The resilience of indigenous knowledge in small-scale African agriculture: key drivers

Abstract

The successful use of indigenous knowledge in development practice in rural Africa over the last couple of decades has proved to be elusive and disappointing. Using empirical field data from northern Malawi, this study suggests that the two key drivers for farmers in this area are household food security and the maintenance of soil fertility. Indigenous ways of knowing underpin the agricultural system which has been developed, rather than the adoption of more modern, 'scientific' ways, to deliver against these drivers. Such indigenous knowledges, however, are deeply embedded in the economic, social and cultural environments in which they operate.

Keywords: Malawi; indigenous knowledge; small-scale agriculture; farming systems; Africa

Introduction

It would seem that the use of indigenous knowledge systems over the last couple of decades as a means of raising production levels, and therefore living standards, for the majority of rural people in Africa can only be described as disappointing at best. Sillitoe (2010, 12) bluntly captures this sense of disappointment when he writes: "After two decades or so, the indigenous knowledge (IK) in development initiative has not, frankly, had the success that some of us expected". This is all the more frustrating, given the optimism of much of the writing around indigenous knowledge in the 1990s and early 2000s (see, for example, Leach and Mearns, 1996; Reij, Scoones and Toulmin, 1996; Ellen, Parkes and Bicker, 2000; Pottier, Bicker and Sillitoe, 2003). It was not as though these writers were overly optimistic or unrealistic, or that they had an unnecessarily romanticised view of indigenous knowledge. On the contrary, there had emerged a strongly critical (in the best sense of the word) view of indigenous knowledge with deep and theoretically informed interpretations of indigenous knowledge systems which demonstrated in no uncertain terms the difficulties and challenges of deploying indigenous knowledge in development (Briggs, 2005).

This lack of success has once again left (small-scale) African agriculture, drawing on indigenous agricultural knowledges and practices, exposed to attack by some development theorists and practitioners as being incapable of rising to the challenge of increased food production, and ultimately the economic transformation of the African countryside. Collier (2008, 2009) has been particularly critical of the inability of small-scale agriculture to deliver, and he is especially so of what he calls the romantic populism of small-scale agriculture, in which there has developed the notion that "peasants, like pandas, are to be preserved" (Collier, 2008, 69). In his view, small-scale agriculture is ill-suited to the demands of modern agricultural production in which scale is important, and which must be driven by what he calls scientific agriculture fully integrated into a fully functioning market system (Collier, 2009). Indigenous knowledge, it would seem, has had its chance and has been found wanting. Although Collier's view has unsurprisingly attracted considerable criticism (see, for example, Aal, Jarosz and Thompson, 2009; Wiggins, 2009), it nonetheless appears to be increasingly influential. In this scenario, indigenous knowledge would appear to have little future as a development tool, and there appears to be the real possibility of IK becoming permanently located at the margins of development practice with no real long-term future (Sillitoe and Marzano, 2009).

There is an argument that the IK research community may have been at least partly responsible itself for bringing about this situation. Although IK discussions have fortunately moved on from what some have described as futile debates about the science/IK binary (see Thomas and Twyman, 2004; Agrawal, 2009, Berkes, 2009b), much recent IK work has tended to focus on three main themes. The first of these has been concerned with building up case-loads of location-specific indigenous knowledge at the community level, centred very much on local ways of knowing (see, for example, Blanckaert et al, 2007; Gomez-Baggethun et al, 2010; Hillyer, McDonagh and Verlinden, 2006; Lauer and Aswani, 2009; Mekoyo et al, 2008). Much of this is well-researched and scholarly work, and fulfils a pressing need to document fully locally-based indigenous knowledge repertoires, but it sometimes can be overly descriptive and too place-specific to be of much wider development value. A second theme, perhaps being promoted as a means of trying to bring IK more into the centre of development practice, has involved work which attempts to validate IK through the use of scientific testing methods (see, for example, Jacobson and Stephens, 2009; Mairura et al, 2008; Saito et al, 2006; Trung et al, 2008). The problem here is that there is the often unsaid assumption that IK can only really be taken seriously when it has the seal of approval of formal science. Related to this second theme is the third where there have been debates about how best, and in what appropriate ways, to merge IK and formal science to produce more effective hybrid ways of knowing (see, for example, Lado, 2004; Liwenga, 2008; Marin, 2010; Mercer et al 2009; Mercer et al, 2010; Reed, Dougill and Taylor, 2007), or more subtly constructed knowledges which draw on a range of sources of knowledge, information and lived, everyday experience (Briggs et al, 2007). Whilst initially seemingly attractive as a compromise, such an approach potentially ignores claims to hegemony by each knowledge system, as well as running the risk of losing the strengths which potentially come from diversity of knowledge traditions (Berkes and Berkes, 2009).

However, at a more conceptual level, there has at the same time been a call for less emphasis on IK as content, or as acquisition of knowledge, and rather more on IK as a process of learning (Laurie, Andolina and Radcliffe, 2005; Berkes, 2009b). Central to this is the need to recognise that IK is embedded in local cultures and local economic priorities, and if IK is abstracted from such environments, then problems will follow. Indeed, as Berkes, (2009, 154) puts it: “Not taking knowledge out of its cultural context is one of the biggest challenges of indigenous knowledge research”. Dixon (2005) and Fairhead and Scoones (2005) at an earlier time made similar points supporting this view. This raises some difficult issues, of course, because, if following McFarlane’s (2006a; 2006b) argument that knowledge is socially produced in particular localities and is therefore embedded locally, culturally and even economically, then IK becomes impossible, or at best problematic, to use outside that locality. However, it is worth noting that the claims to universality of western science cannot always be upheld, as such knowledge was also produced in particular socio-economic and cultural settings, which has resulted in its failure in a number of different settings in Africa, for example. On the other hand, to be positive, this raises the critical nature of the locally important cultural and economic embeddedness of IK. Indeed, it is the central argument of this paper that it is this cultural and economic embeddedness of IK which results in its resilient nature because farmers across Africa use, develop, rework and rely on those locally embedded knowledges which they have by necessity developed for themselves, and it is this, contrary to Collier, which provides the security for much small-scale agriculture in Africa today.

Of particular interest to this paper is the way in which a typical farming community in the Zombwe area of northern Malawi has resolutely resisted introducing external ‘scientific’ ideas in agriculture and preferred largely to retain locally evolved practices. It is not as though farmers in Zombwe are unaware of possibilities – indeed, this is far from the truth. In common with much of Malawi, Zombwe farmers receive technical advice from Government of Malawi extension officers on farming methods, fertiliser use, disease-resistant crop varieties and soil management strategies through the Agricultural Development Division. Zombwe farmers can, and do, draw on a wide range of agricultural knowledge sources to inform their own production systems, from their own accumulated experiences, their own experimentation and from some of the latest scientific and agronomic information available. It is not as though Zombwe farmers deliberately ignore external advice and ideas, but such information is carefully evaluated and then decisions are taken as to the extent to which such information might be acted upon and introduced into their everyday farming practices. The aim of this paper, therefore, is to investigate the ways in which the production and use of locally-constructed knowledges are intricately embedded and linked into the key drivers and household priorities of a farming community in northern Malawi in an attempt to understand the entangled nature of local knowledges for small-scale agricultural production, and the reasons which underpin its continuing resilience.

The study area

The study area of Zombwe is located about 10km to the west of the city of Mzuzu (Map 1) and is a farming area typical of much of central and northern Malawi. The annual rainfall experienced in the area is about 1200mm, with a rainy season which starts in late November and lasts until the end of April or early May. This is followed by a long dry season for the remainder of the year. However, the area is dissected by a number of rivers and streams which provide water throughout much of the year, at least in the valley floors themselves. Zombwe is, therefore, a relatively favourable area for agricultural activity with few serious natural resource constraints.

MAP 1 HERE

The agricultural landscape is dominated by a patchwork of small and deliberately fragmented farms, with an average farm size of 3.9ha. This deliberate fragmentation is to provide a hedge against risk, such that, typically, each farm comprises three types of landholding. This was frequently raised in focus group discussions, and at one such discussion, the consensus view was captured by the Tumbuka phrase '*munda tikuwa naumoza yayi*', which broadly translates as 'we have many gardens to spread the risk of crop failure'. Risk aversion is clearly a key element of farming in this area. Immediately around the house are located *khonde*, normally less than half a hectare in size, on which regularly used food crops such as vegetables and green maize are grown. *Khonde* are purposefully created by leaving spaces for cultivation between the houses in villages and they are therefore easily accessible for use by households. The second landholding type is *mundu ukulu*, or the main farm, which is located away from villages in most cases, sometimes at distances as far as 20km, but more usually just a couple of kilometres. These comprise a larger area in size, ranging from 1 to 20 hectares. Up to ten food crops are typically grown in *mundu ukulu* under a mixed cropping pattern dominated by maize, but mixed with stands of beans, pumpkins, bananas, vegetables, cassava and mangoes, for example, and it is here where the bulk of household food production is undertaken. The third landholding type is *dimba*, which is a garden located in a nearby wetland, and the fact that there is a good number of streams dissecting the area make it possible for almost all farmers to have at least one *dimba* each, at least in Mzimba district. Whereas the main cultivation activity on *khonde* and *mundu ukulu* takes place from July until about January (although tree crops are tended throughout the year), in *dimba*, cultivation is between April and September, although some farmers extend this period by cultivating *dimba* up to the end of the dry season, which is usually in late November. Crops grown in *dimba* rely on moisture residues and may be supplemented with water from the stream, using tools such as watering cans. Consequently, crop cultivation in *dimba* is influenced and controlled by the soil moisture regime rather than soil fertility. The main crops grown in these areas are maize and sugar-cane.

Labour is provided overwhelmingly from within the household, with both men and women involved. There is an element of division of labour involved, with women more active in *khonde* and men more so on *mundu ukulu* and *dimba*, although it is not always as clear-cut as this might suggest. This is further complicated by the nature of land ownership under customary laws in the area. Land is mainly inherited from father to son along patrilineal lineage, although a daughter can also inherit land from the father if she commits to staying in the village for the rest of her life. Although virtually all land is customary tenure, these smallholder farmers, regardless of gender, view their land as securely owned, despite the existence of *de jure* usufructary rights.

Data collection

Data for the study were collected in five main ways, including informal, checklist-driven interviews; six focus groups comprising village members with a gender balance; a questionnaire survey of 111 farmers, which comprised 64 men and 47 women; participant observation and activity within the farming communities; and interviews with key actors, including village leaders, agricultural development officers, government officials and commercial seed and fertiliser suppliers. The researchers participated in various farming activities such as planting, ridging, weeding and harvesting. This generated data on the selection of planting sites for different crops, the division of labour for weeding, the nature of supervision which children under the age of 13 years received when weeding crops, as well as the selection of those crops which were transported to granaries immediately and those which were left in gardens overnight. In-depth interviews with farmers as they planted, ridged, weeded and harvested revealed detailed understandings which farmers possessed of ecological niches in which various crops do well.

The questionnaire was divided into several sections and generated data which addressed crops grown and livestock kept, traditional ecological knowledges (indigenous knowledges and practices) associated with smallholder farming, and the main factors which influenced the use and evolution of traditional ecological knowledges. In some instances, the respondents took over one and a half hours to cover the questionnaire because of the committed level of engagement they showed. Farmers particularly enjoyed responding to the questionnaire whilst performing agricultural work (eg land clearing, ridging, planting, weeding and harvesting), often whilst the researchers also participated. All the interviews and the questionnaire survey were conducted in Tumbuka, the local language. Interestingly, many Tumbuka words capture a broader concept rather than a specific, closely-defined meaning, such that what might appear to be a short sentence in Tumbuka can be loaded with meaning. Among other things, what became abundantly clear from the interviews and discussions with members of the communities was that agricultural production in the area is underpinned by two key drivers: household food security; and the maintenance of soil fertility. The production choices, allocation of resources and, critically, the use of agricultural knowledge are strongly influenced by these drivers.

Household food security

The immediate motivations of farmers in the study area are clear (Table 1). Every one of the 109 farmers who responded to this part of the survey considered the attainment of food security to be a Very Important or Important driver of their agricultural activity. Farmers were not opposed to producing for the market, as the response to the generation of higher profit margins shows in Table 1, but, even of the 12 farmers who rated this motivation as Very Important, all of them also rated food security equally as Very Important. This drive for food security is further reinforced by the wide range of crops chosen for cultivation (Table 2), with a total of 19 different crops being grown, and just over a half of them being grown by all farmers in the survey. The striking features of Table 2 are, firstly, the range of food crops grown, including grains, vegetables and fruit, to provide a relatively balanced household diet in terms of nutrition; and, secondly, the small number of clearly commercial crops, namely groundnuts and tobacco. This was reinforced in discussions with farmers who kept coming back to the importance of growing a wide range of crops, not only to spread risk, but also to provide a varied, and, as far as possible, balanced diet for the household.

One farmer summed this up well when in Tumbuka he said '*usamabazi nkhulya*', which has the meaning of having food available makes a person wealthy. Another responded with '*tikupanda mbeu nzakurya zamitundumitundu*' (food security is only achieved by growing a range of crops).

TABLE 1 HERE

TABLE 2 HERE

However, the importance of attaining food security for the farmers in the community is not just demonstrated by the wide range of crop choices, and motivations for those choices, but more significantly by the ways in which the driver of food security has become embedded into farmers' everyday agricultural practices, including their own self-developed knowledge repertoires. This is all the more remarkable, given the efforts of Agricultural Development Officers (ADOs) in the area to introduce new crops and techniques. In particular, the ADOs have made stringent attempts over the last few years to encourage farmers in the study area to adopt hybrid maize varieties, something which is very much national government policy and has largely been so in various ways since independence in 1964. This has been exacerbated by Malawi's experience of three national droughts over the last 15 years, and so the higher-yielding hybrid maize varieties are seen by government as a rational response to the target of ensuring national food security. However, although there have certainly been national-level food shortages in some years over this time-period, this has not been the case in Zombwe, largely because of relatively secure rainfall conditions over this time-period. Nonetheless, in line with national policy to diffuse the adoption of hybrid maize, there has been no lack of effort by ADOs in the Zombwe area through farmers' meetings, one-to-one discussions with farmers and the deployment of well-resourced demonstration plots.

Despite these best efforts, the adoption of hybrid maize in the study area has not been overwhelming. Of the 111 farmers who gave a response to the question in the survey, only 3 planted a larger area of hybrid maize than local varieties of maize, whereas a further 55 planted only the local maize varieties, with the remaining 53 farmers growing some hybrid maize but still relying predominantly on the local varieties for the bulk of their output. Given the higher yields of the hybrids, something which farmers openly recognise and accept, this raises the question as to why farmers still prefer to put their faith in the local varieties of maize rather than the higher-yielding hybrids. Interestingly, many focus group discussions kept returning to the fact, rather counter-intuitively, that the adoption of the hybrid varieties constituted a greater threat to food security than persisting with the cultivation of the local ones, a conclusion arrived at through the farmers' own observations, experiments and their dynamic and continually-evolving local knowledge.

A key issue for many farmers relates to the time of planting of the maize seeds. The hybrid seed needs to be planted at the time of the first 'planting' rains in November to maximise yields. This inevitably puts a considerable strain on the availability of labour at this time of year to ensure that land is fully prepared and the seed planted on time. It also puts a similar strain on labour availability for harvesting in April through to August. The lower-yielding local maize varieties are more tolerant of reduced water availability, and, although they tend to yield better if planted in November, they can nonetheless be planted at various stages during the rainy season through until the end of January. This evens out labour demands and makes the cultivation cycle easier to manage. But it is more than this. There is the additional problem of insect damage being greater at the start of the rainy season than even just a few weeks later, and such damage affects both hybrid and local varieties equally. From experience, farmers are well aware that maize planted before the Christmas period tends to be much more heavily infested with stalk-borer than that planted afterwards, thus, in their view, cancelling out many of the yield gains made from the early rains' planting. Indeed, the farmers' consensus estimate from the focus groups of yield reductions through stalk-borer infestations was somewhere in the region of 30%, with heavily infested plants failing to produce any cobs at all. Using a systematic survey through field transects, we were able to establish that up to 40% of the plants sown in November and early December were severely affected by stalk-borer (defined as 50% of the leaf area and/or 60% of the stalk affected). The reliance on early planted maize is a clear threat to food security for farmers in the study area, and hence the opportunity to plant local maize steadily every couple of weeks through the rainy season can have a greater positive impact on food security than committing totally to the hybrid varieties in one planting event. Interestingly, despite the advice of the ADOs to plant maize in November, the main planting time for maize is around Christmas-time and shortly thereafter (59% of farmers reported this time as their peak sowing season) in a clear effort to minimise losses from stalk-borer infestation. A commonly heard view in our discussions in focus groups, interviews and whilst working with farmers in their fields was '*nyengo yiweme yakupandila ngoma mpha Christmas*', confirming the importance of the Christmas period for planting.

A further issue arises when it comes to storage of the harvested maize. Hybrid maize can be very susceptible to weevil damage in post-harvest storage, unlike the local maize. Consequently, hybrid maize is consumed by the household relatively soon after harvesting and this tends to result in only small amounts being produced. If the household relied on stored hybrid maize for its food supply several months later, then the losses to weevils would threaten the household's food security; hence, this provides a clear disincentive to rely to any great extent on the hybrid varieties as the main source of household food supply. Pesticides are available to protect the maize in storage, but this represents an additional draw on scarce financial resources for farmers, and one which most are not prepared to make, or, in many cases, simply cannot make. It is also worth noting that taste of the maize flour, which produces the staple food *sima*, is an important consideration, with many arguing that the taste of local maize varieties is superior to that of the hybrids in *sima*. Similarly, green maize from local varieties is also perceived to have a more welcome sweeter taste than that from the hybrids. It would also seem that flour made from local maize has a longer 'shelf-life' than that from hybrids, apart from producing more plates of *sima*.

Even though the hybrid varieties clearly offer higher yields than the local varieties of maize, they are perversely perceived to offer less food security for households. For farmers, the staggered planting of local varieties, in particular, offers a proven and much more secure outcome in terms of food security for the household. Despite the best efforts of the ADOs over many years, the resilience of local knowledge, experience and proven farming practice seems to win the argument.

Maintenance of soil fertility

In the same way that the ADOs encourage the adoption of hybrid maize varieties, they equally energetically promote the use of chemical fertilisers as the most effective way of maintaining soil fertility in the area, both for hybrid and local varieties of maize, and other crops. Farmers are consequently very aware of the benefits of using chemical fertilisers, and many have used them at some point over the last few years and some continue to do so presently. However, chemical fertilisers represent a major purchase, and, with mean incomes in the study area of just over $450 per year per household, for many, purchases of fertiliser can represent a luxury item that cannot be afforded, at least in the context of other calls on the household budget. Indeed, some pointed out that the cash used to buy fertiliser in advance of the growing season might well be needed after the growing season to buy foodstuffs to make up for production and/or post-harvest storage losses.

However, it would be mistaken to assume that the relatively limited uptake by farmers of chemical fertilisers is simply a matter of economics, and therefore farmers fall back by default on using indigenous knowledge to maintain soil fertility as a measure of last resort. Farmers make continuing assessments of the costs and benefits of using chemical fertilisers against those associated with drawing on, and developing, their own understandings of soil resources and their management. Indeed, many farmers continue to evaluate and review their possible use of chemical fertiliser, so it is not the case that farmers have rejected them out-of-hand. Nonetheless, a recurrent concern in the focus group discussions was that chemical fertilisers 'burn' the soil, and farmers' past experiences with chemical fertiliser use have been characterised by mixed fortunes, such that many now associate chemical fertilisers with the disturbance and destruction of the natural mechanisms of soil nutrient replenishment. Others reported that once chemical fertilisers had been applied to farms, such applications had to be maintained otherwise yields decreased by up to a half in later years when no chemical fertiliser was subsequently applied to the soils. Meanwhile, those farms which had not been exposed to chemical fertiliser use at all maintained lower but steady yields over the following years. Farmers interpret this is an indication of the negative effect of chemical fertilisers on soil fertility, as they are seen to disrupt the activity of soil fauna and flora which are themselves seen to be crucial to fertility maintenance.

Consequently, the use of chemical fertilisers is not only an additional financial cost, but it also has the problem of not necessarily meeting the requirements of agricultural practice in the study area. As a result, over generations, farmers have developed a range of local fertility maintenance strategies, all of them based on continually evolving local knowledge and understandings, with many farmers taking the view that indigenous methods of fertility maintenance are not only more cost effective, but, significantly, more soil-friendly than applying chemical fertilisers. A common local practice for soil management and fertility maintenance is the burning of vegetation *in situ*, and the preparation of branches and cut grass for effective burning is a practice which requires special knowledge, skills and talent, as the branches and grass need to be laid in a particular way so that all branches completely burn into ash by the end of the burning process. Farmers lay branches in positions determined by their size. The smaller branches, with diameters of up to 3cm, are placed quite densely around those bigger branches with a diameter above 3cm, so that the smaller branches generate adequate heat to burn the bigger ones. This is crucial as it is the subsequent burning of the bigger branches that generates the necessary amount of heat to be effective in killing weeds.

To attain these necessary high temperatures to be effective, farmers are very conscious of the optimum environmental conditions at the time of managing the fire; these need to be calm, with little or virtually no breeze present. The most skilled and experienced farmers are able to forecast and identify such days, using their local understandings of weather and they can 'sell' their skills and knowledge accordingly. Calm hot days are characterised by *malawi*, hot air seen in the form of waves rising from the surface of the earth, particularly visible in open spaces such as gardens, roads or footpaths. The temperature in the dry season, especially in the months of September and October, is typically above 27ºC, creating ideal conditions for effective burning. Although it can rain throughout the year in Zombwe, August, September and October are relatively dry months, and hence the combination of low rainfall and high temperatures creates ideal conditions for successful burning. There is quite a skill in predicting the optimum timing for burning under these ideal conditions, and there are many farmers who do not share this depth of knowledge and skill. Consequently, for them, the killing effect on weeds of the resultant fire can be limited, as insufficient heat is generated during burning, so that many weed seeds survive, and hence the soil is inadequately sterilised. Farmers are very keen to avoid this situation because it subsequently translates into increased labour needs for weeding the crop, as well as increasing the chances of crop damage during the weeding process. To avoid inadequate sterilisation, many actively seek assistance from experienced farmers to manage the burning process on their behalf. This is typically undertaken on a reciprocal basis in which the expert is not paid in cash, but the recipient of his/her expertise commits a roughly equivalent amount of labour time on the expert's farm. Where burning has been effective, weeds only generally appear late in the crop growth cycle and are easier, therefore, to differentiate from the crops, especially if those crops are of the grass family, such as millet for example. Furthermore, farmers know and welcome the fact that burning helps to break up the soil, which then requires less effort in the task of uprooting weeds. This point was continually raised as a hugely important advantage of effective burning, something clearly not achieved by the application of chemical fertiliser.

A variation on this theme is the gathering of crop residues and uprooted weeds which are then transported to carefully selected sites elsewhere where they are burnt *in situ*. Farmers consider this to be a particularly important practice for the cultivation of pumpkins, as sites have to be reasonably open and extensive because pumpkins develop large leaves, and do so quickly in their growth cycle, and hence they can quickly inhibit the growth of other crops such as beans and young maize. Because it is the open aspect of the site which is the key element in the location choice for cultivation, the soils at that site may not be ideal and so have to be fertilised by the farmers. The ash from the burnt material makes a very good base for the pumpkins, something which is well recognised by the farmers. Although none of the farmers could name the element as potash, or indeed offer a scientific interpretation, as western science might demand, they are nonetheless very well aware of its fertilising properties and the optimum amounts they need to apply for optimum growth.

A further practice is the widespread use of crop residues to maintain soil fertility, something which is commonly used in *khonde*. For example, crops such as beans, after being harvested in *dimba* and *mundu ukulu*, are processed at home. Dry matter waste from processing, including stems and bean pods, are placed in ridge troughs in *khonde* to decompose. Similarly, bran and embryo are waste products from the process of producing flour from maize, and these are also placed in ridge troughs around *khonde*, although they may also be fed to livestock. Even when they are fed to livestock, the remnants are later swept onto the ridge troughs in *khonde*. Farmers do not see the application of crop residues to *khonde* as anything special, as such activities are simply part of everyday life; *khonde* are near to the house where the processing of crops is done, and hence the waste is dumped as close as possible to the site. Nonetheless, a commonly held view is that some crops, particularly maize, when grown with such dry matter decomposing in the soil, grow with vigour and produce bigger cobs, compared to those grown without decomposing dry matter being available. There is a clear understanding among farmers of the positive fertility effects of decomposing dry matter on the growth of crops.

A final means of managing soils and their fertility is through the cultivation of cassava in ‘tired’ fields, a commonly used method of recycling soil nutrients. ‘Tired’ fields are those which farmers perceive as having fertility levels reduced to such low levels that crop production is not seen to be worth the labour and capital inputs needed for production. In the past, leaving land to fallow was a common and well-established practice when shifting cultivation was more widespread in the area, and it is well-known that land which is left fallow regenerates itself naturally as plant species, bushes, grasses and trees recolonise such agricultural spaces. However, as demands on land resources have increased, other methods have had to be developed. In particular, farmers have observed that cassava recycles soil nutrients and has a similar effect to leaving land to fallow, with the key advantage of doing so in a shorter period of time. The planting of cassava on 'tired' fields has now developed as a major method of restoring soil fertility in the study area. It also has two further advantages, over both natural fallows and the use of chemical fertilisers, as cassava provides a steady food supply and its cultivation demonstrates that the land is being used – hence it eliminates any chance of the land ownership coming into dispute, either with other family members or with the community at large.

Clearly, the use of such fertiliser methods is embedded within every day agricultural and household practice. Critically, it is sustainable and cheap, at least in cash terms if not in labour terms. To move to the cultivation of hybrid varieties of maize would mean having to change this method of working, and to the farmers of the study area, this makes little sense, economically, ecologically or socially.

Discussion

There is the sense from the above discussion that there is something approaching two parallel universes operating with regard to how agricultural knowledge is used and deployed in Zombwe, both of which are well aware of the existence of the other, but which politely ignore each other nonetheless. On the one hand, there is the state and its sense of modernity, represented by the ADOs, many of whom are local and are well aware of these local knowledges,, who nonetheless actively promote the modern world of science and technology through their promotion of the adoption of hybrid maize varieties and the use of chemical fertilisers. Because of its dominant position, underpinned by the power of the state, this scientific knowledge of modernity maintains a position, as Davis (2005) puts it, of being a privileged knowledge. This is very different to the suppressed knowledge, again drawing on Davis (2005), of the farmers in the communities which is seen to be conservative and backward, and certainly will not contribute to the major food production challenges posed by Collier (2008, 2009). But local/indigenous knowledge remains a powerful body of knowledge for these communities in Zombwe. The danger in taking this position, however, is that if we are not careful, we end up back with the sterile debates around the dichotomy of scientific and indigenous knowledges (Agrawal, 2009). However, this position misses the point, as farmers are very aware of the availability of both the hybrid maize seeds (and most do use them to an extent) and chemical fertilisers (and, again, many have made use of them at some point, and some still do), but many are nonetheless making conscious decisions to use particular methods which suit their own particular local circumstances. The 'science solution' is embraced as part of the knowledge repertoire of farmers but they are choosing for the most part not to take it up.

An important part of the explanation for this rests with the economics of using the 'science' solution. In Zombwe , the mean annual income of farmers is a little over US$450. Given other household demands on this income, investments in hybrid seeds, chemical fertilisers and pesticides can be seen to be too expensive for many, and especially in the context of the driver of attaining household food security. Sales of crops are not seen as a particularly high priority (see Table 1), so income to offset against investment may not be achieved, and especially so in years of lower production. However, to suggest that this is an economic decision alone is too simplistic. Just over one-half of the farmers in the study do cultivate hybrid maize, but only in relatively modest amounts compared to local varieties (only 3 out of 111 farmers cultivate a greater area of hybrid maize than local). Similarly, most farmers have tried applying chemical fertilisers, however modestly, at some time over the last few years. Whilst economic pressures are clearly serious and impinge directly on decisions, they are by no means the full explanation.

A further key reason lies in the way in which indigenous knowledge has been perceived, valued and used by many in the development 'industry'. As far back as 1998, the World Bank appropriated indigenous knowledge into its approaches to development, although a careful analysis of this approach might suggest that this was little more than a lip-service (see, for example, Briggs and Sharp, 2004). It became *de rigeur* in development, not only to acknowledge indigenous knowledge, but to incorporate it wherever possible in development interventions. Indigenous knowledge became professionalised, and, as Laurie, Andolina and Radcliffe (2005) have suggested, there are clear dangers in this, not least because "local specialist knowledge detracts from development expertise, raising questions about how indigenous knowledge and actors are seen and valued" (Laurie, Andolina and Radcliffe, 2005, 477). For indigenous knowledge to become accepted by the development industry, and not to represent a threat to the existing paradigm of the dominance of science, indigenous knowledge had to follow the same norms, not least the need for it to be decontextualised from its socio-economic and cultural settings, and somehow made universal, to be of any value – and it is here where the crux of the problem lies.

In Zombwe, although household food security is a key driver, there are other factors present, perhaps in the background, but no less important for that. For example, there is strong cultural pressure within the community to be seen as a 'good' farmer, something which is demonstrated by ensuring that the household is food secure. To be unable to achieve this not only generates a sense of pity, but also raises unwelcome questions about that person's father and his inability to pass on sufficient knowledge and skills to ensure that his son is able to meet these needs (and it is interesting that it is seen in these gender-specific terms). For households who do fall on hard times, there is an obligation within the community to help out in times of need, but the price paid for this is a critical loss of face within that community. Several people noted that this kind of peer pressure does not encourage what might be seen as a risk-taking strategy of adopting 'modern' methods.

For farmers in Zombwe, food also has a social value and meaning beyond meeting immediate household demands, however compelling these may be. It fulfils a role in social bonding, and hence the value of food can be more than 'just food'. For example, whereas maize in *mundu ukulu* is rarely harvested whilst still green, the picking and eating of green maize cobs in *khonde* can be a kind of leisure activity which is popular during the morning and late afternoon. This is a vitally important social activity which helps to bind and reinforce social relationships between members of the community. Significantly, it is the local maize which has the preferable taste, and there is something of a stigma if a farmer tries to use hybrid maize for this activity. Furthermore, as we have seen, hybrid maize requires one short planting period, and therefore a subsequent short harvesting period, whereas local maize is planted over a much longer period and so eventually provides maize for these social activities over a period of 2-3 months. Similarly, other farmers working in their *khonde* close to their houses may typically uproot a piece of cassava to share with passing villagers as they converse and pass the time of day, again reinforcing social ties within the community. There is, therefore, a key social aspect of food production that is not always fully appreciated, even by the ADOs themselves. Consequently, this may go some way to explaining why the farmers in the survey ranked higher profits below food security; friendship and social capital have a meaning which is hard to quantify, but is no less important for all that.

As this study has shown, the use and continuing development of indigenous (or local) knowledge is not an irrational grasping of an outmoded set of practices by a group of conservative and stubborn farmers. These farmers know what alternatives are available, and they have made decisions based on information which they have to hand. But what is key here is the way that such decisions are driven by local socio-cultural conditions. Food security is paramount; indeed, in many discussions with farmers the concept of household wealth was often expressed in terms of food security for the household, albeit expressed in differing ways. Consequently, the critical question for farmers is how best to achieve this, and the answer appears to be by adopting a cropping strategy into which the hybrid maize does not easily fit. In a similar vein, soil fertility maintenance does not require expensive chemical fertilisers to meet acceptable levels of fertility, given the cropping strategy adopted, with its emphasis on attaining household food security rather than maximising commercial crop production. The drivers of food production are clearly embedded within the socio-economic and cultural realities of the community, and so are the knowledges which underpin this production.

If we follow the line of argument that indigenous knowledge is indeed embedded within the socio-economic and cultural realities of the community, and it is not some sort of afterthought needed to lend greater legitimacy to a development proposal, then this requires a clear, deep and meaningful engagement with communities from the start of any development intervention. The dangers of indigenous knowledge being divorced from their cultural context are not new – Agrawal in 1995 was already warning of this – but there is still a strong tendency today to ignore this context, as indeed the findings of this study demonstrate. Perhaps it is this which might explain why Sillitoe (2010) felt that he had to express his sense of disappointment at the ‘failure’ of indigenous knowledge, and hence perhaps a clear re-engagement with cultural context might provide a more optimistic future. However, things are not as simple as this might suggest. To engage in this kind of way implies a long-term commitment to understanding the complexities and socio-economic realities of communities before development interventions involving indigenous knowledge systems are deployed, but in a short-term, target-driven development industry, this longer-term approach may not be welcome. That perhaps is the biggest challenge facing indigenous knowledge.

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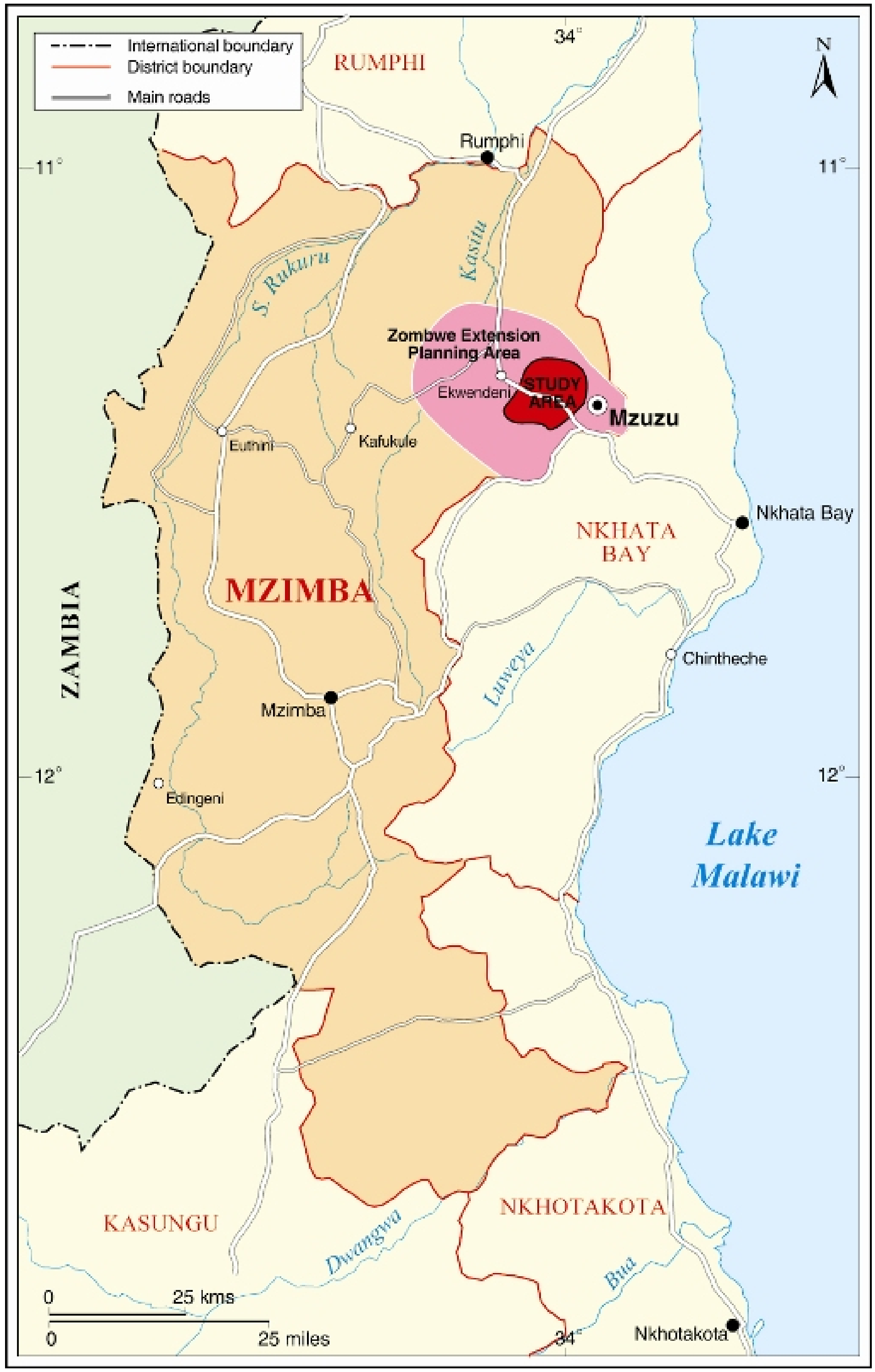
Table 1 Farmers' motivations in crop production								
Objective	Very important	Important	Neutral	Not important	Very unimportant	Respondents	Total scores	Percentage score
Attainment of food security	107	2	0	0	0	109	543	99.6
Increase of yields	87	22	0	0	0	109	523	96.0
Generation of higher profit margins	12	60	32	2	1	107	400	73.4
Environmentally friendly	2	5	100	0	0	107	330	60.6
Production of blemish-free produce for the market	1	6	3	74	23	107	209	38.3
Scores	Very important = 5	Important = 4	Neutral = 3	Not important = 2	Very unimportant = 1			

Table 2 Range of crops grown in the study area		
Crops in order of importance	Smallholder farmers growing the crops	
	Number of farmers growing the crop	Percentage of farmers growing the crop
Maize	111	100%
Beans	111	100%
Pumpkins	111	100%
Mangoes	111	100%
Pineapples	111	100%
Bananas	111	100%
Cassava	111	100%
Sweet potatoes	111	100%
Green vegetables	111	100%
Sugar cane	111	100%
Tomatoes	100	91%
Guavas	90	81%
Avocado pears	60	54%
Peas	60	54%
Oranges	30	27%
Yams	20	19%
Tobacco	3	3%
Ground nuts	2	2%
Millet	2	2%
N=111		


TANZANIA
ZAMBIA
MOZAMBIQUE
MALAWI
NORTHERN
CENTRAL
Lilongwe
MOZAMBIQUE
SOUTHERN
Blantyre


International boundary
District boundary
Main roads
RUMPHI
34°
N
Rumphi
11°
11°
S. Rukuru
Kasitu
Zombwe Extension
Planning Area
STUDY
AREA
Ekwendeni
Mzuzu
Euthini
Kafukule
Nkhata Bay
NKHATA
BAY
ZAMBIA
MZIMBA
Chintheche
Luweya
Mzimba
12°
12°
Edingeni
Lake
Malawi
NKHOTAKOTA
KASUNGU
Dwangwa
Bua
0
25 kms
0
25 miles
34°
Nkhotakota