An ethnographic exploration of the impacts of HIV/AIDS on soil fertility management among smallholders in Butula, western Kenya

M. Misiko

Tropical Soil Biology and Fertility Institute of the International Centre for Tropical Agriculture (TSBF-CIAT), P.O. Box 30677-00100, Nairobi, Kenya (tel: +254-(0)20-722 4752/5; fax: +254-(0)20-722 4763/4; e-mail: m.misiko@cgiar.org)

Recieved 11 March 2008; accepted 30 November 2008

Abstract

This paper shows how HIV/AIDS negatively affects soil fertility management strategies among Kenyan smallholders. The paper examines this relationship, using ethnographic interviews of purposively selected affected households in Butula Division, Busia District, Kenya. Soil fertility management was given low priority in the face of high HIV/AIDS prevalence although it is a critical resource for meeting basic needs. Findings show that HIV/AIDS poses a significant and complex threat to the already deficient soil fertility management practices among smallholders. The disease's synergistic relation with poverty increases the stress on soil fertility management. It destructs local social structures and households by taking away resource persons, overburdening traditional insurance systems, and obliterating any modest capital and labour useful for soil fertility management that has been accumulated by the household. There is need for robust soil fertility policy-action frameworks that can be sustained under the limiting conditions of affected households and that can mitigate HIV/AIDS impacts amidst high poverty.

Additional keywords: capital, HIV/AIDS prevalence, household, labour, poverty

Introduction

The Human Immunodeficiency Virus and the Acquired Immune Deficiency Syndrome (HIV/AIDS) have multiple wide-ranging impacts, from individual to national levels (Haddad & Gillespie, 2001). This paper focuses on impacts on soil fertility management among smallholders at the local level. The negative effects of soil infertility in rural Sub-Saharan Africa are evident and interlinked with those of HIV/AIDS. The relationship between these two problems is a cause for grave concern (e.g., Anon., 2002; 2004).

Africa is unlikely to overcome its agricultural problems without addressing the HIV/AIDS problem that has led to dire shortages of labour, depletion of household resources, human nutritional decline and knowledge erosion (Loevinsohn & Gillespie, 2003).

Butula Division, like the rest of Kenya, is highly dependent on agriculture. Agriculture directly and indirectly accounts for about 80% of employment opportunities (Anon., 2005). Population pressure has been blamed for declining soil fertility (Misiko, 2007), although rigorous research shows that this is not necessarily the case (Tiffen *et al.*, 1994). HIV/AIDS is also threatening agricultural development. It is causing households that practise subsistence agriculture to neglect even basic traditional practices such as applying manure and compost and using traditional seed production systems. The effects of HIV/AIDS are reflected in labour shortages for farm work, while labour is widely seen as a crucial factor in soil fertility management (Anon., 2002). Relatively little effort has been made by soil scientists to assess HIV/AIDS impacts on agricultural production. Field research staff is not expected to deal with HIV/AIDS as part of their ongoing work, even when its detrimental effects are clearly visible. As it is put in the local language, it is like *shida sio tu mzigo mzito, ni utelezi wa sakafu* (ignoring the mud that causes one's burdened legs to slide). Against this background, this paper assesses the impact of HIV/AIDS on soil fertility management among smallholder farmers by studying selected cases in Butula Division, western Kenya.

Methodology

Study area

The study was carried out in Butula Division, Busia District, Kenya. Butula is one of the six sites of the project Strengthening 'Folk Ecology' that was initiated by the Tropical Soil Biology and Fertility Institute (TSBF) of the International Centre for Tropical Agriculture (CIAT). This site was purposively identified because of the high prevalence of HIV/AIDS (Anon., 2000), which in 2007 was estimated at about 33% (Anon., 2007).

In Butula the Abamarachi (a sub-group of the Luyia) form the dominant ethnic group. The Abamarachi have a patrilineal kinship system with extensive (customary) property rights vested in men. Women do most of the farm work and the household chores. They are less mobile than men, who spend more time in urban centres or are engaged in non-farm income-generating activities. Due to changes in family structures as a consequence of HIV/AIDS there are an increasing number of child-headed households (Misiko, 2007).

The population density of Butula in 2002 was estimated at 426 persons per square kilometre (Anon., 2003). Most households own less than 0.8 ha of land (Misiko, 2007). The infant mortality rate is 125.9 per 1000 and the under-five-mortality rate 210 per 1000. The total fertility rate is 6.1 children and the average household size is 6.5. Prevalent diseases in the area, apart from HIV/AIDS, include malaria, typhoid, amebiosis, intestinal parasites/worms, respiratory tract infections, tuberculosis, venereal diseases, skin diseases and measles. Butula has one sub-district hospital, one health centre and two dispensaries. For 47.5% of the households it takes more than one hour to reach the nearest healthcare facility and the divisional agricultural office (Anon., 2007).

Butula has a mean annual rainfall of 1500 mm (Anon., 1997). The soils in the study villages in Butula can be characterized as chromic and orthic Acrisols, dystric Nitisols and rhodic Ferralsols, with partly petroferric and dystric phases. The sampled households were situated at about 1300–1350 m above sea level. Soil samples taken from representative farms in 2003 showed severe N and P deficiencies (Misiko, 2007).

Common crops grown in Butula include maize (*Zea mays* L.), common bean (*Phaseolus vulgaris* L.), cassava (*Manihot esculenta* Crantz), sorghum (*Sorghum bicolor* (L.) Moench), sweet potato (*Ipomoea batatas* (L.) Poir.), cowpea (*Vigna unguiculata* (L.) Walp.), finger millet (*Eleusine coracana* (L.) Gaertn. ssp. *Africana*), green gram (*Vigna radiata* L.R. Wilczek), sim sim (*Sesamum indicum* L.), sugarcane (*Saccharum officinarum* L.), banana (*Musa* spp. L.), many species of vegetables, and mango (*Mangifera indica* L.) (Tittonell *et al.*, 2005; Misiko, 2007). Common livestock include poultry, cattle, goats and sheep.

Sampling

Resource persons were used to purposively identify and sample 30 households in two small villages of about 90 households that had been seriously affected by HIV/AIDS. Twenty-three were female-headed, and two were child-headed with some assistance from close relatives. Special cases were studied in depth, notably those who had previously been involved in project activities or soil fertility management but had their efforts ruined as a result of HIV/AIDS. This part of the study covered two households, five key informants and two women's groups with a membership of about 20 women each, some of whom came from neighbouring villages. The two women's groups were made up of widows who were particularly suffering from the effects of HIV/AIDS. The two households that were studied in depth were represented by an adult male member and an adult female member. They were interviewed repeatedly and visited several times by the researcher to allow naturalistic interactions during shared work around the house and in the fields.

Qualitative data collection and management

The study was based on ethnographic methods (Frankfort-Nachmias & Nachmias, 2005). Data were gathered through participant observation and in-depth interviews among affected householders and women's groups. Two focus group discussions (FGD 1 & 2) (Krueger, 1994) were held with the two widow groups and one with purposively selected key informants (FGD 3). Detailed notes from the focus group discussions and in-depth interviews were processed, transcribed and analysed manually, using thematic and content analysis. In addition, two cases of households hit hard by HIV/AIDS were documented. For confidentiality reasons pseudonyms are used in the quotations used in this paper.

Main findings

Household activities and socio-demographic profile

From the three focus group discussions (FGDs) the following picture emerged of the

households in Butula. The households included relatively many children under 10 years old, implying a heavy dependency burden. At the maximum only two household members were engaged in subsistence farming or otherwise gainfully employed. Key informants indicated dramatic changes in household composition of those affected by HIV/AIDS, with direct negative implications for soil fertility management. According to the key informants, more than one third of all households in Butula no longer resembled the traditional Abamarachi household. By way of listing and classifying which households were 'not normal', key informants concluded that about one quarter of the 90 households in the two villages were headed by women, especially widows, and about one ninth were headed by grandparents (after their children had died from AIDS-related illnesses). Child-headed households were few but were emerging faster than the community was prepared to deal with. Most of these children did not go to school, did not have useful farming knowledge, and were opting to migrate to urban areas to beg, or were simply offering cheap labour in the villages. Most of the affected households had stopped attending agricultural research and extension meetings and were not applying the knowledge and implementing the technologies that were being disseminated to improve their agricultural productivity.

Selected perceptions of HIV/AIDS

HIV/AIDS is now so common in Butula that people no longer entirely blame witchcraft for it. A general perception is that HIV is real but that one may contract it as a result of being 'pushed into bad luck' through witchcraft, as the following statement shows:

> "*This problem is real. My children may have strayed... I strongly suspect so. But there are many worse rogues who have not died. Why did my son, my daughter-in-law, and my two grandchildren have to perish? Why all this pain on my household only? There are people who know why!*" (Perris 003, 13.10.07/Butula)

In Butula, there are several government and NGO initiatives that aim at informing people about HIV-related issues, which has increased knowledge on HIV/AIDS among smallholder farmers (Anon., 2000). The high incidence of HIV/AIDS makes it common knowledge who in the community is suffering or who died from AIDS-related illnesses. However, there are also cases of successful treatment with antiretroviral drugs (ARV). Because this makes HIV/AIDS even more mysterious, many myths abound. A perception that was gaining momentum was that successfully treated persons are cured. As one key informant said:

> "*...because ARVs hide the symptoms of HIV/AIDS, the community may perceive these infected as having been healed, or never having been infected. Many carriers of HIV have remarried, or are spreading the virus. The perception here [Butula] is that they were not suffering from the disease or must have been mistaken as a result of witchcraft.*" (Priscilla 007, 12.10.07/Butula)

The key informant interviews and FGDs show that HIV/AIDS is broadly blamed for poverty and alcohol abuse. Other factors mentioned were polygamy, remarrying of infected widows, healing practices where a single razor blade is used on several patients when administering local medicine, specific funeral practices or celebrations, urbanization, and sins such as adultery and infidelity.

There appears to be a close link between the perception of human health status and the 'health' of the soil. An example of a widely held analogy in Butula is the idea that 'soil is mother' (*udongo ni mama*, Swahili). Like a woman's womb, soil can be barren. Fertility levels were described in terms such as health and energy, tiredness (Misiko, 2007). *The more the soil is used, the more tired or sick it becomes* (FGD 1). As with humans, good health is the normal expected condition. Terms like sick, tired, low in energy or old, when applied to soil, show the farmer's focus on infertility (i.e., deficiency and ill-health). A soil that is 'unhealthy' or low in energy (i.e., tired, as seen in crop performance) is 'weak' and possibly 'old' (Misiko, 2007). If the owners of land are sick, or their farm is 'bewitched' (*imeharibiwa na waovu*, Swahili), one of the symptoms is low soil fertility or crop productivity. For example, according to FGD 1, there is a direct link between sick malnourished children and the status of soil fertility. Previous interviews (e.g., Professor, 03.08.05/ Butula) showed similar findings: *unaweza kuona umaskini wa udongo kwa kuangalia kwashiorkor ya watoto, au mimea isiyo na afya* (one can tell the status of soil fertility on a farm by observing whether the children have kwashiorkor or the crops are stunted). In people's perception, land and human welfare are thus intricately linked, with each one affecting the other (Misiko, 2007).

The influence of HIV/AIDS on soil fertility and crop choice

Some traditional crops that were preferred and known to be tolerant of low soil fertility, were at the same time being abandoned because of labour constraints. For example, millet and sorghum, though not necessarily more labour-intensive in the field than maize, require more labour input during processing and take longer to be ready for consumption, because they cannot be roasted like maize. Pests, diseases, weeds (as a result of poor management and infertile soils), and the lack of markets are compounding factors. Labour constraints result in the farmland reverting to natural or weedy fields that increasingly are dominated by bushes. Natural fallows in western Kenya are not necessarily good for soil fertility. They tend to become dominated by poor plant species such as poverty grass (*Danthonia spicata*) and guava (*Psidium guajava* L.). Cassava (*Manihot esculenta* Crantz) is perhaps the one most often referred to by the average smallholder in Butula as a 'reliable' crop because it yields 'something' even with little tillage and weeding. Cassava was left as bushy 'fallow' on many farms and was believed to improve soil fertility (Saïdou, 2006; Misiko, 2007). The main factor underlying this practice is the illness or death of prime-aged persons, entailing loss of labour and income for the households concerned, resulting in inability to hire labour and buy fertilizer and seed. The purchase of livestock that could provide manure is also no longer possible. Key informants expressed their fear that members of affected households would lose their zest for life and sense of purpose needed for good soil fertility management. Soil fertility management is a long-term investment that cannot compete with the immediate threats of HIV/AIDS.

Key informants and participants in the three focus groups indicated that affected households had experienced notable decreases in agricultural production as a result of HIV/AIDS. These decreases were directly associated with depletion of household labour, lack of investment in soil fertility management, loss of assets like cattle and land, and increased *per capita* workload. Loss of skills and knowledge were also mentioned as critical

impacts, since HIV/AIDS had eliminated resource persons or had infringed on the time available to attend extension meetings or build social capital (as also reported by Haddad & Gillespie, 2001; Anon., 2002; 2007).

HIV/AIDS directly frustrates soil fertility management efforts. It also affects the nutritional status of the household members remaining behind, thereby decreasing their energy to manage soil fertility meaningfully. Most new soil fertility management technologies are labour and knowledge intensive (Misiko & Ramisch, 2007). Butula is a low-mechanized farming community and, given that AIDS is concentrated in the productive age groups, there is a serious decrease in key resource persons who can work the soil and market crops. Given women's critical role in subsistence farming, the decline of their contribution to soil fertility management as a result of their own illness or caring for ill family members, is especially destructive. Additionally, women's access to land is constrained by patrilineal land tenure. Upon the death of her husband a woman has to surrender the land to her in-laws and cannot decide on its use. Generally, widows and grandparents caring for their orphaned grandchildren were reportedly not motivated to invest in the land either. The following two cases show how soil fertility management is no longer prioritized in such circumstances.

Case 1: Soil fertility management in an overburdened household

Justin is 32 years old. He completed secondary education and has no formal employment. He was born into a family of 18. His father died in 1994 and left behind four widows. Justin himself has six children, born of his two wives. His household includes the four children of one of his late sisters. The total number of people Justin directly takes care of is 17.

Justin is an active member of a local HIV/AIDS awareness and prevention team. He is the site *Resource Person* for TSBF-CIAT in Butula and an active participant in experimentation, knowledge dissemination and new seed technology promotion. His household's livelihood depends mainly on brick making, poultry keeping, bicycle transportation (locally called *boda-boda*), and growing and selling vegetables. HIV/AIDS has altered Justin's household immensely, eroding the potential for generating and accumulating income and increasing its social burden. Justin says:

> *"After the death of my father, my sisters married early. They had no strong custodian to prevent this and stand by them against the abuse that they suffered in their marriage. They were divorced only to end in a worse situation after that. Their estranged marriages have resulted in children who have been 'dumped' on me here. My father's widows are sick and cannot work. Two are infected with HIV. They did not inherit any meaningful assets. Their children are HIV positive, like some of my nephews and nieces. That means my sister likely became infected during her marriage. All this brings an immense stigma on this household. There is an enormous burden on those of us (my wives and I) who can work. My household suffers perennial labour shortage. We have been selling assets to pay for debts, medical bills, food needs and fuel. Now, we have almost run out of assets. I am soliciting for funds to help pay for some of the medical expenses. So you see, you can not expect my family to buy certified seed, new hoes, quality manure, fertilizer, or pesticides. We do not have time to prepare our farm timely, or weed our crops as before. Our priorities are simply not in investing in the soil, though we would like to do so. But, that is*

nothing. The real problem we are experiencing in Butula is bigger: it is called confusion or loss of hope." (Justin 002, 09.10.07/Butula)

Case 2: Abandonment of soil fertility management as a result of HIV/AIDS

Esteri is aged 37. She excelled at primary school, but there were no funds to continue her education. She has no formal employment. Esteri is the youngest of a family of five children. She has lost all her brothers and sisters to HIV/AIDS. She alone now has to take care of their five children and four of her own.

Esteri is an active member of an agricultural self help group in Butula. She has participated in TSBF-CIAT projects in Butula for more than four years now. Her household's livelihood depends mainly on pig rearing, poultry keeping, weaving and selling baskets and hats, and growing vegetables and other crops. She says:

"*I decided to take care of my brothers' children to maintain discipline and keep them together, to ensure that they get food and clothing, and prevent them from ending up as street urchins or as slaves in the hands of labour-hungry predators. After the death of my siblings, these children had no custodian to protect, guide and counsel them, or to prevent them from being abused. It has not been easy, however. The activities I engage in scarcely help to provide for basic maintenance, such as fuel (kerosene), salt, and soap. I struggle with primary school fees. I can rarely afford a balanced diet, let alone an adequate meal. These children have to deal with a constant stigma. They often fall sick and miss school. There is scarcity of all basics (clothing, medication, food, housing). These children are very young, and, unlike my neighbours, I have resisted to draw them into farming. They have to attend school, but I fear this may not help them to understand how to till the land. I sometimes fear that they may not get the very essential survival skills. They depend entirely on me. The harvest is so little because I cannot afford fertilizer or other crucial inputs. I have never known how to beg. I have always worked hard, earned and invested in the land through planting soya bean, relying on biomass transfer, even buying mineral fertilizer like di-ammonium phosphate and Mavuno (a compound fertilizer blend).*

Our off-farm income sources were so critical for soil fertility management, payment of labour and buying of inputs, but when my brothers and sisters fell sick due to AIDS I diverted my resources and energy to saving them. I paid for their funerals. Sadly, they left behind no meaningful assets to help bring up the children. My late brothers had not even secured land title deeds, and now the security of their farms rests solely on my effort. And you know what is happening: increases in fertilizer prices, health costs and education expenses, which only complicates our lives beyond words. I now only manage to engage in those less capital intensive enterprises, which are not paying enough to allow meaningful soil fertility management. If you want a good harvest you must invest endlessly in good soil fertility management. Unfortunately, no hungry human eats soil fertility. Our soils are so poor, and we are told by you people (researchers) that we first need to rebuild soil fertility before we can attain sustainable production levels. This is extremely problematic." (Esteri 001, 09.10.07/Butula)

Discussion: the larger picture

The above cases illustrate how HIV/AIDS has changed smallholder households. Traditional smallholder households were built on the assumption that only few people would die and that if one or two members would fall ill the others could fend for them. HIV/AIDS has changed this dramatically. Affected smallholder-householders have to live with psychological traumas for which there is no cultural insurance mechanism. Current interventions by the government or NGOs do not address such fundamental issues as psychological support and soil fertility management, which are so necessary for food security. For young widows the situation is especially traumatic. Their husband's home is not their own, and they have to live with the stigma, the blame and social and culture-related insecurities.

Soil fertility and poverty under HIV/AIDS impacts

Another dimension that needs to be highlighted in the above cases is that crop pests, crop diseases, Striga weed, erratic climatic effects, are all connected to poorly managed or unattended farmfields (e.g., Anon., 2002). Households have no resources or time to look for solutions to diseases of preferred crops, such as banana streak virus, soya bean rust, groundnut rosette disease, cassava mosaic virus, or to irrigate their fields if the rains fail. They have no funds to invest in soil fertility or meaningful agricultural development.

Support to learning processes and decision-making

Smallholders are facing changes in the systems they manage, which to them are rapid and unprecedented (Loevinsohn & Gillespie, 2003). The causes range from the collapse of established markets, extreme weather events linked to climate change, the emergence of new weeds, pests or diseases, and soil degradation. In this situation, research at the Tropical Soil Biology and Fertility Institute (TSBF) has sought to support smallholders in rethinking their decision-making. The key methods comprise two main elements: learning processes and decision-support tools, to help farmers grasp soil fertility concepts deemed critical for the systems they manage. Aspects such as soil nutrients and biological processes are difficult to grasp for smallholders because they are hardly visible. Smallholders are positivists; they judge by outcomes, i.e., crop yields. Similarly, they see that HIV/AIDS 'disappears' with antiretroviral drugs. To them this HIV/AIDS thing is unclear; if it can disappear like bewitchment then it must be beyond individual control. Hence, solutions to the problem of HIV/AIDS should also be based on approaches that encourage discussion and reflection on immediate experiences of the people concerned within specific contexts, while focusing on outcomes or practical applications. This may demystify HIV/AIDS, while – at the same time – addressing underlying long-term effects.

The potential contribution of new germplasm

All households and groups studied were quick to point to successes with new high-yielding germplasm, such as the common bean variety KK15 and the soya bean variety SB20,

introduced by the Kenya Agricultural Research Institute (KARI) and TSBF. TSBF envisages soya bean as an entry point for addressing N_2-fixation, human nutritional problems, HIV-related illnesses, and smallholder income. The new soya bean varieties promoted in Butula are promiscuous. They can fix atmospheric nitrogen without artificial inoculation. These varieties are leafy and result in more biomass for incorporation into the soils than local varieties, and smallholders see biomass cover as good for soil moisture conservation, smothering a pernicious weed, Striga, and reduced weeding requirements.

These are no uncomplicated solutions, however. Even promiscuous legumes require phosphorous (P). P is only adequately sourced through mineral fertilizer. There still are many marketing issues to deal with. The consumption of foods such as soya beans is also an issue. Butula smallholders were only beginning to understand how to process soya beans to make them edible (Misiko, 2007). The farmers' preferred solution mentioned in interviews and focus group discussions was the cow, as is illustrated by what one of the women said: "Give me a cow and I'll manage soil fertility. Give me a cow, and these children will not suffer from malnutrition. You see, the cow is a bank that does not require me to go far all the time."...(Penina, 005, 14.10.07/Butula)

Conclusions

This study shows that priority problems among smallholder households in Butula include disease, school fees, immediate food needs, shelter and women's land rights. There is no doubt that soil fertility is a major problem too and scientists will need to focus on how good soil fertility management contributes to solving the other problems. In other words, soil fertility technologies need to be presented as solutions that do not pose new complications for the troubled households. Such solutions were far from arrived at.

However, the promotion of soya bean was seen by women's groups as offering practical solutions for the long term. The two widow groups in the study (FGD1 & 2) saw legume farming (soya bean) as useful in the fight against the effects of HIV/AIDS. Therefore, mainstreaming HIV/AIDS messages into agricultural research was a practical beginning, but then the nature of utilization of these technologies that were introduced to these households becomes of crucial importance.

Smallholders want convenient but effective techniques for soil fertility management (Misiko, 2007). Many of the HIV/AIDS-induced problems will have to be dealt with by longer-term policy-related action frameworks. These will have to address crop pest and disease control, marketing, development of acceptable weed-resistant crop varieties, and some immediate relief for the hard-hit, for example by direct supply of improved seed. These are necessary steps that give rise to other development problems, such as those with water and nutrition, all interconnected with HIV/AIDS, and the general issue of human health. Soil fertility management researchers will need to be keener on these 'other' issues. They have to develop technologies that, for example, are not labour-intensive and require little additional input, and they will need to address issues of improved farming husbandry skills through better knowledge dissemination. Longer-term researchers will have to partner with farmer groups to address the problems holistically, in collaboration with institutions dealing with HIV/AIDS issues.

Acknowledgements

Special thanks are due to the TSBF-CIAT Institute and the International Development and Research Centre (IDRC) for their financial and logistical support. I gratefully acknowledge Ken Otsieno, who worked closely with me to complete data collection and interpretation. I am much indebted to all farmers who directly and indirectly participated in this study.

References

Anonymous, 1997. Busia District Development Plan 1997–2001. Republic of Kenya. Government Printer, Nairobi, 49 pp.

Anonymous, 2000. The Impact of HIV/AIDS on Education in Kenya, and the Potential for Using Education in the Widest Sense for the Prevention and Control of HIV/AIDS. Final Report UNICEF Kenya; Country Office Study. Government of Kenya & United Nations Children's Fund (UNICEF) Kenya Country Office, Nairobi, 140 pp.

Anonymous, 2002. The impact of HIV/AIDS on Agricultural Production and Mainstreaming HIV/AIDS Messages into Agricultural Extension in Uganda. Food and Agriculture Organization of the United Nations (FAO), Rome, 25 pp.

Anonymous, 2003. Annual Report 2003 Kenya Country Programme. African Development & Emergency Organization (ADEO), Nairobi, 13 pp.

Anonymous, 2004. The Impact of AIDS. United Nations, New York, 10 pp.

Anonymous, 2005. Strategy for Revitalising Agriculture 2004–2014. Ministries of: Agriculture, Livestock and Fisheries Development; Co-operative Development; and Marketing, Nairobi, 20 pp.

Anonymous, 2007. Constituency Strategic Plans – Bulletin of the Institute of Economic Affairs, Issue 3, March 2007, 8 pp.

Frankfort-Nachmias, C. & D. Nachmias, 2005. Research Methods in the Social Sciences (5th edition). Arnold, London, 640 pp.

Haddad, L. & S. Gillespie, 2001. Effective food and nutrition policy response to HIV/AIDS: what we know and we need to know. *Journal of International Development* 13: 487–511.

Krueger, R.A., 1994. Focus Groups: A Practical Guide for Applied Research (2nd edition). Sage, Newbury Park, California, 191 pp.

Loevinsohn, M. & S. Gillespie, 2003. HIV/AIDS, Food Security and Rural Livelihoods: Understanding and Responding RENEWAL. Working Paper No 2. International Service for National Agricultural Research (ISNAR), The Hague & International Food Policy Research Institute (IFPRI), Washington, D.C., 40 pp.

Misiko, M., 2007. Fertile ground? Soil fertility management and the African smallholder. PhD thesis Wageningen University, Wageningen, 146 pp.

Misiko, M. & J. Ramisch, 2007. Integrated soil fertility management technologies: review for scaling up. In: A. Bationo, B. Waswa, J. Kihara & J. Kimetu (Eds), Advances in Integrated Soil Fertility Management in Sub-Saharan Africa: Challenges and Opportunities. Springer, London, pp. 873–880.

Saïdou, A., 2006. Converging Strategies by Farmers and Scientists to Improve Soil Fertility and Enhance Crop Production in Benin. Tropical Resource Management Papers No 84. Wageningen University

and Research Centre, Wageningen, 225 pp.

Tiffen, M., M. Mortimore & F. Gichuki, 1994. More People, Less Erosion: Environmental Recovery in Kenya. John Wiley, Chichester, 328 pp.

Tittonell, P., B. Vanlauwe, P.A. Leffelaar, E.C. Rowe & K.E. Giller, 2005. Exploring diversity in soil fertility management of smallholder farms in Western Kenya. I. Heterogeneity at region and farm scale. *Agriculture, Ecosystems and Environment* 110: 149–165.