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Understanding Soil in its Social Context: Integrating Social and Natural Science Research within AfNet

Ramisch, J.J.

Social Science Officer, TSBF, P.O. Box 30677 Nairobi, Kenya (j.ramisch@cgiar.org)

Abstract

Continuing dialogue between the natural and social sciences means that the conception of integrated natural resource management (INRM) is evolving from largely discipline-based approaches to more integrative, holistic ones. This paper presents examples of opportunities for integrating natural and social sciences including understanding the social forces driving soil fertility changes, identifying the clients for new technologies, and improving the sharing of knowledge and information between farmers and researchers. It also outlines theoretical and methodological

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approaches for integrating social science into TSBF's research activities, and identifies strategic lessons from the past decade's research that would be relevant for TSBF's partners within the Africa Network for Soil Biology and Fertility (AfNet).

While individual disciplines still retain preferred modes of conducting fieldwork (i.e.: participant observation and community-based learning for "social" research, replicated trial plots for the "biological" research) a more "balanced" integration of these modes is evolving around activities of mutual interest and importance, such as those relating to understanding on-farm variability and providing decision support for farmers. Since TSBF works through partnerships with national research and extension services, it has an important role in stimulating the growth of common bodies of knowledge and practice at the interface between research, extension, and farming. To do so requires strong champions for interdisciplinary, collaborative learning from both natural and social science backgrounds, the commitment of time and resources, and patience.

Introduction

The Tropical Soil Biology and Fertility (TSBF) Programme (now Institute) was created in 1984 under the patronage of the Man and Biosphere programme of UNESCO and recently incorporated into the Future Harvest system of food and environment research centres as a research Institute of the Centro Internacional de Agricultura Tropical (CIAT). As an international research body, the underlying justification of TSBF's work has been that "the fertility of tropical soils is controlled by biological processes and can be managed by the manipulation of these processes" (Woomer and Swift, 1994).

Being an organisation with an explicitly biological and ecological mandate and origin, TSBF has nonetheless sought social science input into its research program. However, since TSBF has always been a small team (never more than six internationally recruited scientists), much of TSBF's considerable output has therefore been generated through collaboration with partner organisations (both national and international), with a special focus on sub-Saharan Africa through the African Network for Soil Biology and Fertility (Afnet). The decision to develop and maintain a core competency at the interface of social and natural sciences at TSBF has also provided a helpful nucleus for building social science competency with partners.

This paper explores the need for greater integration of social and natural science methods in dealing with soil biology and fertility management, and the potential for doing so within AfNet or other African organisations. It presents key programmatic areas where the potential for synergy is high, and suggests ways of building familiarity and competency with interdisciplinary methods and approaches.

The second half of the paper examines the historical record of TSBF and AfNet as "laboratories" for developing meaningful interdisciplinary dialogue and collaboration, and asks whether what has emerged so far has been "social soil science" or merely "soiled social science". Examples of theoretical and methodological evolution are drawn from "grey" project literature, personal commentary, and publications. The strategic lessons from these examples reflect in microcosm the much broader debates about the potential for "rigorous" science under competing disciplinary approaches to integrated natural resource management (INRM). They also address the all too common assumption that the responsibility for developing a common institutional culture and language within INRM falls more to social scientist "newcomers" than to biological or natural scientists.

Relating Natural and Social Sciences

Agriculture is a human endeavour, manipulating plants and soils in a complicated environment to sustain life and support economic and social livelihoods. As such, the management of soils always occurs in a social context and improvements to soil fertility management strategies will only come about if they satisfy the social and economic needs of farmers.

Traditional agronomic (or soil) research has tended to neglect these social components as "externalities" that merely impinge on the studied processes. However, there is great potential for synergy by understanding the social context of soil management, as the examples provided in the following sections will show. These examples are grouped around three key topics that can integrate natural and social sciences in integrated soil fertility management (ISFM) research:

a) Identifying the social forces **shaping soil fertility change**, including economic and demographic drivers, cultural factors, and policy environments.

b) Identifying the **clients for new or improved technologies**, the uses they will have for ISFM, and the decision-making criteria they use for evaluating both current and improved options.

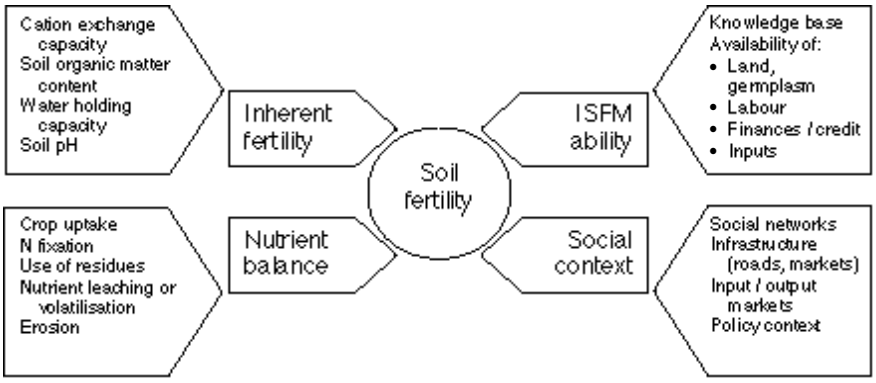
c) Improving the **sharing of soil fertility expertise**, by better understanding existing knowledge systems and improving communication and dissemination strategies to strengthen them.

The social context for fertility changes

Because the rural landscape is full of farms, and people living and working on them, it is often natural to conclude that rural people are therefore "farmers". Of course farming (whether for subsistence or market-oriented production) is only one of multiple rural livelihoods, such as artisanal work, petty trading, labour exchange, or seasonal migration.

Even people who indeed consider themselves "farmers" are not just soil managers, and management ability is a function of knowledge, and access to key resources (such as land, labour, germplasm, finances, and inputs). Beyond the farmer's management ability, the "fertility" of a soil is also function of inherent bio-physical properties, nutrient balances, and broader social contexts (Figure 35.1). As a result, decisions to manage (or to ignore managing) the soil resource are part of a trade-off analysis that considers the soil within a wider economic or livelihood sustainability framework. Research can play an important role here in understanding the conditions under which different interventions are likely to be profitable or attractive to farmers (cf. papers in this volume by Kaliba and Rabele, Kipsat *et al.*, and Mutiro and Murwira).

Figure 35.1: Soil fertility as an interaction of socio-economic and bio-physico-chemical properties.



Soil fertility changes, therefore, have their origins in many human-mediated processes that influence the rate and nature of the key biological and pedological processes (i.e.: erosion / sedimentation, organic matter decomposition / accumulation, etc.). Social differences between farmers (in terms of capital assets like land, labour, cash, and knowledge) and their institutional context will in turn systematically influence the types of soil management options available and the ultimate soil fertility status outcomes. Furthermore, social and soil fertility

changes interact with each other over the long term – strong soil managers are likely to improve their economic and social well-being while weaker ones may become trapped in declining or vulnerable livelihoods.

For example, Vihiga district in western Kenya is one of the most densely populated regions in sub-Saharan Africa, with between 1200 and 1400 people per km^2. Although endowed with a high potential climate and inherently fertile soils, the region's political history has left long-distance markets and infrastructure poorly-developed. Out-migration (particularly by young men) is extremely high, which serves both to give households access to off-farm income, and also as a means to reduce pressure on households to sub-divide their land amongst sons. Wealth ranking conducted in this area (Table 35.1) shows that the "wealthiest" households have better access to off-farm income, which can be used to pay hired labour and to support more intensive soil management. Less intensive soil fertility management strategies are associated with the middle and "poor" households, which often have to sell household labour to others.

Table 35.1: Relationship between ISFM practices and wealth class in Vihiga District, Kenya

	Wealthiest farmers (n=34)	Poorest farmers (n=59)
Agricultural labour	Hired + family	Family only
Off-farm income	56 %	20 %
Use fallowing	12 %	0 %
Rotate crops	32 %	22 %
Make compost	53 %	42 %
Regularly use manure	91 %	59 %
Ever used inorganic fertiliser	68 %	42 %
Land has SWC terraces	91 %	39 %

(Carter and Crowley . Unpublished data)

It is apparent from these data that the soil fertility problems of the "wealthy" farms would therefore differ significantly from those of the other households, and that soil fertility changes (either improvement or decline) are strongly related to the socio-economic and political dynamics of households' access to resources. The notion of establishing farmer typologies that relate household characteristics to land use behaviours and soil fertility outcomes has therefore taken root as one of the most useful interactions between social and natural sciences within ISFM research. Not only do these typologies improve the ability to explain existing patterns of soil fertility, but they facilitate better targeting of recommendations and decision support advice.

Technologies for whom?

It is widely recognised that the adoption of new soil fertility management technologies is uneven. Since not all farmers have similar needs or constraints, many studies attempt to determine the adoption potential for new technologies based on farmer characteristics (cf. Kaliba and Rabele, this volume). Socio-economic differences (as discussed in the previous section) may indeed help explain why some farmers are better able to afford the land, capital, or labour needed to experiment with or to use a new technology.

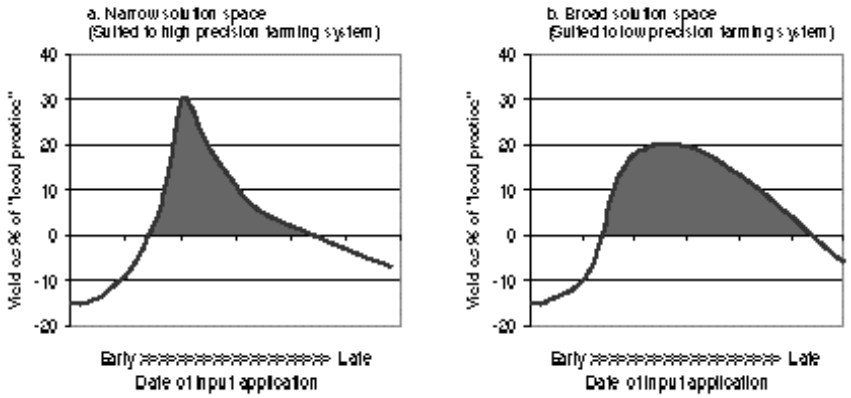
However, equally important for understanding the relationship between farmer difference and the acceptability of technologies is the notion of a farming system's "precision" (Reese and Sumberg, 2003). For a variety of reasons, farmers in rural Africa are often not in a position to act on or implement their decisions or plans in the precise manner, or at the precise times, that they might wish. Richards (1989) demonstrates that "how people actually farm" often contrasts sharply with how they might "ideally like to farm". The intervening reasons might be climatic (the rains may be early or late, too short or too heavy), institutional (the desired inputs such as seeds or fertilisers may not be available when required or at a reasonable price), or related to the household itself (labour appropriate to a specific task might not be available, because of competing demands, illness, or indeed simple "bad luck").

Farming systems where farmers exercise relatively little control over key components of their environment (*low precision* systems) differ markedly from those where they exercise more control (*high precision* systems). For example, maize in sub-Saharan Africa is often planted later than the ideal date because of labour constraints, risk considerations, and crop rotations, with consequent yield reductions of up to 75% compared to the optimal planting date (Byerlee and Heisey, 1996, using Zimbabwe as example).

The argument of Reece and Sumberg (2003) is that agricultural research has historically tended to neglect differences in farming system "precision", even while working to ensure that technologies continue to give acceptable yields across a range of environmental conditions. While plant breeding prioritises the yield "stability" of a crop variety over an environmental gradient (subject to minor location-specific adjustments) farmers who are unable to provide the precise management anticipated by the researcher may suffer significant yield losses. Clearly, research that is developing technologies for use in "low-precision" farming systems must acknowledge that farmers' management practices will vary, making questions of management adaptability as important as those of environmental adaptability.

Related to the concept of a farming system's "precision" is that of a technology's "solution space": the "area around an optimal set of operator-influenced conditions within which a technology will still yield 'positive' results" (Reece and Sumberg, 2003: 416). In Figure 35.2, the yield response of the crop in (A) is highly sensitive to the date of input application, whereas the option shown in (B) obtains a lower maximum but sustains favourable yields over a wider range of application dates. The area under the two curves represents the "solution space" of the two different technologies. The narrower solution space of technology (A) would be appropriate for a farmer who can control the management variable (in this case application date) with the needed precision. The second option (B) has a broader solution space and so would be more suited to a lower precision farming system.

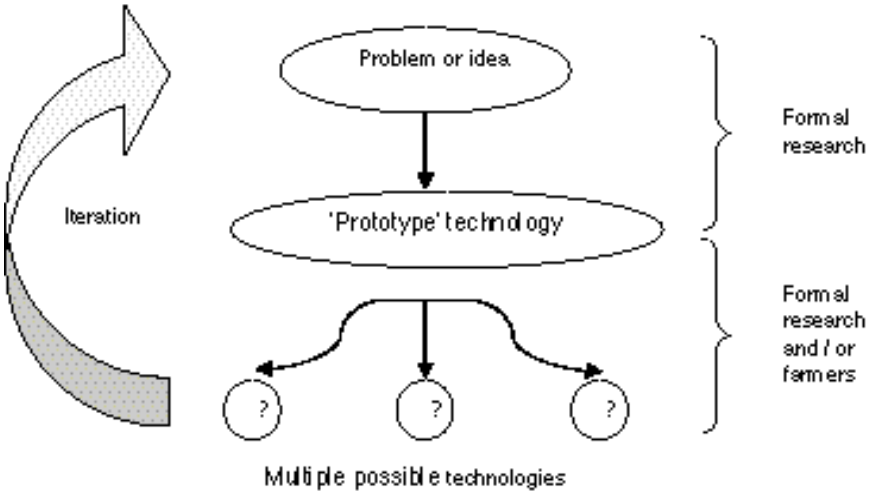
Figure 35.2: Comparing the response of two technologies with different "solution spaces".



(Adapted from Reece and Sumberg, 2003: 417)

To better match the precision of farming systems to technologies, technology design must involve the intended beneficiaries earlier. Figure 35.3 shows an idealised flowchart of a participatory technology design process, with control of the design moving from "formal" to "farmer-led" as soon as the comparative advantage shifts from researcher to farmer. The actual solution space of a given technology will become apparent as technology development takes place, defined as a direct result of the choices made (and options excluded) during this process by the people who will ultimately decide to use the technology. Thus the solution space that is defined for a given technology being perfected by its users will inevitably come to correspond to the precision of their farming system, and that space will also be smaller than the range of possibilities that had been open at the initial stages.

Figure 35.3: Participatory technology design process.



(Adapted from Reece and Sumberg, 2003: 415)

The role of research in this process is therefore to identify "prototype" technologies of interest to farmers, and then immediately involving the group(s) most likely to benefit in the next steps of designing and refining the technologies (cf. papers in this volume by Odendo *et al.*, and Miiro *et al.*). After all, most agricultural technologies in use today were designed by farmers. Such a collaborative research strategy is attractive not only because it empowers farmers to seek new options more confidently, but also because it reduces the likelihood of investment in "dead end" or non-adopted technologies, thereby ultimately reducing research costs.

Participatory research strategies, however, are only slowly taking root in TSBF and AfNet. It should be acknowledged, though, that the "over-designing" of technologies before involving farmers in their development is a natural consequence of scientists failing to a) trust in the innovative capacity of farmers or b) know how to apply farmers' knowledge and innovation as contributions to "formal" scientific activity. It limits farmers' role to relatively passive activities, such as selecting niches or adapting application rates to local circumstances, which ultimately discourages any sense of ownership of the technology development process. However, to recognise certain behaviour as an "innovation" requires channels of communication and trust to exist between farmer and scientist (see the next section), and a willingness to see all modifications of practice (including abandonment and complete reversals) as potentially useful.

Observations of innovative farmer practice can feed into researchable topics, such as the use of Tithonia as a nutrient-rich mulch (now a staple "technology" promoted by TSBF and others in East and Southern Africa). When translating the Tithonia biomass transfer technology to other farms, a commonly heard comment is that the cut-and-carry system is "labour intensive". Harvesting biomass from hedgerows all at once before planting one's crops is indeed a large, and previously non-existent task, even if pruning hedgerows or applying plant material on cropland are familiar activities already in the household calendar. As a result, many farmers have begun harvesting their Tithonia sporadically (as part of normal hedge maintenance) and transferring it to their compost pile (another familiar task). Clearly the decision not to continue with the cut-and-carry operation and instead supplement the compost pile with Tithonia should be seen as an "innovation" or indeed as a logical supplementation of existing practices. However, while Tithonia had been identified as a "best bet" for direct application to fields, it may not be the "best" option for materials to be added to compost piles. A natural entry point for truly interdisciplinary research would be experimentation based on farmers' own practices (many report that Tithonia speeds the "cooking" of compost piles making it ready for use sooner) to validate the use of Tithonia or other materials as part of the composting process.

Sharing experience better: local knowledge and decision support

If farmers' experience of soil fertility change is a function of their different socio-economic constraints and opportunities then there are also clear implications for dissemination and technology adaptation. One is that local knowledge of soil ecology ("Folk Ecology") is itself an important entry point for scientists wishing to understand and build on local practices. Building a shared language then facilitates the translation of strategic research principles into applied tools, such as those that can assist farmers making land use decisions. The second implication is that dissemination and adaptive learning strategies must acknowledge that not everyone will be reached by the same methods. This suggests that methods must be targeted towards the known potential users, and also that if a diversity of potential users is identified, multiple strategies might need to be employed to avoid favouring some groups over others.

The original starting point for scientists and farmers trying to build a common understanding of soil has been local taxonomies. Local names and descriptions of soils have the longest history of use by soil scientists, who recognised that the subtleties of farmers' terminologies reflect the intimacy of frequent interactions and reliance on the land around them.

However, it is also important to understand how local people recognise and monitor changes in the soils that support their livelihoods. Many

local concepts of soil fertility mirror the terminology used to describe human health (this is also true of some scientist versions of these concepts). Farmers will refer to soils that are “tired”, “sick”, or “thirsty”, and also to soils that have become “addicted” to chemical fertilisers. However, many local knowledge systems treat soil in a much more holistic fashion, seeing its well-being as embedded within broader systems, for example recognising that crop-soil health is itself strongly influenced by pest dynamics and climate variation. The problems of soils may also be attributed to supernatural origins, such as the neglect of traditions, taboos, or rituals that would have renewed the soil’s fertility (cf. Richards, 1989).

These latter “cosmological” aspects of local knowledge are often the ones most criticised by scientists when minimising the importance of dialogue between local and scientific traditions. Nonetheless, it is not possible to ignore this local knowledge base, since local people will continue to make land use decisions based on its assumptions. Initiating a dialogue that will build on the strengths of local knowledge can also facilitate the process of filling the “knowledge gaps” that are also present, and modifying or replacing negative practices. The very fact that local knowledge often varies between individuals (as a function of gender, age, geography, ethnicity, or livelihood), and indeed that it is not necessarily organised as systematically, coherently, or comprehensively as more “formal” knowledge means that it is essential to find ways to bring local and new knowledge systems together.

Dissemination and decision support strategies must therefore confront this diversity. Materials and methods must recognise that farmers have greatly varying abilities, knowledge, and assets, and that “one size” will not “fit all”. As shown in Figure 35.3 above, any given project or technology can conceivably result in multiple finished knowledge outputs, depending on how well the initial ideas have been used and modified by the people who are likely to be interested in or able to benefit from that knowledge. The decision support guides to support improved knowledge should therefore reflect the production and livelihood goals of those clients / co-researchers, as well as their biophysical and socio-economic assets. These are daunting challenges, but with the help of better understanding of local conditions, local knowledge, and the use of better simulation and modelling tools TSBF and AfNet are helping to meet them (cf. Amede, this volume).

Evolution of Theories and Methods within TSBF and AfNet

The development of a TSBF research agenda that looked beyond the soil to the people cultivating it has moved from descriptive, characterisations of farming systems to more strategic study of social

differentiation, power, and networks as they relate to soil fertility management innovation. An interest in dissemination has broadened into investigation of social dynamics, knowledge, and farm-level decision-making. There has also been a tradition of self-reflection, examining the consistency and coherence of TSBF's stated goals, methods, and actual practice, as well as the extent to which grassroots action conforms to its depiction to outsiders. As such, social science practice has developed quite healthily over the last ten years 1992-2002, driven significantly by the following factors:

- The ***disciplinary background*** of the Social Science Officer (and to a lesser extent, that of field staff). Three people have held this position – Simon Carter (1992-1997, Geographer), Patrick Sikana (1998-2000, Anthropologist), Joshua Ramisch (2001-present, Human Ecologist) – and each has had preferred research topics and interests. In addition, Eve Crowley (1994-1996, Anthropologist) worked with TSBF on a Rockefeller Social Sciences Fellowship; a position shared half time with ICRAF.
- The ***demand for "socio-economic" understanding*** of processes being studied by other TSBF staff and collaborators.
- The natural ***evolution of projects*** from inception to later stages. This organic growth has typically moved from characterisation using very descriptive studies to more explanatory work building on existing practices through to development of longer-term interactive learning activities.
- ***Evolving social science debates*** concerning knowledge, power, and participation. The co-supervision of MSc and MA students has been an especially useful vehicle for maintaining contact with these debates.
- Responding to ***donor agendas***, including but not limited to perceived needs for research results readily useful to farmers, a clearer understanding of agrarian change and its links to changes in soil fertility, livelihoods analysis, impact assessment, and identifying the most effective ways of "scaling up" organisational successes.

Demand driven – but by whom?

There has always been a tension between the research agendas demanded from *within* TSBF by social scientists (i.e.: disciplinary interests, evolving projects and debates) and those expected from *outside* (i.e.: from other TSBF staff, partners, donors). This tension results from different research paradigms and differing ideas about the role of research in relation to social change. From the natural science perspective, the key contribution of social science to INRM often appears to be identifying and understanding the social factors that limit "adoption" or the "appropriateness" of given technologies.

Other socio-cultural phenomena, such as "policy" might be acknowledged as important to the fate of different innovations, but most teams (even multi-disciplinary ones) lack the capacity to generate relevant policy-related questions, experiments or interventions. In other words, when the organisation is researching natural resource problems, the natural-social science dialogue has most often begun with identifying "black boxes" of external, *social* forces that need illumination, rather than defining truly *interdisciplinary* questions about how research (including technical research) can support positive change in rural societies.

This tension is reflected clearest in the history of the social science position itself (for fuller discussion, cf. Ramisch *et al.*, 2002). Created in 1992, the post was originally charged with "Resource Integration". This step was perceived as a natural evolution for TSBF, which always held an ecological, systems-oriented approach to thinking. Although TSBF's strength remained at the plot level, the diversity of forces impinging on the plot draws attention naturally towards a broader, systemic analysis (Scholes *et al.*, 1994).

The Resource Integration Officer was therefore initially charged with "developing a model for integrating biophysical and socio-economic determinants of soil fertility for small-scale farms" (Swift *et al.*, 1994). Under this rubric, social factors were expected to be integrated into holistic models as additional explanatory variables. Once key and perhaps universal variables were identified, these could then be added to a "minimum set" of characterisation data collected for TSBF sites (cf. Anderson and Ingram, 1993). However, the main contributions to the TSBF programme remained in terms of site selection, selection of themes for process research, and client group selection, with much less emphasis on experimentation, or monitoring and evaluation (Crowley, 1995). This can be seen in the earliest social science work of AfNet, which included developing simple GIS databases for East Africa, a more detailed one for western Kenya, detailed formal survey work in western Kenya, participatory characterisation of farmers' recognition and management of farm and landscape-level management of soil variability in Kenya and Zimbabwe.

The most fundamental methodological evolution over the last decade has been from largely descriptive, empirical work towards developing more theory-driven, strategic research and the broader use of participatory approaches. At the same time, there has been a search for the optimal degrees of participation relating to the "fieldwork" aspects – which actors, doing which tasks, using which methods. This search has highlighted some of the still extant divides between the rhetoric of research aims and the realities of operational daily practice, as well as tensions that exist between different models of the role of research in stimulating change.

Social science within AfNet

The AfNet membership is still overwhelmingly natural scientists (over 150 soil scientists, biologists, agronomists) with social science represented in 2002 only by six (socio)economists. While there is a general appreciation that "social science" is important to the network, there is still great unfamiliarity with what can really be offered or understood. The emphasis remains on economic information about the "profitability" or "adoptability" of known technologies, with no expertise or experience in applying strategic, interdisciplinary research questions at the interface of human-environment interactions to soil fertility management. AfNet could have made it a higher priority to try to attract more social scientists, but soil and agricultural scientists need to be trained to recognise where social science can make their lives easier. This has to happen at university and in special training courses, and (rather like gender mainstreaming) has to have soil and agricultural scientists as its champions, not *just* the social scientists. Host institutions have also to provide the space for scientists to engage in interdisciplinary research. Unfortunately, while recognised by the various AfNet coordinators, this has tended to be subsumed, and therefore obscured, within the larger problem (true within AfNet as within the CG system more generally) of declining numbers of soil scientists faced with increasing obligations and expectations.

There has been significant turnover of personnel at TSBF since 1992, most notably the tragic loss of Patrick Sikana in the 2000 crash of Kenya Airways flight KQ431. Problems with the continuity of personnel at TSBF and within AfNet have had major impacts on developing an interdisciplinary and social science research agenda that is based on institutional memory and a coherent agenda. Within partner organisations, the retrenchment of public sector employees (as part of structural adjustment or other "reform" programmes) has gutted national research bodies and extension services. The relatively low numbers of social scientists present in national systems must also be seen in the light of the stark fact that they tend to be much more attractive to donors and thus more likely to move on from low paid national positions. Social scientists trained in participatory methods are also much less likely to return to agricultural research jobs when conservation and health present opportunities in more prominent and well-funded fields. Finally, staff turnover in African organisations has tragically been exacerbated by sudden deaths like Patrick's, attributable to accidents, disease, and general insecurity.

The 8th AfNet meeting held in Arusha in May 2001, also clearly demonstrated that amongst partners TSBF is still perceived essentially as a biology-based organisation with minimal social science input. Active recruiting of social scientists has begun through networking

and proposal development, but has been complicated by the rapid expansion of AfNet in the past two years. The massive influx of new members and the expansion of activity into West Africa have simultaneously increased the potential demand for ISFM input and diluted the few interdisciplinary voices present within the network. The AfNet mandate of increasing the use of "integrated" approaches frequently takes a back seat to its more "traditional" and familiar mandate of increasing support of biological approaches to partner institutes through curriculum development and networked experiments. The role of social science within AfNet remains an unresolved problem, acknowledged as important (for "integrated" resource management, for greater "adoption", and ultimately donor approval of soil fertility management topics) but not backed by resources or strong champions within the network.

The lack of "champions" for social science research within TSBF can also be seen in the example of Ritu Verma, an IDRC-funded MA student who worked with TSBF in western Kenya from October 1997 to April 1998. Her research comprehensively examined gender and agricultural practice but without a strong link to the core of TSBF was never meaningfully integrated into other projects. Ironically, her book *Gender, Land, and Livelihoods in East Africa: Through Farmers' Eyes* (Verma, 2001) is the most extensive TSBF text produced by social science research but presents its arguments in such detail that it has been difficult to absorb or disseminate, making it a testimony to missed opportunities.

A final point to note is that all of the social scientists who have worked at TSBF have been relatively young and in the early stages of their careers, whereas the biological scientists have generally been more senior. The onus has been on the social scientists to communicate novel ideas in terms their colleagues could understand or accept; this was relatively easy with concepts such as spatial variability, but much harder with feminist political ecology. Furthermore, in the past, strong personalities or opinions have tended to block communication between individuals and to limit interactions within the team. The new team that came together in early 2001 has begun to overcome some of these historical difficulties, further stimulated by meetings held in conjunction with the union with CIAT and the formation of the strategic Alliance for ISFM between CIAT, TSBF, and ICRAF. However, without a more senior social scientist or generalist present to mentor or to mediate communication, interdisciplinarity will always be a challenge.

"Research" or "action research"?

The development of social science at TSBF has been implicitly predicated on two very different models of how change is brought about in rural

communities and what role outsiders and scientists can play in that process:

- The more conventional approach suggests that a "good technology sells itself" and that working with communities merely requires that the "best bet options" are made available to the "categories of farmers" who are likely to benefit from them. In this model, which is still widely held by many natural scientists including TSBF partners, a "research" organisation has too few resources and no comparative advantage in doing dissemination, and is better placed to research and evaluate the dissemination and technology promotion activities carried out by partners (local NGO's or national agricultural bodies).
- The alternate approach argues that understanding local processes of innovation, resource distribution, resource allocation decisions, and information transfer is essential to developing technologies relevant to their users' conditions. Integral to this second approach is the development of meaningful communication and learning across disciplinary boundaries – something that TSBF has attempted to do repeatedly, but which still remains problematic.

As TSBF and its partners have become more versed in participatory methods, tension has developed between these models. The desire for more "development" oriented activity has been highlighted in the redesigning of the "Resource Integration" theme of TSBF in 2000 into the new Focus 1, demonstratively titled "Empowering Farmers", into which all the other bio-physical Foci's arrows flow. It may also have been further accentuated by the recruitment in the late 1990s of TSBF field staff for Kenya with NGO backgrounds in action research. The argument has been that without actively engaging in dissemination and community organisation the phenomena of interest to research (knowledge flows, further innovation and adaptation, etc.) will be too scarce to be viable or observable. Indeed, these staff members have found it difficult to define or implement "research" as an independent activity, devoid of extension or development components.

In reality, most partner organisations have lacked the resources (personnel, transport, and operating funds) to carry out such work, and indeed have often turned to TSBF for material or logistical support. The decision to devolve more of the research, experimentation, and dissemination activities to the host communities, therefore, is not so much ideologically driven as pragmatic. The increasing use of farmer-designed and farmer-run experiments, farmer-to-farmer training, and group-based activities has effectively begun to address the desire for more "action" oriented work while providing social processes worthy of investigation. What has emerged in the project areas of western Kenya (where TSBF and local groups have had a reasonably long, 5-8 year history of contact) are prolonged, one-to-one relationships between

scientists and farmers. Interactive, two-way learning, through community-based interactive sessions and farmer-based demonstrations, has been enhanced by researchers, and is widely conducted in local dialects. The ongoing challenge, however, has been finding optimal roles for researcher, extensionist, and farmer participation under these continuing conditions of resource constraint.

Collaboration and "participation"

Under the prevailing orthodoxy of participation, it is difficult to find projects that do not describe themselves as using and embracing "participatory" methods, to the extent that the term invites dismissal or covert cynicism (cf. Cooke and Kothari, 2001). These methods are usually assumed to apply only to relationships between researcher / extensionist and "client", where they are used to "level" the power relationships between actors. Yet in the TSBF context, where planning and implementation of activities is explicitly done in partnership with national research and extension institutions, participatory methods of collaboration have had to evolve. If cross-disciplinary learning has been difficult within TSBF, it has been even more so between TSBF and its partners, a fact which must be acknowledged before looking at the effectiveness of "participation" in the dealings of "researchers" with farmers.

This point needs to be based on what might be called "realistic expectations" of change. True collaboration must recognise (however reluctantly) that working with the human resources that are on hand within networks means starting from the perceptions and skills of those partners and moving at the best pace possible. It would have been easy to "cook" fancy results about participation if the social scientists had simply gone it alone. Working in partnership through AfNet, however, has forced TSBF to confront the realities of public funded research in Africa, the conservatism and logistical difficulties of which demand considerable patience. It is relatively easy for partners to influence each other's rhetoric, harder to alter each other's conceptualisations of problems, and harder still to make lasting changes in the way each carries out research tasks. "Participation" is not an approach whose benefits are learned or appreciated quickly and the socialisation of knowledge backwards and forwards between scientists and farmers depends fundamentally on the generation of experience.

The progress of AfNet towards "internalising" the rhetoric of farmer participatory research may seem slow even if it is one of the more advanced scientific networks (cf. review of on-farm research in the EU-funded project, Carter *et al.*, 1998). As mentioned above, the scarcity of AfNet members trained in participatory methods able to act as "champions", and the lack of continuity in many institutions facing

financial crisis, hinder the development of a more interdisciplinary research culture.

However, progress is being made in learning new attitudes and unlearning old ones. For example, in the EU-funded project, the Zambian team decided to work on the local *fundikila* mound systems and to replicate the farmers' practices on-station to validate the system in full view of their peers. Among other AfNet partners, research teams in Zimbabwe and Kenya now acknowledge the various micro-niches that farmers recognise and manage and have incorporated these into various research designs. Increasingly sophisticated understanding of wealth and gender differences as they relate to soil fertility management have also been incorporated into more recent project designs. Finally, previously distinct elements of process and on-farm research have been combined in activities where complex soil-crop scenario modelling has been fed back into negotiation or decision support work conducted with farmers.

The politics of community-based research

It is, of course, never easy to surrender control of research agendas, even where the research is ostensibly for the benefit of the rural poor (i.e.: TSBF's Theme 1 is "Empowerment of Farmers" with new technologies). If TSBF has truly embraced the devolution to farmers (or other stakeholders) the major responsibility for adaptive testing and sharing of accountability for quality control over research, what have the political implications of this move been?

As TSBF placed more attention on building capacity in its partners for farmer participatory research, it also shifted to working with local farmers as groups and individuals. In the earlier 1990s, on-farm trials were based on individuals' farms. In such arrangements, host farmers were expected to define and explain experiments to other local and visiting farmers. While we do not know the exact accomplishment through this arrangement, there are indications in Kabras and Vihiga that selecting "model" farmers to work with disaffects them from many other farmers.

Down the road, focus shifted to the group approach. Initially, it seemed obvious that involving many farmers would have a multiplier effect. However, it soon became apparent that the *manner* in which TSBF talks (and to *whom*) is more important than mere numbers. Groups are frequently unstable and many are not especially open to new membership. When researchers request farmers to work with them collectively, "new" groups emerge. But these "new" groups usually comprise members of a previous, defunct group. This means that one has to *deliberately* seek the inclusion of all types of farmers (within and outside groups) in research and dissemination. This role of a local unifier is tricky and can even appear comical before local farmers.

Intervening research on the nature of social capital and the role of local groups and networks in passing agricultural information (Misiko, 2001) has shown that there is still a tendency for some groups or individuals to view their participation in TSBF as "secret knowledge" that is not to be shared with others. Likewise, non-participants are often wary of inquiring about project activities, assuming that they are not welcome or need to be invited by some patron. This attitude has persisted for multiple reasons, and in spite of the considerable efforts of TSBF and other research bodies to present their work as "open to all" by actively seeking to include marginalized groups. Because local politics takes precedence even over the "good intentions" of outsiders, the vast exposure that many farmers have had to project work in western Kenya does not, therefore, translate into widespread use or understanding of ISFM.

The initial willingness of TSBF to accept "groups" as representatives of community interests has led to numerous problems. After all, groups exist and persist when they have strong roles and identities, histories of their own which often only become known with time. For example, the most vocal members of groups have frequently been people who are either not well respected by others locally, or possessed of agendas that run far beyond ISFM. This later group tends to see the research project as a vehicle for access to new resources and political leverage than as an opportunity for new learning (Sikana, 1995), although it may take project staff a long time to appreciate this reality. Since much of TSBF's on-farm work has been initiated in the context of structural adjustment programmes and the cessation of donor funding for major local development projects, it is natural that farmer concerns about water, health, poor infrastructure, or education would be mapped onto the "research" activities if TSBF was the only "development" agency working in their area. Beyond such explicit "hijacking" of groups, there are frequently tensions between participants over the definitions of goals, membership, and indeed the "success" of the group's activities.

Nevertheless, working through groups provides an opportunity to diffuse risk and broaden responsibility and ownership of activities. Groups should be seen neither as a panacea for community-based management's difficulties, nor as a replacement for effective dissemination strategies. When setting up experiments or demonstrations at the local level, having wider input about where in the landscape, whose land, or which soils are suited to which types of research activity has proven invaluable. With our broadened knowledge of the diversity of local soil types, requests by farmers to have activities replicated on different soils become logical and understandable, when previously they might have been dismissed as unjustified demands for a share of a perceived research "pie". In the end, such replication turns out to be both good science and good politics.

Strategic Lessons: Finding Common Ground

Building on the easiest topics

The challenges that TSBF has tried to address are highly complex in both biophysical and social terms. As such, interdisciplinary collaboration depends on developing a better understanding of what changes are taking place, and of developing a modus operandi that can generate useful knowledge as part of an on-going dialogue between scientists and farmers.

The parallel dialogue that must take place, between social and natural scientists, has been easiest around themes that integrate themselves readily into natural science work, including spatial variability, wealth ranking or farmer typologies as they relate to ISFM practice, and understanding the strengths and weaknesses of existing local knowledge. It has been considerably harder to incorporate elements that relate to the political nature of "research", such as using livelihoods analysis or feminist political ecology to find the place of ISFM and research interventions within local practice.

Championing workable models

If AfNet, collaborators have been slow to adopt interdisciplinary and participatory approaches. It is due in part to the relative lack of successful, convincing models of how such approaches pay short or long-term benefits to ISFM research. Further constraints have been staff turnover (which leads to fragmented agendas and loss of institutional memory), scarcity of time and resources, and a shortage of generalists or social scientists within partner organisations. The rhetoric of interdisciplinarity and participation have rapidly infiltrated research bodies because they are relatively cost free and often there is the perception that donor funding is linked to such language. Simplified versions of interdisciplinary activities, linking ISFM with participatory wealth ranking, or moving from local soil taxonomies to broader understanding of how soil fertility is managed locally, have also begun to take hold within local practice. While some natural scientists are "afraid of having to become social scientists", there is a slowly growing constituency within AfNet that sees advantages for interdisciplinary collaboration. Nevertheless, without relatively senior "champions" for interdisciplinary or socially oriented approaches within TSBF, new methods and approaches are at a disadvantage compared with the more familiar status quo.

Negotiating the role and nature of "research"

Given the variables of donor climate, institutional and personnel changes, and socio-political change on the ground, truly interdisciplinary ISFM research will need to develop a common language and common priorities that can form a core identity in dealing with outside forces. This requires an iterative process of negotiating the role of "research" in the development of local communities. If donors, researchers, and extensionists feel the need to "scale up" local successes and achievements to *broader* communities, it must be reconciled with the desires of the initial community members for taking research accomplishments to greater *depth*. If moving towards group-based research methods means shifting the burden of implementation to national partners, a common path for "participation" will need to be negotiated. In particular, the skills and attitudes necessary to support more decentralised forms of research need to be cultivated by the scientists, agents, and farmers involved.

Despite the rhetoric of interdisciplinary collaboration, cross-disciplinary learning and communication remain complicated by the divergent ideas of what role "research" can and should play in bringing about change in rural communities. Resolving these divergences often falls to social scientists, since their disciplinary orientation predisposes them to thinking about such issues and their colleagues are more likely to see these issues as somehow separate from their daily activities of research. However, building common bodies of knowledge and practice can only happen with the full participation of all disciplines involved in ISFM.

References

Anderson, J.M. and Ingram, J.S.I. (1993) *Tropical Soil Biology and Fertility: A Handbook of Methods*. 2nd edition. Wallingford, UK: CABI.

Byerlee, D. and Heisey, P.W. (1996) Past and potential impacts of maize research in sub-Saharan Africa: a critical assessment. *Food Policy*. 21(3): 255-277.

Cooke, B. and Kothari, U. (2001) *Participation: The New Tyranny?* London: Zed Books.

Carter, S.E., Chuma, E., Goma, H.C., Hagmann, J., Mapfumo, P., Ojiem, J., Odendo, M., Riley, J. and Sokotela, S.K. (1998) On-farm research in the TSBF Programme: Experiences in smallholder systems of tropical Africa. Chapter XI in, Carter, S.E., Riley, J. (eds.) Final Report: *Biological Management of Soil Fertility in Small-scale Farming Systems in Tropical Africa* (EU Project ERBTS3*CT940337). Pp 189-206.

Crowley, E.L. (1995) Some methods for characterising social environments in soil management research. In, Carter, S.E. (ed.) P*roceedings of the 1st project*

workshop (Annual Report to the EU for 1995), held at Sokoine University of Agriculture, Morogoro Tanzania, April 19-24, 1995. Project ERBTS3*CT940337: Biological management of soil fertility in small-scale farming systems of tropical Africa. Pp. 99-110.

Crowley, E.L. and Carter, S.E. (2000) Agrarian change and the changing relationship between toil and soil in Kakamega, Western Kenya, 1900-1994. *Human Ecology*. 28(3): 383-414.

Misiko, M.T. (2001) *The Potential of Community Institutions in Dissemination and Adoption of Agricultural Technologies in Emuhaya, Western Kenya.* MA Thesis. Nairobi: Institute of African Studies, University of Nairobi.

Ramisch, J.J., Misiko, M.T. and Carter, S.E. (2002) Finding common ground for social and natural sciences in an interdisciplinary research organisation – the TSBF experience. *Looking back, looking forward: Social Research in CGIAR System*, CGIAR conference hosted by CIAT, 11-13 September, 2002. Cali, Colombia.

Reece, J.D. and Sumberg, J.E. (2003) More clients, less resources: towards a new conceptual framework for agricultural research in marginal areas. *Technovation*. 23: 409-421.

Richards, P. (1989) Agriculture as a performance. In, Chambers, R., Pacey, A., Thrupp, L.A. (eds.) *Farmer First: Farmer Innovation and Agricultural Research.* London: Intermediate Technology (IT) Publications. Pp 185-195.

Sikana, P.M. (1995) "Who is fooling who? Participation, power, and interest in rural development" Paper presented by special invitation at the International Development Research Centre (IDRC), June, 1995. Ottawa, Canada: IDRC (unpublished).

Scholes, M.C., Swift, M.J., Heal, O.W., Sanchez, P.A., Ingram, S.J.I. and Dalal, R. (1994) Soil fertility research in response to the demand for sustainability. In, Woomer, P.L. and Swift, M.J. (eds.) *The Biological Management of Tropical Soil Fertility*. Chichester, UK: John Wiley-Sayce. Pp 1- 14.

Swift, M.J., Bohren, L., Carter, S.E., Izac, A.M. and Woomer, P.L. (1994) Biological management of tropical soils: Integrating process research and farm practice. In, Woomer, P.L. and Swift, M.J. (eds.) *The Biological Management of Tropical Soil Fertility*. Chichester, UK: John Wiley-Sayce. Pp 209-228.

Verma, R. (2001) *Gender, Land, and Livelihoods in East Africa: Through Farmers' Eyes.* Ottawa: IDRC.

Woomer, P.L. and Swift, M.J. (eds.) (1994) *The Biological Management of Tropical Soil Fertility*. Chichester, UK: John Wiley-Sayce.