some field insights were lost in the process. Time constraints also hindered one of the more potentially useful forms of mixed-method research: iterative data collection and analysis processes. Though there was some iteration—earlier PRA research informed surveys; survey data informed the next round of qualitative research to some extent. An analytical session that followed the qualitative research could potentially have informed the last survey, but there was some rigidity with

the panel data set due to available baseline variables and the limited size of the sample to take on added complexity. So the main 2001-2002 quantitative and qualitative research processes were carried out largely separately, with insufficient time available for using findings to determine what the next round of questions should be.   Also, the case study data, once written up, was easily accessible to quantitative analysts, as they were written in a way that most scientists can understand. However, making the large quantitative datasets more accessible to qualitative analysts takes time and was not done properly due to the urgency of completing analyses.

Of a more general nature, the quantitative specialists on the team were economists while qualitative specialists came from sociology backgrounds. These different backgrounds and disciplines meant we came into the project with different assumptions about poverty and its causes. We were able to understand each other's different viewpoints as valid, but the differences still emerge in the write-ups—it is usually clear where an economist or sociologist was responsible for the drafting of different sections, and in some places these perspectives even appear contradictory. It is also important to consider how to build institutional capacity for undertaking mixed method research on an ongoing basis (outside of the context of the research team put together for this project), and an institutional culture supportive of this approach.

There are also some inherent differences in the nature of data that lead to difficulties of integration. One obvious difficulty is that because of differences in sample sizes, the qualitative analysis captures what is occurring across a small proportion of these

households, and will probably not be able to explain many things that the survey picks up.   By its nature, quantitative analysis must assume similar models of behavior for all households. This is beneficial for systematically testing for effects of specific variables, though its high degree of complexity can render interpretation difficult. In contrast, the case studies were not structured to evaluate the influence of a particular variable across all households so there is a chance that apparent important findings from survey analysis are not followed up in the case studies; and then its omission in the case studies could be taken to mean lack of importance. These are both problems that good researchers will watch out for. However, there are strong advantages in the qualitative research for understanding cause and effect relationships if the researcher is well trained.

Finally, there are financial and time-cost implications for combining research methods, and professional pressures to publish within the boundaries of one's own discipline. All of these serve as disincentives for using mixed method research. The implication of our study findings presented here, however, is that if poverty reduction is a serious objective of agriculture research, then these investments are essential. It is important then to think about what new incentives for mixed method research might look like.

6. Conclusions

This paper has discussed the methodological strengths of combining quantitative and qualitative approaches in researching poverty, using a study of the impact of agricultural research on poverty in Western Kenya. We found, as others have in the past, that quantitative and qualitative methodological approaches each had their strengths and

weaknesses in generating certain types of empirical information. Large-scale survey data and econometric analysis are well equipped to investigate trends and changes, and make more generalizable inferences with respect to certain topics. Qualitative methods were more effective in unraveling poverty processes, for dealing with social concepts such as status, power, or stigma, and for understanding the reasons why people do what they do. Both methodological approaches contributed to the detailed description of what poverty actually means for those involved.

Both sets of methods found that defining the poor by one criterion does not generate the same results when other criteria are applied. Poverty is thus multidimensional and difficult to determine regardless of method, normative criteria are particularly tricky for understanding poverty, and findings derived from any method must be further contextualized. Laziness is given considerable local attention as a cause of poverty, but if quantified would be misleading—rather, it needs to be unpacked with reference to the socio-cultural context in which this association is made.

Poverty in its static and dynamic aspects is difficult to measure and explain using any method, and applying these different lenses just increased the complexity of the task. In the context of the rapid changes in conditions, it may also be more useful, theoretically and from a policy perspective, to explore vulnerability. Vulnerability shows the processes and conditions under which people may become poor. Yet this concept will also be difficult to explore with quantitative and qualitative methods. Finally, what is needed is not only the combination of quantitative and qualitative methods, but also multiple

methods within each category in a study that has adequate resources and time to truly integrate at each stage of the process. It would be particularly valuable to return to our case study households after another five years, to see what has occurred in relation to agroforestry technologies, but also their lives and livelihoods more generally. The collection and analysis of quantitative and qualitative panel data sets would increase the ability to unearth these complicated processes. We would then be able to better theorize vulnerability, and understand its relationship to technology and other development interventions.

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End Notes

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[1] This paper will not review the recent literature that examines the benefits and challenges in integrating qualitative and quantitative methods. Those are aptly covered in other publications, notably Kanbur (2003) and White (2002).

[2] Since the 1970s, impact assessment in the CGIAR has evolved from crop management research, to returns to investment, equity consequences, spillover effects and sectoral linkages in the 1980s, and to gender, health and the environment in the 1990s (Pingali 2000). The dominant tradition within which this impact assessment has taken place has been economic evaluation, supplemented by peer review and external review by expert panels. Social and environmental impact assessment and participatory evaluation have been minor branches of evaluation (Horton 1998)

[3] This wider project was commissioned by the CGIAR's Standing Panel on Impact Assessment and coordinated by IFPRI. The other country studies were in Bangladesh, Zimbabwe and Mexico. For more on this project and the experience using mixed-research methods and integrated social and economic analysis, see Meinzen-Dick et. al. 2004; Adato and Meinzen-Dick 2003. The full substantive findings of the Kenya case study are reported in Place et al., 2005.

[4] These questions are answered in Place et al. 2005
[5] Part of the new quantitative study households formed a panel with the earlier survey.
[6] Pilot sites refer to those where ICRAF initially engaged with villagers to test soil fertility enhancing agroforestry systems and thus farmers there have had longer experience in using the technology. Introduction to the technology was carried out by others (e.g. extension) in the non-pilot villages, beginning a couple of years later.

[7] For the baseline, 120 households were interviewed, but due to incomplete data, deaths, and other factors, only 103 samples could be used for the full analysis.

[8] Our findings were consistent with those of the World Bank-led project *Voices of the Poor* (Narayan et al. 2000), that emphasized the multi-dimensional nature of poverty, including powerlessness, shame and humiliation.

Although people may also hide things from qualitative researchers, this is less likely using extended case study methods, because of the length of time in the field to develop rapport, cross-check replies and observe