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The use of indigenous knowledge in development: problems and challenges

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Abstract

The use of indigenous knowledge has been seen by many as an alternative way of promoting development in poor rural communities in many parts of the world. By reviewing much of the recent work on indigenous knowledge, the paper suggests that a number of problems and tensions have resulted in indigenous knowledge not being as useful as hoped for or supposed. These include problems emanating from a focus on the (arte)factual; binary tensions between western science and indigenous knowledge systems; the problem of differentiation and power relations; the romanticisation of indigenous knowledge; and the all too frequent decontextualisation of indigenous knowledge.

Keywords

Indigenous knowledge; development; indigenous environmental knowledge; power relations

The use of indigenous knowledge in development: problems and challenges

Introduction

“Kama elimu ya asili ni nzuri kiasi hicho, kwa nini shamba langu ni hafifu?”

The above Kiswahili quotation, said to me during fieldwork by a small-scale farmer in Coast Region in Tanzania, translates into English: “If indigenous knowledge is so good, why is my farm so poor?” Whilst there may well be a good many other reasons (and there are) why his farm was indeed so poor, for this farmer the use of indigenous knowledge was not apparently a solution to his difficulties. In fact, he went on to talk about how he would like to employ what he called modern technology and modern farming methods, if only he could afford them. This discussion is disconcerting, not least because of the way in which over the last two decades or so, the use of indigenous knowledge in development has become a mantra of sorts, representing one possible way of negotiating the so-called ‘development impasse’, or, indeed, the ‘death of development’. In response to this challenge, this paper attempts to offer a view as to how and why this situation has come about, by exploring some of the key issues which await the unwary in their conceptualisation and deployment of indigenous knowledge in development planning and implementation.

For some post-development writers, indigenous knowledge represents a possible alternative for progress among the world’s rural poor. As Escobar (1995, 98) puts it: “[t]he remaking of development must start by examining local constructions, to the extent that they are the life and history of the people, that is, the conditions for and of change”. Such approaches can be supported by careful ethnographic work capable of teasing out the complexities of the interrelationships established between

communities and places (Herbert, 2000). This implies a change that comes from within communities themselves, having confidence in and deploying indigenous knowledge, among other things, to bring about economic and social progress. There is then a sense of the rural poor having a voice about progress which affects them, and outsiders listening seriously to what the rural poor have to say, learning from them, and respecting their realities and priorities (Chambers, 1983; 2001).

Such an interest in indigenous knowledge in the literature can be traced back some 20-25 years, although there is some suggestion that there are hints of the emergence of an embryonic indigenous knowledge before then. For example, although much of Allan's (1965) *The African Husbandman* is fundamentally a text on the standard development narrative of population and land pressure, to be relieved by the application of technology and capital, there is nonetheless a recognition that indigenous agricultural systems demonstrate a considerable knowledge of, and sympathy with, the environment. However, early keynote contributions to our understanding of indigenous knowledge appeared a little later and include a collection of papers in the IDS Bulletin in 1979 (see especially contributions by Barker, Bell, Belshaw, Chambers, Howes, and Richards (all 1979)), and landmark seminal work by Brokensha, Warren and Werner (1980), by Richards (1985), and subsequently by Scoones and Thompson (1994). From much of this work, indigenous knowledge becomes central to later debates about sustainable development because of the way in which such knowledge has apparently allowed people to live in harmony with nature for generations. Such a privileging of indigenous knowledge in development is, therefore, apparently to be welcomed, as it represents "a shift from the preoccupation with the centralised, technically oriented solutions of the past decades that failed to

alter life prospects for a majority of the peasants and small farmers of the world” (Agrawal, 1995, 414).

However, to assume that ‘development’ in some way perished in the late 1980s/early 1990s, as suggested by some on the neoliberal right and the cultural left, may be premature, with writers such as Hart (2001) suggesting that by the end of the 1990s, ‘development’ had returned, if indeed it ever went away. This not only involved redefining development in the context of social capital and social development, for example, but also the deployment of indigenous knowledge as part of the armoury of some mainstream development agencies (Eyzaguirre, 2001; see also World Bank, 1998). Central to this process has been the increasing institutionalisation of indigenous knowledge through conferences, development plans and a broad, sometimes grudging, acceptance by the development community of its assumed inherent value as part of a shift in addressing the direct concerns of the poor (Shepherd, 2001; Warren, 1991, 1992; World Bank, 2000; see also Hubbard, 2001). It may even have reached the status of “a new populist rhetoric” (Agrawal, 1995, 415). Without doubt, there is a conviction in many quarters of the need to tap into the stock of indigenous knowledge if appropriate planning and land management strategies are to be developed in a sustainable way (Chokor and Odemerho, 1994; De Boef, Amanor and Wellard, 1993; Okali, Sumberg and Farrington, 1994). Such conviction has contributed to this institutionalisation, despite the apparent difficulty that, whilst indigenous knowledge seems to reject western science’s claims to universality and spatial transferability, at the same time its institutionalisation casts it as an object that can be essentialized, archived and indeed transferred itself. Whether this indeed the case, or indeed whether the use of indigenous knowledge genuinely

does offer a realistic and meaningful way forward for development planning and implementation, is highly contested. The Tanzanian farmer quoted above appears to be unconvinced; development practitioners frequently seem equally unconvinced.

The focus on the empirical and (arte)factual

Much indigenous knowledge research has tended to focus on the contents of indigenous knowledge systems *per se*, with a particular interest in indigenous soil classification and management methods (see Critchley, Reij and Wilcocks, 1994, for example), as well as on indigenous technologies, water conservation techniques and indigenous woodland management. There has been relatively less interest in knowledge about vegetation for grazing and livestock management more generally, although there are notable exceptions (for example, Bollig and Schulte, 1999; Briggs, Badri and Mekki, 1999; Dinucci and Fre, 2003; and Goodman and Hobbs, 1988, among others). Arguably, this interest has been at the expense of a deeper understanding of the epistemology of indigenous knowledge; the focus of attention has been very much on an empirical and practical knowledge of the environment and natural resources, and how they can be used and managed in ways that provide material support for communities within which they are deployed. The economic and socio-cultural contexts in which such knowledge is used seems to be of lesser interest. There is, of course, absolutely nothing wrong with this strong practical and empirical interest, but it does have the consequence that indigenous knowledge then tends to become disconnected from context. In a related way, Reij, Scoones and Toulmin (1996, 26-27) have suggested that “much effort is expended on designing and disseminating ‘solutions’, but too little time is spent on understanding the problem”. A similar charge might be levelled at our understandings of indigenous knowledge.

This can be exemplified by some of the work conducted on the indigenous knowledge of soils. Much of this work has revolved around understanding how people classify soils, and, in particular, the factors used in such classifications. Soil colour and texture emerge as key common factors in indigenous soil knowledge (see, for example, Ellis-Jones and Tengberg, 2000; Kundiri, Jarvis and Bullock, 1997; Lamers and Feil, 1995; Sandor and Furbee, 1996; Sillitoe, 1996). In their study of farmers in Niger, Lamers and Feil (1995) note that 'red' soils are seen to be moderately fertile, quite sandy with some organic content; 'black' soils are more fertile with a greater organic content; and 'white' soils are very infertile with little organic material. For Osunade (1994) in Swaziland, touch is an important process for farmers in deciding soil fertility, as well as identifying the presence of fauna and flora; for example, earthworm casts are found on nutrient rich soils, but never on acidic soils. In Nigeria, farmers are also aware of the link between soil texture and the differential deposition of river sediments, as well as the 'feel' of soils and their moisture content (Kundiri, Jarvis and Bullock, 1997). There is much that is factually very useful, practical and relevant here, but very much only within the place/space in which these knowledges have been developed. There persists the uneasy feeling that somehow these knowledges are too place-specific to be of much theoretical use, or, indeed, of much developmental value beyond these particular locations.

There is, moreover, a sense in many of these discussions that these factual (but nonetheless important) knowledges must in some way be related to formal science, that for them to be accepted, they must somehow be scientifically testable in a formal sense. In their study of farmers in the Peruvian Andes, Sandor and Furbee (1996) suggest that, as well as classifying soils on the basis of texture, farmers also recognise features such as soil horizons, the relationships between changes in soil distributions and the

landscape, and changes in soil behaviour under different conditions, very much tools and conceptualisations of formal soil science. Indeed, some studies have gone further in attempting to draw similarities between western scientific knowledge and indigenous knowledge about soils, with differing interpretations and results. In Peru, for example, it is suggested that there is a close agreement between the indigenous soil knowledge held by communities in Lari and the US Soil Classification (Guillet, 1989), whilst in the Caatinga region of north-east Brazil, De Queiroz and Norton (1992) suggest that the morphologically-based indigenous soil classification system, based on texture, colour, structure and depth, produces similar results to more formal scientific soil classifications. Research in Burkina Faso has shown that, although perceptions of degradation may differ, there is nevertheless a strong amount of agreement on soil types and characteristics between scientific measures of soil fertility and what the authors call local perceptions (Gray and Morant, 2003). Other writers are more wary, though, and express some doubts about this apparently unproblematic 'union' of western and indigenous soil knowledges (for example, Briggs, Pulford, Badri and Shaheen, 1998; Haburema and Steiner, 1997). Niemeijer (1995) echoes this wariness on the grounds that whereas western soil science tends to focus on the deeper soil horizons, representing the more fixed characteristics of soils, indigenous soil knowledge, on the other hand, tends to focus on the surface layers which are more relevant to agricultural evaluation. In other words, there is a suggestion that because the objectives and priorities of the two approaches are so divergent, there is little likelihood of meaningful dialogue taking place.

Although there is no dispute that this work is empirically rich and important, there remains the sense that it remains somewhat disembodied, or somehow still pristine and unsullied by its economic, social and political contexts. The trick, therefore, is to tease out such knowledge in the development interests of the community. Such approaches have been critiqued, though, for being too empiricist and too reliant on practice, and for not paying enough attention to a more rigorous theorisation or politicisation of indigenous knowledge (Kapoor, 2002). Leach and Mearns (1996, 32) go further when they suggest that indigenous knowledge is frequently charged with being "methodologically weak or unproven... populist or politically naïve; and that it generates findings that are too complicated to be of practical use to policy makers". These are very pressing problems throwing up major challenges for the proponents of the use of indigenous knowledge in development. The discussion now turns to examine some of these problems and challenges.

Western science and indigenous knowledge: binary tensions

All too frequently, western science and indigenous knowledge are represented as two different, competing knowledge systems, characterised by a binary divide, a divide arguably evolving out of the epistemological foundations of the two knowledge systems. Hence, they may be treated as discrete entities, separable from each other in space, which of course, if the case, precludes dialogue and learning between them (Mohan and Stokke, 2000). Although a number of observers has suggested that this divide may indeed be false, or, at least, not as marked as might be supposed (see, for example, Bebbington, 1993; Bell, 1979; Briggs, Badri and Mekki, 1999; Chambers, 1979; Leach and Fairhead, 2000), the binary notion still persists. Western science is seen to be open, systematic and objective, dependent very much on being a detached centre of rationality and intelligence, whereas indigenous knowledge is seen to be closed, parochial, unintellectual, primitive and emotional (Agrawal, 1995; Ellen and Harris, 2000; Herbert, 2000; Howes, 1979; Howes and Chambers, 1979; Mitchell, 1995; Warren, 1991). Consequently, whereas western knowledge systems are part of the whole notion of modernity, indigenous knowledge is part of a residual, traditional and backward way of life, a view which may be reinforced by the concentration of work on indigenous knowledge on people in low- and middle-income countries.

It is not a big step, therefore, to imagine that development can only emerge from the application of western knowledge and that indigenous knowledge itself has little to offer. As Escobar (1995, 13) puts it: “[d]evelopment has relied exclusively on one knowledge system, namely, the modern Western one. The dominance of this knowledge system has dictated the marginalization and disqualification of non-Western knowledge systems”. Ellen and Harris (2000) take this further, arguing that the term ‘indigenous’ almost invites an oppositional ‘us and them’ scenario between the two knowledge systems. It may well be that there can be no rapprochement, however, as possible interactions are constrained by the different ways in which participants have been trained to think and by the rather different contexts in which they operate (De Walt, 1994). This binary is perpetuated in some of the empirical literature, perhaps unintentionally. For example, in a discussion that is broadly sympathetic to indigenous knowledge, Kundiri, Jarvis and Bullock (1997, 206) nonetheless talk about farmers having “very subjective methods of identifying and describing the different soils”. By using the word

‘subjective’, a non-rigorous connotation of indigenous knowledge is implied. Similarly, Pretty (1994) notes that participatory methods of data collection are all too often assumed to lack the rigour and accuracy assumed to be present in more formal positivist approaches. Science has retained its resilience in development debates over indigenous knowledge because of its perceived ‘substance’ (Leach and Mearns 1996), something which indigenous knowledge apparently does not possess.

The debate, however, has moved on. There has now developed a more ‘entangled’ view of the two knowledge systems, perhaps reflecting the realities of everyday existence. Scepticism, even disillusionment, with what Scoones (1996, 50) has called “the seductiveness of the simple solution” provided by science has grown. Consequently, there is an increasing recognition of the ways in which the complexities of reality, the multiple perspectives of the people involved and the contextualisation of knowledge in time and space must play a role. Indeed, it can be argued that indigenous knowledge has an advantage over western science in the context of poor communities, in that information is tested in the context of survival, and hence is not just true or false in some sort of dispassionate way (as western science might conclude), but is either more or less effective in providing the means of survival, a conclusion more meaningful in the context of everyday existence (Davies, 1994; Kalland, 2000). It has been suggested elsewhere that farmers’ understandings of soils are driven very much by the demands of agricultural concern as an everyday activity, and not by soil scientists’ interests in more holistic views of plant productivity (Ericksen and Ardon, 2003). Hence, indigenous knowledge becomes something very much driven by the pragmatic, utilitarian and everyday demands of life. Of course, this implies a much greater openness on the part of western science to explore, even recognise, the validity of alternative explanations and to acknowledge

the importance of the negotiated character of knowledge production (Leach and Mearns, 1996; Pottier, 2003), even though in practice this may be difficult to achieve.

Although there are apparent attractions in a meaningful dialogue between western science and indigenous knowledge, in reality there remain tensions. Interestingly, Chokor and Odemerho (1994, 153) optimistically suggest that “once official views and community values are integrated, conflict and rivalry associated with traditional and modern land conservation measures in tropical Africa will be considerably reduced”. This situation, however, seems to be still some way off. In the view of Homann and Rischkovsky (2001), for example, the problem for the integration of western and indigenous knowledges is that the former searches for knowledge of universal significance which is not context-related, whilst the latter is a social product closely linked to a cultural and environmental context. It is interesting how the view that western science is in some way objective, detached and decontextualised from its socio-cultural, political and physical environments is still pervasive in these debates. Of course, western science is as much socially constructed as indigenous knowledge, and it is ironic that although the charge is frequently made that indigenous knowledge is too place- and culturally-specific to be universal and transferable, and therefore to be of much value in a broader sense, such doubts are rarely expressed about western science, even though its results in the last 50 years of development in Africa and elsewhere have hardly been impressive in transforming poor people’s lives (see Krugly-Smolska, 1994).

More prosaically, even where both knowledge systems appear to be operating within the same community, there seems to be a dispute about their relationship. Ortiz (1999), for example, asserts that little is apparently known about the interaction between such knowledge systems among farmers,

suggesting either that the two knowledge systems operate independently of each other, or perhaps that there has been little interest shown in how they may be complementary or even competing. Conversely, though, Bellon (1995) shows that maize farmers in Chiapas in Mexico are happy to combine traditional and modern technologies in a wholly pragmatic way. Indigenous knowledge systems might be usefully seen as a complement, adding to existing (formal) knowledges, and not as a competitor (De Walt, 1994; Reij, Scoones and Toulmin, 1996). However, there may be a further explanation; that is, in practice, farmers do not think of knowledge as coming from two or more separate, self-contained and competing systems anyway. With reference to empirical work among Bedouin in Egypt, Briggs, Badri and Mekki (1999, 102) write that: “significantly, the Bedouin do not see the debate, as far as it affects them, in such stark bipolar terms; indeed, they accept that there are various knowledges and are more than prepared to appropriate those elements of knowledges, including formal science, that they see as being to their economic, social or political advantage”. Perhaps the theoretical and conceptual debates about a binary (or other) divides constitute little more than a diversion from the actual realities of how knowledge is constructed by people on the ground.

Despite this, it seems that recent empirical work has served only to emphasise the tensions. Attempts to integrate western scientific and indigenous knowledge systems with regard to soil classification and use have proved to be extremely problematic (see, for example, Oudwater and Martin, 2003; Payton *et al*, 2003), either because of the huge practical difficulties involved in trying to integrate farmers’ cognitive soil maps with scientific soil maps held by a GIS, or because of the persistent fundamental methodological and epistemological differences between the two traditions. In a study of forest management in Mexico, Klooster (2002) concludes that both bodies of knowledge, in their different ways, are really quite limited in their abilities to inform the social practice of environmental management. This is because local knowledge is inadequate for monitoring the bigger picture of the forest’s response to woodcutting, and formal science simply lacks the institutional flexibility to deal with the socio-

economic consequences of woodcutting. In a different context, WinklerPrins and Sandor (2003) have suggested that perhaps the problem might be related to the fact that local soil knowledge comprises a combination of both knowledge **and** skills, and the difficulty in separating these has led to the undervaluing of local soil knowledge as real knowledge by outsiders, and therefore by western science. There is an implication that, because skills are so entangled with the production of indigenous knowledge, its production is a trial-and-error process, with none of the reasoning or controlled experimentation of western science.

The different ways in which western science and indigenous knowledge systems are conceptualised are well exemplified in a study of soils in Papua New Guinea (Sillitoe, 1998). Science classifies soils according to measured properties, but Papua New Guinea highlanders see soils as having any number of characteristics relating to use for different purposes. For their part, there is, therefore, no need to generalise or develop soil classes that relate to each other, as this is quite irrelevant in the cultural and economic contexts of the Papua New Guinea highlands. Indeed, because farmers look for dominant soil properties of relevance to particular needs, their classifications are likely to be more holistic and reflective of socio-cultural and economic issues than would be the case with formal soil science classification systems. Whilst acknowledging the key role of colour, texture, moisture and stoniness, Sillitoe (1996), in earlier work, suggests that these factors are combined and modified endlessly to build up descriptive classes. It is not just simply a question of listing factors to develop a classificatory system, as western soil science might do; it is much more complex and entangled than that. Indeed, he goes on to suggest that local people: “describe soil as a mixture of this and that property, being neither exclusively, but lying on the ill-defined boundary between them” and this “highlights how contrived is the division of soil into bounded classes” (Sillitoe, 1996, 273). Similarly in Tanzania, Ostberg (1995) has developed the idea of a much more nuanced indigenous understanding of soils, where people recognise the importance of sediments deposited from run-off, especially run-off from nearby forest soils. Good land is properly ‘cooled’, a ritual state of the soils once bad influences have been removed. When crop yields start to decline, the soil is seen to be becoming tired and ‘warm’, and severely degraded areas are ‘hot’. Interestingly, the heat of the soil is cooled by rain to generate fertility.

Further, there is a conceptualisation of ‘soil coming up’, as new fresh soil is mixed with the existing topsoil to maintain fertility, rather than the erosion of land going down. Land, therefore, has life which comes up from below, together with an equally life-giving rain.

The tensions created by the binary divide between western science and indigenous knowledge clearly persist, despite many well-intentioned efforts to reduce or eliminate them. It may well be that this issue will remain unresolved for some of the reasons discussed. However, the reality in rural areas may be much more pragmatic, in that farmers and others may, because of the demands of daily existence, develop a hybrid, mediated knowledge, which is developed and continually re-worked often in highly innovative ways. Indeed, it may be, therefore, that indigenous knowledge no longer exists in any untouched, pristine form, such that it may be more accurate to describe such knowledge as a local knowledge.

The problem of differentiation and power relations

Despite its practical attractions, it is not helpful to conceptualise indigenous knowledge as a unitary knowledge, as though the knowledge is shared more or less equally across all members of the community. This may be quite attractive from the perspective of development practice, but it ignores the unevenness, often fragmentary and mediated nature of indigenous knowledge, and how such knowledge can become quite differentiated across a community. The concept of a shared community knowledge, as well as seeming to ignore individual agency, is cut across by factors such as age, experience, wealth, production priorities, household circumstances, political power and not least gender (Batterbury, 1998; Briggs *et al*, 2003; Davis, 1996; Ellen and Harris, 2000; Mohan and Stokke, 2000; Sillitoe, 1998; Swift, 1979). These factors clearly have an impact on an individual’s access to knowledge and on that individual’s ability to use such knowledge.

Gender differences in particular raise important issues. In Nigeria, for example, a study showed that, although there was indeed a considerable transfer of knowledge between men and women, there was

also evidence of woman to woman knowledge transfer, perhaps creating a knowledge that was owned solely or largely by women (Andresen, 2001). Indeed, there appeared to be differences in some of the terms used by men and women, supporting notions of divergent knowledge systems, at least in part. Furthermore, gender differences in forms of land management can be apparent, with, for instance, male-controlled cash-crop farms having lower pH and macronutrient values, with female-controlled subsistence plots having more potassium in excess (Engel-Di Mauro, 2003). Similarly, those women who play a major role in livestock care often have a more detailed (ethno-)veterinary knowledge than men (Davis, 1996). However, care needs to be exercised not to develop this into an essentialist gender approach. Women's experiences and knowledges are also mediated by livelihood system, class, age and so on. Hence, women have no special relationship with resources "because women are not a unitary category, and their environmental relations reflect not only divisions among women but also gender relations and the dynamics of political economies and agroecosystems" (Jackson, 1993, p.1950). Similarly, Jewitt (2000) challenges the notion of women being naturally better guardians of the environment simply because they are women. Drawing on empirical work in India, she shows that women tend to collect dead wood, not because it necessarily represents good conservation practice, but because it does not need cutting, it is lighter to carry and it burns more easily than green wood. Significantly, if there is no dried wood, then green wood is indeed cut, with little sense of coppicing or other management methods.

The power relations associated with knowledge are no less problematic in the context of indigenous knowledge than they are elsewhere. Indeed, in the view of Agrawal (1995), the link between power and knowledge needs to be made quite explicit if indigenous knowledge is to be genuinely effective in contributing to development. A key issue, however, is that by accepting that there is a legitimate indigenous knowledge as a viable alternative to western scientific knowledge in particular locational contexts, the authority of external knowledge providers is seriously threatened. Hence, western science can be seen as an instrument of power and is unlikely to be ceded easily by 'experts' for another knowledge system through which

they have no power (Bell, 1979; Novellino, 2003; Swift, 1996). This raises a critical issue for the legitimacy of indigenous knowledge; for if indigenous knowledge is to be taken seriously, it potentially jeopardises the hegemony of current development planning strategies based on western science and the dominant role of the ‘expert’. This can play out in two ways. Firstly, not only may ‘experts’ discourage scientific research that discredits their dominant development discourse, but they may also attempt actively to discredit local knowledges to maintain their position. Hoben (1995) shows that local environmental knowledges in Ethiopia, for example, were discredited because they were held responsible for producing environmental degradation. Consequently, all the other elements of the indigenous knowledge base, such as manuring methods, the use of ash, the use of rotational leguminous crops, terracing methods, and locally constructed run-off ponds to collect rainwater were also, wholly undeservedly, discredited.

Secondly, it can be argued that the power of western science has been maintained by the construction of crisis narratives. Of course, indigenous knowledge is represented as the villain of the piece, such that, in colonial times, for example, Africans “were constructed as ‘unscientific exploiters’ of the resource base” (Mackenzie, 1995, 101), and hence their voice was silenced. It can be argued, therefore, that “crisis” narratives are important to sustain the position of the expert and of the hegemony of western science. Not only do local people not steward the resources well based on their own indigenous knowledge, but the real solutions to the problem emanate from western science, and the application of such solutions comes from development experts and professionally trained resource managers. Crisis narratives keep them in a job and at the same time vilify indigenous knowledge. The more that experts disagree with each

other, the more that things on the ground must really be desperate. In other words, this is where real power lies in the knowledges' debate (Roe, 1995; see also Leach and Mearns, 1996). Even where indigenous knowledge systems contribute to natural resource management programmes, there is still frequently an overall managerial control retained by experts, donors or whoever (Schroeder, 1999a; 1999b). Indigenous knowledge is really not to be trusted in this particular power game.

However, the complexity of power relations at the local level in the context of indigenous knowledge is also problematic. There seems to have developed some sense of indigenous knowledge being a 'good thing' because of its empowering qualities, even though the concept of empowerment may be ill-defined or poorly theorised (Cleaver, 1999). Fundamentally, the question as to whose knowledge counts has to be addressed. Simply because an indigenous knowledge exists does not mean that it is necessarily correct or unproblematic at the local level. Indeed, because indigenous knowledge is so empirically rooted, there is a tendency to ignore power, legitimacy and gender politics, and therefore there is no check on whose view might be the legitimate one (Kapoor, 2002). An example of meetings in Tanzania shows that men's voices are heard more than those of women, and that women tend to speak for women as a group, whereas men tend to speak as individuals (Cleaver, 1999). This creates real challenges for those trying to make sense of the power relations and legitimacy of indigenous knowledge in local communities; it creates even bigger challenges for those who are trying to implement indigenous knowledge as part of a development 'armoury'. Indeed, as Davies (1994, 7) comments, if people are prepared to hide, distort or misunderstand local knowledge (as she suggests they might) and to hold multiple and even contested views, then a consensus, community

knowledge can never be reached “rendering the use of all these differing sources of knowledge in decision-making impossible”. This is a depressing conclusion for practitioners, but this problem of power relations cannot be sidestepped; there is a real need for the power and positionality of players in these indigenous knowledge debates to be evaluated critically, as Twyman (2000) has suggested in the context of community-based natural resource management initiatives. Although the current received wisdom seems to be that the ‘local’ is the immediate future for development, in terms of participation, indigenous knowledge and so on, if it is to be successful, there needs to be a much fuller engagement with the underlying power relations involved.

Indigenous knowledge as a romanticised, static and unchanging body of knowledge

Because of its attractiveness as an alternative, indigenous development, there exists a real danger of over-valorising and over-romanticising indigenous knowledge in practice. In an important way, indigenous knowledge serves to empower local communities by valuing local knowledge and, for example, in supporting notions of the ‘African renaissance’. This is reinforced by the contemporary trend of promoting development and environmental programmes at the local level by governments, NGOs and some development agencies. However, Schroeder (1999b) warns that such approaches may end up by romanticising such communities. The difficulty then is that indigenous knowledge tends not to be problematised, but is seen as a ‘given’, almost a benign and consensual knowledge, simply waiting to be tapped into. Maddox, Giblin and Kimambo (1996) have provocatively framed this as a ‘Merrie Africa’ versus ‘Primitive Africa’ debate. The former represents a society living in harmony with nature before ecological disasters and economic exploitation under colonialism took place; the latter represents pre-colonial Africans living in a hostile environment subject to disease, famine and dislocation. The trick is to extract those environmental and other knowledges that contributed to the former. For some, the romanticised conceptualisation of an untainted ‘Merrie Africa’ is what drives their conceptualisations of indigenous knowledge.

The view of indigenous knowledge as an untainted, pristine knowledge system is unhelpful. It cannot be assumed at all that indigenous knowledge will necessarily provide a sustainable answer to production challenges in poor rural communities. Bluntly stated: "...the self-evident (but nevertheless useful) point that if IK and ISWC [indigenous soil and water conservation] were truly effective, there would not be the problems of food shortages and land degradation that are evident today" (Critchley, Reij and Wilcocks, 1994, 297). Whilst this can be charged as a naïve view, in that other factors such as land ownership and terms of trade may contribute to food shortages, it nonetheless makes the point about the over-romanticisation or over-privileging of indigenous knowledge. Bebbington (1993, 278) is similarly sceptical when he writes that: "[n]onetheless, there remain few experiences in which low-input agriculture has proven economically viable". The notion that in some way the application of indigenous knowledge is necessarily always going to provide a more appropriate and sustainable solution to land management issues than, for instance, western science, is untenable. Simply because members of a community use a particular set of methods, based on local knowledge, does not guarantee better land management, sustainable increased production or reduced land degradation (Osunade, 1994). But it may be more than this. Given farmers' concerns to maximise food security, there needs to be considerable caution in exercising calls for a return to traditional agricultural practices based on indigenous knowledge (Jewitt, 2002). In some ways, the romanticisation of indigenous knowledge results in its adoption as the hegemonic knowledge system as a replacement for Western science, making the same claims for pre-eminence. Indeed, Cleaver (1999, 605) pertinently asks whether there is not a danger of "swinging from one untenable position ('we know best') to an equally untenable and damaging one ('they know best')".

Perhaps emanating from its romanticisation, there has emerged a representation of indigenous knowledge as being static and timeless, somehow frozen in time (Adams, Potkanski and Sutton, 1994; Bebbington, 1993; Kalland, 2000). Such representations are unhelpful, because they create an image of an unchanging, conservative culture. Indeed, Kalland (2000) argues that such views generate images of people possessing little economic sophistication and engaging little with external markets. It is, of course, then only a small step to argue that western science needs to be deployed to provide the necessary conditions for change. Interestingly, Niemeijer and Muzzucato (2003), drawing on field

evidence from Burkina Faso, argue that because much indigenous knowledge research has focused on taxonomies, rather than theories or processes, there has consequently developed a tendency to see indigenous knowledge as static. A different focus on the processes of indigenous knowledge might therefore generate a deeper and more dynamic understanding of change.

There is, however, a serious challenge to these views. Empirical evidence suggests that people are very open to new ideas and change, as long as they make economic sense and are culturally acceptable. The idea that indigenous knowledge is static and unchanging is difficult to sustain. Rather, it is fluid and constantly changing, reflecting renegotiations between people and their environments (Sillitoe, 1998). Based on fieldwork in the Ecuadorian Andes, Bebbington (1993) has shown that knowledge acquisition is dynamic and ever-changing, with people being open to new ideas, as long as they remain in control of their modernising impacts. Watson, Adams and Mutiso (1998) draw similar conclusions about the dynamism of knowledge systems in relation to Marakwet irrigation management in Kenya, whilst in southern Egypt, Bedouin communities display a dynamic and pro-active relationship with their natural environment, testing and developing new environmental knowledge compatible with their economic and social environments (Briggs, 1995; Briggs, Badri and Mekki, 1999). In central Tanzania, paddy rice has only been grown since the 1930s, when it was introduced by Asian in-migrants to the area, but is now widely grown by African farmers, all of whom consider rice-cultivation to be an indigenous activity (Shaka, Ngailo and Wickama, 1996). This last example further raises the issue as to what actually constitutes 'indigenous', and how much it can be a contested term. Reij, Scoones and Toulmin (1996) are of the view that although local knowledges and practices certainly exist, they are inevitably mediated by external influences from in-migrants, return migrants, extension workers, visiting businessmen and so on. In a similar vein, Ostberg (1995) stresses the importance of 'outside' sources of knowledge and the interplay of outsiders' and local knowledges to produce a mediated and provisional knowledge. These are important challenges for those who are arguing for the primacy of an untainted indigenous knowledge. As Amselle (2002, 220) reminds us: "There is not, nor has ever been, such a thing as a closed society".

Decontextualisation

A key element of indigenous knowledge is that it tends to be deeply embedded within the society in which it has been developed, and it must therefore be seen in its economic, political and cultural contexts (Adams, Potkanski and Sutton 1994; Barrera-Bassols and Zinck, 2003; Bebbington, 1993; Davies, 1994; Jewitt, 2000; Myers, 2002; Pottier, 2003). This is awkward for development practice as it makes the broader application of indigenous knowledge difficult between different geographic, cultural and economic settings. Herein lies one of the thorniest policy difficulties for indigenous knowledge. Indeed, it highlights one of the perceived key differences between indigenous knowledge and western science, in that, whilst indigenous knowledge is indeed deeply embedded in its context, western scientific knowledge thrives on abstract formulation and separation from the lives of the investigated (Agrawal, 1995; Pretty, 1994). Hence, there is a real danger here that in development discourses, indigenous knowledge can amount to little more than “a convenient abstraction, consisting of bite-sized chunks of information that can be slotted into western paradigms, fragmented, decontextualised, a kind of quick fix, if not a panacea” (Ellen and Harris, 2000, 15). But this view misses the point that it is precisely the local embeddedness of indigenous knowledge that imbues it with relevance, applicability and even power. There is, therefore, the real danger that indigenous knowledge will lose its agency and efficacy if it becomes depersonalised and/or objectified and is used in some sort of top-down manner. There are, therefore, real problems in applying indigenous knowledge ideas out of context.

In the Eastern Desert of Egypt, it has been shown how deeply embedded local environmental knowledge and practice is in the culture of Bedouin society, with conserved areas of vegetation being “products of the bonds that individuals, families and lineages have established with particular places” (Hobbs, 1990, 105). During prolonged drought, the Bedouin return to their ‘lineage preserves’ to graze livestock on perennial shrubs and acacia leaves. Careful conservation of shrubs is observed, even if prices are favourable; they are never uprooted or defoliated completely. Careful pruning ensures that enough foliage or seeds are left for new growth. The bush is not re-pruned before full recovery, and any plants in the area are left

untouched. Interestingly, conservation practices are not readily apparent because they tend to be “non-activities” like not cutting or not charcoaling etc. Conservation is recognised as a necessity to stay in the desert and preserve the way of life, to avoid having to settle down and take on peasant ways. In East Africa, disequilibrium has occurred when local knowledge and practice has been disrupted by the introduction of new social institutions to manage new resource opportunities such as boreholes, ignoring and replacing former practices (McCabe, 1990). In rather different contexts, Belshaw (1979) has documented the ecological and cultural importance of intercropping in East Africa, whilst Gauld (2000) has emphasised the importance of economic context in community-based forestry policies.

Of course, this line of reasoning leads inevitably to the conclusion that the application of indigenous knowledge from one context to another clearly carries serious risks of failure, and, indeed, that there is little merit in trying to develop indigenous knowledge as a generic development planning tool. Because knowledge is developed by local people through a real understanding of the environment in a particular place, knowledge is not easily transferred into other locations, raising doubts about how applicable indigenous knowledge is out of its immediate geographical context (Leach and Mearns, 1996; Warren and Rajesakaran, 1993). If so, this raises serious questions about how useful indigenous knowledge can really be in a wider development context. Indeed, it can be argued that indigenous knowledge should not to be packaged, generalised or ‘scientised’, because such an approach misses the point of the special character of local needs, as well as ignoring the reality of “the socio-economic and historical situation of the local community in which the technology is applied” (Sikana and Mwambazi, 1996, 108). This view is echoed by Eyzaguirre (2001), who argues that a global recognition of indigenous knowledge as a planning tool may be at a price. That price is the detachment of indigenous knowledge from its cultural, livelihood and community contexts, the very things which helped to create indigenous knowledge in the first place, and hence such a disembodied indigenous knowledge may end up by undermining the system itself. Although there has recently developed the rhetoric of an ‘indigenous technical knowledge’ which implies a certain universality of knowledge, overlooking the

unique features of particular knowledge systems and taking knowledge out of its cultural context (Sillitoe, 1998), there are clearly problems with what might be seen as a developing institutionalisation of indigenous knowledge (for a fuller discussion, see Briggs and Sharp, 2004). Indeed, there are real dangers in such institutionalisation in that the focus of an institutionalised indigenous knowledge may be rather more on administrative structures and management, rather than on indigenous knowledge *per se*.

The limits of indigenous knowledge

This brings the discussion back to where it started, with the Tanzanian farmer. He clearly had little faith in what indigenous knowledge had to offer him, and, in many ways, we should not be surprised. It seems that, all too often, we have conceptualised indigenous knowledge in unproblematic, and even naïve, ways, and therefore it has turned out to be less helpful than has been supposed or hoped for as a development tool. Indeed, arguably, the term ‘indigenous knowledge’ itself reflects this, conceptualised as some separate, self-contained folk knowledge. In reality, few farmers compartmentalise knowledge into such separate, self-contained entities, but rather develop knowledge as something that is hybridised, mediated and local. Farmers are nothing if not pragmatic and utilitarian in how they assess and use knowledge. If a particular piece of knowledge works for her/him, and it makes economic and socio-cultural sense, then it will be used, regardless of whether it is drawn from western science, a repertoire of local knowledge or some other source. There is a need, therefore, to recognise the limits of indigenous knowledge, as it is frequently conceptualised in the literature. Whilst indigenous knowledge may indeed be represented as a valid and relevant alternative to western science, realistically it needs to be seen as something rather more nuanced, pragmatic and flexible, perhaps even provisional, highly negotiable and dynamic. Indeed, rather than resisting western science, indigenous knowledge appears to be becoming ever more complicit as it becomes appropriated by ‘development’, a process which will only harden as indigenous knowledge becomes increasingly institutionalised. The challenge will then be for proponents of indigenous knowledge to make the difficult choice between arguing for promoting indigenous knowledge as a radical alternative to western science and knowledge, or instead negotiating a way into mainstream development practice.

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Bibliography

- Adams W, Potkanski T and Sutton J (1994) Indigenous farmer-managed irrigation in Sonjo, Tanzania. **Geographical Journal**, 160, 17-32.
- Agrawal A (1995) Dismantling the divide between indigenous and scientific knowledge. **Development and Change**, 26, 413-439.
- Allan W (1965) **The African husbandman**. (Oliver and Boyd, London).
- Amselle J (2002) Globalization and the future of anthropology. **African Affairs**, 101, 213-229.
- Andresen P R (2001) gender and indigenous knowledge: experiences in Nigeria and the USA. **Indigenous Knowledge and Development Monitor**, 9 (www.nuffic.nl/ciran/ikdm/9-1/andres.html).
- Barker D (1979) Appropriate methodology: an example using a traditional African board game to measure farmers' attitudes and environmental images. **IDS Bulletin**, 10 (2), 37-40.
- Barrera-Bassols N and Zinck J A (2003) Ethnopedology: a worldwide view on the soil knowledge of local people. **Geoderma**, 111, 171-195.
- Batterbury S (1998) Local environmental management, land degradation and the gestion des terroirs approach in West Africa: policies and pitfalls. **Journal of International Development**, 10, 871-898.
- Bebbington A (1993) Modernisation from below: an alternative indigenous development? **Economic Geography**, 69, 274-292.
- Bell M (1979) The exploitation of indigenous knowledge or the indigenous exploitation of knowledge: whose use of what for what? **IDS Bulletin**, 10 (2), 44-50.
- Bellon M R (1995) Farmers' knowledge and sustainable agroecosystem management: an operational definition and an example from Chiapas, Mexico. **Human Organisation**, 54, 263-272.
- Belshaw D (1979) Taking indigenous knowledge seriously: the case of intercropping techniques in East Africa. **IDS Bulletin**, 10 (2), 24-27.
- Bollig M and Schulte A (1999) Environmental change and pastoral perceptions: degradation and indigenous knowledge in two African pastoral communities. **Human Ecology**, 27, 493-514.
- Briggs J (1995) Environmental resources: their use and management by the bedouin of the Nubian Desert of southern Egypt. In Binns T (ed) **People and environment in Africa**, (John Wiley, Chichester), 61-67.
- Briggs J, Badri M and Mekki A M (1999) Indigenous knowledges and vegetation use among bedouin in the Eastern Desert of Egypt. **Applied Geography**, 19, 87-103.

- Briggs J, Pulford I D, Badri M and Shaheen A S (1998) Indigenous and scientific knowledges: the choice and management of cultivation sites by bedouin in Upper Egypt. **Soil Use and Management**, 14, 240-245.
- Briggs J and Sharp J (2004) Indigenous knowledges and development: a postcolonial caution. **Third World Quarterly**, 25:4.
- Briggs J, Sharp J, Hamed N and Yacoub H (2003) Changing women's roles, changing environmental knowledges: evidence from Upper Egypt. **Geographical Journal**, 169, 313-325.
- Brokensha D, Warren D and Werner O (eds) (1980) **Indigenous knowledge systems and development**. (University Press of America, New York).
- Chambers R (1979) Editorial. Rural development: whose knowledge counts? **IDS Bulletin**, 10 (2), 1-3.
- Chambers R (1983) **Rural development: putting the last first**. (Longman, Harlow).
- Chokor B and Odemerho F (1994) Land degradation assessment by small-scale traditional African farmers and implications for sustainable conservation management. **Geoforum**, 25, 145-154.
- Cleaver F (1999) Paradoxes of participation: questioning participatory approaches to development. **Journal of International Development**, 11, 597-612.
- Critchley W, Reij C and Wilcocks T (1994) Indigenous soil and water conservation: a review of the state of knowledge and prospects for building on traditions. **Land Degradation and Rehabilitation**, 5, 293-314.
- Davis D (1996) Gender, indigenous knowledge and pastoral resource use in Morocco. **Geographical Review**, 86, 284-298.
- Davies S (1994) Information, knowledge and power. **IDS Bulletin**, 25 (2), 1-13.
- De Boef W, Amanor K and Wellard K (eds) (1993) **Cultivating knowledge: genetic diversity, farmer experimentation and crop research**. (Intermediate Technology Publications, London).
- De Queiroz, J S and Norton B E (1992) An assessment of an indigenous soil classification used in the Caatinga region of Ceara State, northeast Brazil. **Agricultural Systems**, 39, 289-305.
- De Walt B R (1994) Using indigenous knowledge to improve agriculture and natural resource management. **Human Organisation**, 53, 123-131.
- Dinucci A and Fre Z (2003) **Understanding the indigenous knowledge and information systems of pastoralists in Eritrea**. Communication for Development Case Study 26, FAO (Rome).
- Ellen R and Harris H (2000) Introduction. In Ellen R, Parkes P and Bicker A (eds) **Indigenous environmental knowledge and its transformations** (Harwood Academic Publishers, Amsterdam), 1-33.
- Ellis-Jones J and Tengberg A (2000) The impact of indigenous soil and water conservation practices on soil productivity: examples from Kenya, Tanzania and Uganda. **Land Degradation and Development**, 11, 19-36.
- Engel-Di Mauro S (2003) Disaggregating local knowledge: the effects of gendered farming practices on soil fertility and soil reaction in southwest Hungary. **Geoderma**, 111, 503-520.
- Ericksen P J and Ardon M (2003) Similarities and differences between farmer and scientist views on soil quality issues in central Honduras. **Geoderma**, 111, 233-248.

- Escobar A (1995) **Encountering development: the making and unmaking of the Third World.** (Princeton University Press, Princeton NJ).
- Eyzaguirre P B (2001) Global recognition of indigenous knowledge: is this the latest phase of 'globalization'? **Indigenous Knowledge and Development Monitor**, 9 (www.nuffic.nl/ciran/ikdm/9-2/column.html).
- Gauld R (2000) Maintaining centralized control in community-based forestry: policy construction in the Philippines. **Development and Change**, 31, 229-254.
- Goodman S M and Hobbs J J (1988) The ethnobotany of the Egyptian Eastern Desert: a comparison of common plant usage between two culturally distinct bedouin groups. **Journal of Ethnopharmacology**, 23, 73-89.
- Gray L C and Morant P (2003) Reconciling indigenous knowledge with scientific assessment of soil fertility changes in southwestern Burkina Faso. **Geoderma**, 111, 425-437.
- Guillet D (1989) A knowledge-based systems model of native soil management. **Anthropological Quarterly**, 62, 59-67.
- Habarurema E and Steiner K G (1997) Soil suitability classification by farmers in southern Rwanda. **Geoderma**, 75, 75-87.
- Hart G (2001) Development critiques in the 1990s: culs de sac and promising paths. **Progress in Human Geography**, 25, 649-658.
- Herbert S (2000) For ethnography. **Progress in Human Geography**, 24, 550-568.
- Hobbs J (1990) **Bedouin life in the Egyptian wilderness.** (The American University of Cairo Press, Cairo).
- Hoben A (1995) Paradigms and politics: the cultural construction of environmental policy in Ethiopia. **World Development**, 23, 1007-1021.
- Homann S and Rischkowsky B (2001) Integration of indigenous knowledge into land-use planning for the communal rangelands of Namibia. **Indigenous Knowledge and Development Monitor**, 9 (www.nuffic.nl/ciran/ikdm/9-3/homann.html).
- Howes M (1979) The uses of indigenous technical knowledge in development. **IDS Bulletin**, 10 (2), 12-23.
- Howes M and Chambers R (1979) Indigenous technical knowledge: analysis, implications and issues. **IDS Bulletin**, 10 (2), 5-11.
- Hubbard M (2001) Attacking poverty – a strategic dilemma for the World Bank. **Journal of International Development**, 13, 293-298.
- Jackson C (1993) Doing what comes naturally? Women and environment in development. **World Development**, 21, 1947-1963.
- Jewitt S (2000) Mothering Earth? Gender and environmental protection in the Jharkhand, India. **Journal of Peasant Studies**, 27, 94-131.
- Jewitt S (2002) **Environment, knowledge and gender: local development in India's Jharkhand.** (Ashgate, Aldershot).
- Kalland A (2000) Indigenous knowledge: prospects and limitations. In Ellen R, Parkes P and Bicker A (eds) **Indigenous environmental knowledge and its transformations** (Harwood Academic Publishers, Amsterdam), 1-33.

- Kapoor I (2002) The devil's in the theory: a critical assessment of Robert Chambers' work on participatory development. **Third World Quarterly**, 23, 101-117.
- Klooster D J (2002) Toward adaptive community forest management: integrating local forest knowledge with scientific forestry. **Economic Geography**, 78, 43-70.
- Krugly-Smolka E (1994) An examination of some difficulties in integrating western science into societies with an indigenous scientific tradition. **Interchange**, 25, 325-334.
- Kundiri A M, Jarvis M G and Bullock P (1997) Traditional soil and land appraisal on fadama lands in northeast Nigeria. **Soil Use and Management**, 13, 205-208.
- Lamers, J P A and Feil P R (1995) Farmers' knowledge and management of spatial soil and crop growth variability in Niger, West Africa. **Netherlands Journal of Agricultural Science**, 43, 375-389.
- Leach M and Fairhead J (2000) Fashioned forest pasts, occluded histories? International environmental analysis in West African locales. **Development and Change**, 31, 35-59.
- Leach M and Mearns R (eds) (1996) **The lie of the land: challenging received wisdom on the African environment**. (International African Institute, London).
- McCabe J T (1990) Turkana pastoralism: a case against the tragedy of the commons. **Human Ecology**, 18, 81-103.
- Mackenzie F (1995) Selective silence: a feminist encounter with environmental discourse in colonial Africa. In Crush J (ed) **Power of development**. (Routledge, London), 100-112.
- Maddox G, Giblin J and Kimambo I N (eds) (1996) **Custodians of the land: ecology and culture in the history of Tanzania**. (James Currey, London).
- Mitchell T (1995) The object of development: America's Egypt. In Crush J (ed) **Power of development**. (Routledge, London), 129-157.
- Mohan G and Stokke K (2000) Participatory development and empowerment: the dangers of localism. **Third World Quarterly**, 21, 247-268.
- Myers G A (2002) Local communities and the new environmental planning: a case study from Zanzibar. **Area**, 34, 149-159.
- Niemeijer D (1995) Indigenous soil classifications: complications and considerations. **Indigenous Knowledge and Development Monitor**, 3, 20-21.
- Niemeijer D and Muzzucato V (2003) Moving beyond indigenous soil taxonomies: local theories of soil for sustainable development. **Geoderma**, 111, 403-424.
- Novellino D (2003) From seduction to miscommunication: the confession and presentation of local knowledge in 'participatory development'. In Pottier J, Bicker A and Sillitoe P (eds) **Negotiating local knowledge: power and identity in development** (Pluto Press, London), 273-297.
- Okali C, Sumberg J and Farrington J (1994) **Farmer participatory research: rhetoric and reality**. (Intermediate Technology Publications/Overseas Development Institute, London).
- Ortiz O (1999) Understanding interactions between indigenous knowledge and scientific information. **Indigenous Knowledge and Development Monitor**, 7 (www.nuffic.nl/ciran/ikdm/7-3/ortiz.html).
- Ostberg W (1995) **Land is coming up: the Burunge of central Tanzania and their environments**. (Stockholm Studies in Anthropology, Stockholm).
- Osunade M A (1994) Community environmental knowledge and land resource surveys in Swaziland. **Singapore Journal of Tropical Geography**, 15, 157-170.

- Oudwater N and Martin A (2003) Methods and issues in exploring local knowledge of soils. **Geoderma**, 111, 387-401.
- Payton R W, Barr J J, Martin A, Sillitoe P, Deckers J F, Gowing J W, Hatibu N, Naseem S B, Tenywa M and Zuberi M I (2003) Contrasting approaches to integrating indigenous knowledge about soils and scientific soil survey in East Africa and Bangladesh. **Geoderma**, 111, 355-386.
- Pottier J (2003) Negotiating local knowledge: an introduction. In Pottier J, Bicker A and Sillitoe P (eds) **Negotiating local knowledge: power and identity in development** (Pluto Press, London), 1-29.
- Pretty J N (1994) Alternative systems of enquiry for a sustainable agriculture. **IDS Bulletin**, 25 (2), 37-48.
- Reij C, Scoones I and Toulmin C (eds) (1996) **Sustaining the soil: indigenous soil and water conservation in Africa**. (Earthscan Publications, London).
- Richards P (1979) Community environmental knowledge in African rural development. **IDS Bulletin**, 10 (2), 28-35.
- Richards P (1985) **Indigenous agricultural revolution: ecology and food production in West Africa**. (Hutchinson, London).
- Roe E (1995) Except Africa: postscript to a special section in development narratives. **World Development**, 23, 1065-1069.
- Sandor J A and Furbee L (1996) Indigenous knowledge and classification of soils in the Andes of southern Peru. **Journal of the Soil Science Society of America**, 60, 1502-1512.
- Schroeder R A (1999a) Geographies of environmental intervention in Africa. **Progress in Human Geography**, 23, 359-378.
- Schroeder R A (1999b) Community, forestry and conditionality in the Gambia. **Africa**, 69, 1-21.
- Scoones I (1996) Range management science and policy: politics, polemics and pasture in southern Africa. In Leach M and Mearns R (eds) **The lie of the land: challenging received wisdom on the African environment**. (International African Institute, London), 34-53.
- Scoones I and Thompson J (1994) (eds) **Beyond farmer first: rural people's knowledge, agricultural research and extension practice**. (Intermediate Technology Publications, London).
- Shaka J, Ngailo J and Wickama J (1996) How rice cultivation became an 'indigenous' farming practice in Maswa District, Tanzania. In Reij C, Scoones I and Toulmin C (eds) **Sustaining the soil: indigenous soil and water conservation in Africa**. (Earthscan Publications, London).
- Shepherd A (2001) Consolidating the lessons of 50 years of 'development'. **Journal of International Development**, 13, 315-320.
- Sikana P and Mwambazi T (1996) Environmental change and livelihood responses: shifting agricultural practices in the lakes depression zone of northern Zambia. In Reij C, Scoones I and Toulmin C (eds) **Sustaining the soil: indigenous soil and water conservation in Africa**. (Earthscan Publications, London), 107-116.
- Sillitoe P (1996) **A place against time: land and environment in the Papua New Guinea Highlands**. (Harwood Academic Publishers, Amsterdam).
- Sillitoe P (1998) Knowing the land: soil and land resource evaluation and indigenous knowledge. **Soil Use and Management**, 14, 188-193.

- Swift J (1979) Notes on traditional knowledge, modern knowledge and rural development. **IDS Bulletin**, 10 (2), 41-43.
- Swift J (1996) Desertification: narratives, winners and losers. In Leach M and Mearns R (eds) **The lie of the land: challenging received wisdom on the African environment**. (International African Institute, London), 73-90.
- Twyman C (2000) Participatory conservation? Community-based natural resource management in Botswana. **Geographical Journal**, 166, 323-335.
- Warren D M (1991) **Using indigenous knowledge in agricultural development**. World Bank Discussion Paper No.127.
- Warren D M (1992) **Indigenous knowledge, biodiversity conservation and development**. Keynote address at the International Conference on Conservation of Biodiversity in Africa: Local Initiatives and Institutional Roles, Nairobi, Kenya.
- Warren D M and Rajesakaran B (1993) Putting local knowledge to good use. **International Agricultural Development**, 13, 8-10.
- Watson E E, Adams W M and Mutiso S K (1998) Indigenous irrigation, agriculture and development, Marakwet, Kenya. **Geographical Journal**, 164, 67-84.
- WinklerPrins A M and Sandor J A (2003) Local soil knowledge: insights, applications and challenges. **Geoderma**, 111, 165-170.
- World Bank (1998) Indigenous knowledge for development: a framework for development. **Knowledge and Learning Centre, Africa Region, World Bank**. <http://www.worldbank.org/afr/ik/ikrept.pdf>
- World Bank (2000) **World Development Report 2000-01: attacking poverty**. (Oxford University Press for the World Bank, Oxford).