Mr Napite's botanical knowledge: bridging farmers' and scientists' insights during participatory research*

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Abstract

When farmers and scientists engage in participatory research, differences in their knowledge systems ought to be taken into account. Mr Napite is a farmer and plant expert with whom we studied relationships between soil fertility and fallow vegetation on the Makonde plateau in South Eastern Tanzania. Though his broad and detailed botanical knowledge is recognised by other local experts, this does not provide him any particular social status. Although he received a rather extensive formal training, his botanical knowledge draws largely on personal and traditional concepts. Clear morphological characteristics, others than the reproductive related organs, are the key features he uses for identifying and classifying plants. His knowledge on plant species and their ecology is of comparable complexity as of scientific knowledge. Though this is intricately linked to cultural aspects, this study illustrates that it is possible to bridge farmers' and scientists' insights during participatory research.

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Introduction

Rural people's active involvement in agricultural research has become common practice with the widespread acceptance of participatory approaches. This is advocated on the argument that it gives farmers greater ownership of both the research process and results (Chambers, 1997; Okali *et al.*, 1994). Ultimately it would contribute to their general empowerment by increasing their self-esteem and making them less dependant from external agents for their development (Slocum & Thomas-Slayter, 1995). Participatory approaches would have the advantage to lead to development of technologies more appropriate to resource-poor farmers living in complex and risk prone environments which is not the case for the classical model of "transfer of technology", which served industrial and green revolution agriculture (Martin & Sherington, 1997).

Collaboration between farmers and scientists calls for reflections on differences in the knowledge systems of these two groups of actors. Rural peoples' knowledge has become a focus of research on its own right. Scoones and Thompson (1994) observed that there are three contrasting ways of representing rural people's knowledge:

- rural people's knowledge is "primitive", "unscientific", "wrong"
- rural people's knowledge is a "valuable and under-utilized resource" and needs to be intensively and extensively studied, and "incorporated" into formal research and extension practise
- neither rural people's knowledge nor Western science can be regarded as unitary "bodies" or "stocks" of knowledge. Instead, they represent contrasting epistemologies produced within particular agro-ecological, socio-cultural and political economic settings.

Indigenous knowledge systems are frequently portrayed as closed, pragmatic, utilitarian, value laden or context dependable implying that they cannot have the same authority and

credibility as science (Devisch, 2002). On the other hand, it is also asserted that indigenous people have amassed a rich body of knowledge through centuries of observation and experimentation about the diversity of organisms and species communities in their territory (e.g. Shepard *et al.*, 2001; Descola, 1999; Kikula, 1997). Consequently, some scientists behave as if it were possible to pluck information relating to their specialisms out of the cultural context and treat it as independent technical facts. Because of the complex entanglement of bio-physical and socio-cultural factors in daily farming, some anthropologists argue (e.g. Sillitoe, 1998) that concepts central to agricultural science may not be entirely appropriate to understanding and documenting local practices and should not be allowed to determine research priorities. This point calls for careful consideration for whoever gets involved in participatory research.

Mr Napite is a farmer with whom we collaborated for almost four years in Mtopwa, a village on the Makonde plateau in South Eastern Tanzania (Fig. 1). Together we studied the relationships between fallow vegetation and soil fertility. From the start Mr Napite volunteered to cooperate and quickly proved to be a plant expert. This was of direct practical value, as none of us was familiar with the plants. The agro-ecological insights gained from this research, have been reported elsewhere (Dondeyne *et al.*, 2003a).

Figure 1

Drawing on the experiences from this collaboration, this paper aims at documenting the nature of the knowledge of a local plant expert such as Mr Napite, and to reflect on implications for participatory research by analysing the similarities and differences between indigenous and scientific knowledge. Starting from a description of Mr Napite's knowledge, we analyse how he acquired this knowledge and what brought him to learn it. This leads to question on his socio-economic status before coming to conclusions on how farmers and scientists can come to a sharing of insights into agro-ecological processes.

Makonde plateau

The Makonde plateau reaches 120 km inland and is separated from the coast by a narrow plain (Fig. 1). It is largely inhabited by the Makonde people, who migrated from northern Mozambique in the middle of the 19th century (Liebenow, 1971). They are part of a cluster of matrilineal Bantu speakers living in an area stretching from the East African coast up to central and West Africa (Wembah-Rashid, 1975).

The plateau is gently sloping from east to west; altitudes ranging from 80 to 880 m above sea level. Soils are derived from strongly weathered sandstone, forming predominantly weakly structured coarse sandy material, excessively drained, with low levels of nutrients and minerals and low base saturation (Dondeyne *et al.* 2003b). Cashew nut is the most important cash crop in the area. The most common food crop is cassava, planted in mixture with maize, sorghum and upland rice. Typically fields are cultivated for four consecutive years. On these soils with inherent low fertility, yields quickly decline over the years. Farmers then leave the land fallow for up to 10 years. The fallow vegetation consists of dense bush and saplings known as “Makonde Thicket” (Bennett *et al.*, 1979).

Research procedure

In March 1999 at the conclusion of the fieldwork on soil fertility and fallow vegetation, we asked Mr Napite to narrate his life story. We asked him especially to elaborate on how he learned about plants and what motivated him to do so. To get an insight into key characteristics for distinguishing plants, we asked Mr Napite to group plants according to their “affiliations” — i.e. according to how he perceives them to be related to each other. Out of the 166 plant species he had recognised during the fieldwork, we presented him a list of 50 randomly selected species to which we added *Setaria verticillata* and *Salacia erecta* as they had been reported to be indicators of respectively low and high soil fertility (Dondeyne *et al.*, 2003a). We also added *Acanthospermum hispidum* because of its similarities with *Oxygonum*

sinuatum which was one of the randomly selected species. The Makonde names were printed on cards, which we asked him to group. Insights into his concepts related to “vegetation ecology” were obtained by having him to regroup the same species according to their likelihood of occurring together. Additionally we asked him to indicate how each of these species is associated with soil fertility. To assess in how far his knowledge on plants could be linked to their utility, we asked him to describe all possible types of uses. Though Makonde names of the plants were used, the discussions were held in Swahili, the *lingua franca* in the area and with which all involved were confident.

Results

Life story

Ismail Napite was born in 1961 in the village of Chimbuko, Tandahimba district, about 20 km North East of Mtopwa. His parents were ordinary farmers. From 1970 to 1976 he went to the primary school at the village and from 1977 to 1980 he went to the Kigonsera Secondary School. In 1982 he started working as an “Agricultural Field Auxiliary” for the Ministry of Agriculture, as he was not allowed to continue studying. He was later posted in Mtopwa as a Village Extension Officer. In January 1997 he was made redundant and has since been living in the village as an ordinary farmer.

The training provided at the secondary school focused especially on agriculture. He had courses in sciences, physics, chemistry, maths, biology, agriculture and livestock, English, Swahili, history, Islamic knowledge, Bible knowledge and political education. Courses in biology included general botany; those in agriculture dealt with cash crops such as cashew, cotton and coffee. They were thought how to grow these crops, the required spacing and the uses of fertilisers and pesticides.

As a Village Extension Officer he got additional training through courses, usually of one or two weeks. Subjects were for example “soil and water conservation” and “management of small projects”. What he was thought about weeds concerned the use of herbicides, but he does not remember much about it as these have never been available. In 1987, he got some training on rice cultivation, as there was the plan to start a rice irrigation project along the Ruvuma river.

Already as a child he was eager to learn names of weeds and trees. He learned this from other farmers. He had no specific mentor but was just asking farmers. His parents had stressed that although he was going to school, he had to learn how to farm else life would be difficult. This encouraged him to learn these things.

In this way he learned for instance that place where Nahimana (*Salacia erecta* (G. Don) Walp., Mtapuchi (unidentified tree species), Mbobo (*Grewia pachycalyx* K. Schum.) and Uhangu (*Mucuna pruriens* (L.) DC.) grow, are fertile. Crops really grow well on areas where you find these plants. He believes that Nahimana brings fertility to the soil by the nodes it has on its roots. The other three shed their leaves, and so that must be the way they fertilise the soil. Another example is that if you add ash from cashew leaves to the soil, rice really grows well and does much better than the other crops. He never had any explanation for this during his formal education. But he observed that it could be due to the ashes not penetrating deep into the soil and as rice has superficial roots, it could hence benefit more from it than other crops.

He feels to be widely appreciated for his knowledge on agriculture by the villagers of Mtopwa. But only few people do appreciate his knowledge on plants. Some elderly men, even healers, admitted that he knows more plants than they do. Healers have a very

specialised knowledge. They just know the plants they use in their practice. He feels to have a much broader knowledge.

Plant characteristics

The groupings of the plant species in terms of their “affiliations” are presented in Table 1. The classification is based on clear morphological characteristics; utilitarian properties are only used for making some subdivisions. Consistently, the crops — groundnuts (*Arachis hypogea*), yam (*Dioscorea alata*) and cassava (*Manihot esculenta*).— are not handled differently from wild plants. The characteristics used are directly observable ones as well as less obvious ones such as the presence of tubers. Plants with very similar characteristics, such as *Acanthospermum hispidum* and *Oxygonum sinuatum*, which are both herbaceous annuals with conspicuous spikes have the same name (Mbigili) though it is realised that they are distinct species. Similar and related species, but which do not have their own names, are referred to by calling them “jami ya” literally meaning “family of” – examples are *Commelina* sp. and *Commelina benghalensis*. Some common but exotic weeds, such as *Tridax procumbens* do not have a proper name; PWD is actually a nickname derived from “Public Weed Domain”.

Ecological insights and uses of plants

The groupings of the plant species according to their likelihood of occurring together, and their relationship with soil fertility as well as their uses, are presented in Table 2. The classification corresponds to variations between cultivated fields and mature fallow fields or forests. Species of the forest are clearly associated with higher soil fertility while weeds of cultivated or fallow lands are associated with low to medium soil fertility levels. Species for which no use was mentioned are predominantly weeds of cultivated or fallow lands. Strikingly nearly all forest species have medicinal uses while the four species mentioned to be used in traditional ceremonies are either crops or are associated to agricultural land.

Table 1

Table 2

Discussion

Mr Napite's botanical knowledge derives from his personal interest in plants akin to that of amateur botanist anywhere else. Alcorn (1995) claims that ethnobotanical knowledge is not only held by individual farmers, but is also held in customary "scripts" that farmers learn from their parents and pass on to their children. This surely holds for part of the knowledge on farming practices, but the way Mr Napite acquired his botanical knowledge shows that such a "script" is neither formal nor systematic. Nor did his parents seem to have played any particularly role as source of this knowledge, though they encouraged him learning so.

From his parents' attitude with regards to schooling transpires how, in South Eastern Tanzania, schools are seen as alien institutions. Little of what Mr Napite learned during his formal training seems to have had any bearing on the development of his botanical knowledge. Most striking is that what he learned about weeds only concerned pesticides, which never have been available. Intriguingly whatever he must have studied about botany seems not to have had much impact on his concepts for classifying plants or on his ecological insights.

As Warren (1998) points out, for any domain there are three types of knowledge:

- basic core knowledge possessed by virtually all members of a community that provides the basis for communication on a given topic
- shared knowledge that expands on the core knowledge and allows persons occupying related occupational niches to communicate in more specialised ways, and
- specialised knowledge within an occupational niche that most others in the community do not require.

Mr Napite's botanical knowledge surely is specialised, though not strictly linked to a particular occupational niche, such as one expects to be held for example by healers or blacksmiths. Although his expertise is recognised by healers, as well as by some peer farmers, he does not seem to derive any particular social status from it.

The classification systems presented here are constructed on the spot during the interview. Therefore, we do not want to imply these to correspond to any generally accepted botanical classification system of peoples of South Eastern Tanzania. They are intended for getting insights into the kind of plant characteristics such an expert, as Mr Napite considers relevant. They show that Mr Napite's botanical knowledge is general, open and constitutes an intricate system. Scientific identification keys such as developed by Keller (1996) take into account that in tropical forest it is often not practical to identify plants on the basis of their reproduction related organs. It should therefore not be much of a surprise that Mr Napite classification system is based on morphological characteristics other than flowers or fruits. These illustrate how rural people classification systems can be similar and concordant with scientific classification systems. The grouping of unnamed but related species by calling them "family of" is another example of similarities between indigenous and scientific knowledge.

Thrupp (1989) argues that knowledge taken out of cultural context threatens both to misrepresent and devalue it. Though we are aware of the important cultural aspects linked to plants in the area¹, in this study we did not probe in-depth for cultural aspects linked to plants. Nevertheless, in the course of the participatory research work on fallow vegetation and soil fertility, we learned through informal discussion that particular species used in particular initiation rites bear taboos and cannot be cut by women. The uses of plants in traditional ceremonies, was also mentioned when discussing plant uses in general. This

information made us sensitive for cultural aspects and hence a fruitful collaboration was not hampered. Along this line, some caution may be warranted when interpreting the association between soil fertility and fallow or forest vegetation. On the one hand our study on the relationship between soil fertility and fallow vegetation (Dondeyne *et al.* 2003a) showed that there is a positive correlation between soil fertility and some plant species typical of mature fallow , or forest vegetation (*Salacia erecta*, *Mucuna pruriens* and *Millettia impressa*); and a negative correlation was found with species typical of cultivated fields (e.g. *Cyperus* spp., *Setaria verticillata* and *Sesamum latifolium*). On the other hand, fertility and forests are also cultural linked as during initiation rites youngsters have to stay for some time in the forest.

Sillitoe (2000) argues that imposition of our scientific categories and technological priorities not only threatens to misrepresent knowledge but also to limit analysis by predisposing us to think certain issues important and to overlook others that may be significant to local understanding and experience. Collaborating for several years with Mr Napite, we learned to appreciate and respect each other's knowledge and expertise. The classifications generated in the course of this study indeed illustrate, how interactions between farmers and scientists can lead to a fruitful ground for a common understanding, notwithstanding cultural differences.

¹ see the ethnographic study of healing practices in South Eastern Tanzania by Langwick (2001)

Conclusions

Mr Napite's expert knowledge does not seem to be linked to any special social status or occupational niche. Despite the relative extensive formal education he received; his knowledge on plants seems to be based on personal or traditional concepts rather than on those of western science. He acquired his knowledge through personal and informal enquiries with fellow farmers. This study illustrates how similar and concordant rural people's classification systems are with scientific classification systems. Without having to get into an in-depth understand of all cultural significance of indigenous knowledge, it is therefore possible to come to common understanding between farmer and scientist in the course of participatory research.

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Figure 1 Location of Mtopwa village on the Makonde plateau in South Eastern Tanzania

Table 1 Classification of 53 plant species according to their “affiliations” as perceived by Mr Napite, a local plant expert of South Eastern Tanzania

Grouping	Makonde name	Family	Species
1. Plants with underground pulses			
	Ntesa	Fabaceae	<i>Arachis hypogea</i>
2. Annual plants			
a - erect, slightly woody plants			
	Chidwanga	Malvaceae	-
	Chipanga makali	-	-
	Jami ya lipukutanyedi	-	-
	Liawanyima	Malvaceae	<i>Hibiscus</i> sp.
	Minyominyomi	Asteraceae	<i>Bidens pilosa</i>
	Mjalahu	Fabaceae	<i>Crotolaria</i> sp.
	Mjini	Lamiaceae	-
b - procumbent plants			
	Mbigili (1)	Asteraceae	<i>Acanthospermum hispidum</i>
	Mbigili (2)	Polygonaceae	<i>Oxygonum sinuatum</i>
c - plants regrowing easily			
	Jami ya nakushukuru	Commelinaceae	<i>Commelina</i> sp.
	Nakushukuru	Commelinaceae	<i>Commelina benghalensis</i>
	PWD	Asteraceae	<i>Tridax procumbens</i>
d - non woody, herbaceous plants			
	Chileumbuzi	Cyperaceae	<i>Cyperus</i> spp.
	Jami ya nakatumbaku	Asteraceae	-
	Lusunga	Asteraceae	<i>Launaea</i> spp.
	Nakatumbaku	Asteraceae	Vernonidae - sp.
	Nanchilanga	Scrophulariaceae	<i>Striga asiatica</i>
3. Plants needing physical support of others (vines)			
a - too woody to be useable as ropes			
	Lihongo	Vitaceae	<i>Cissus</i> sp.
	Msimbulale	-	-
	Mtambulo	Combretaceae	<i>Combretum stenanthoides</i>
	Nahimana	Celastraceae	<i>Salacia erecta</i>
	Ndegachitundu	Celastraceae	<i>Salacia leptoclada</i>
b - non woody vines			
	Chiteteha	Euphorbiaceae	<i>Dalechampia scandens</i>
	Lidingili	Convolvulaceae	<i>Astripomoea malvaceae</i>
	Mtolo	Apocynaceae	<i>Saba comorensis</i>

Table 1 Classification of 53 plant species according to their “affiliations” as perceived by Mr Napite, a local plant expert of South Eastern Tanzania (continued)

Grouping	Makonde name	Family	Species
4. Plants standing on their own			
a - big trees			
	Mtapuchi	-	-
	Nkolong'ombe	Fabaceae	<i>Baphia</i> sp.
b - medium sized trees, suitable for constructions as poles			
	Mbendu	-	-
	Mkungulu	Loganiaceae	<i>Strychnos pungens</i>
	Mmalala	-	-
	Mnembelembe	Caesalpinoideae	<i>Cassia</i> sp.
c - small trees, not suitable for constructions			
	Mchendeche	-	-
	Mdudu	-	-
	Mkung'u	Celastraceae	-
	Mnami	-	-
	Mpumbulu	-	-
	Mputiputi	-	-
	Mpwipwi	-	-
	Mtochi	-	-
	Numukamongo	Fabaceae	<i>Canavalia</i> sp.
	Nung'anung'a	Flacourtiaceae	-
5. Plants with tubers or bulbs			
a - woody above the ground			
	Muhogo	Euphorbiaceae	<i>Manihot esculenta</i>
b – vine			
	Chitundi	Dioscoreaceae	<i>Dioscorea alata</i>
c – herbaceous			
	Indondo	Araceae	<i>Arisaema</i> sp.
	Nanyanda	Liliaceae	<i>Gloriosa superba</i>
6. Grasses			
a - creeping grasses			
	Chikonga	Poaceae	<i>Digitaria</i> sp.
	Chiyeye	Poaceae	-
	Jami ya chikonga	Poaceae	-
b - erect grasses			
	Chipunga	Poaceae	<i>Setaria</i> sp.
	Nachisuvele	Poaceae	<i>Setaria verticillata</i>
	Nachitani	Poaceae	<i>Eleusine indica</i>
	Nambole	Poaceae	<i>Panicum maximum</i>

Table 2 Classification of 53 plant species according to their likelihood of occurring together as perceived by Mr Napite, a local plant expert of south Eastern Tanzania. The association of the plant species with soil fertility and their type of uses are also indicated.

Grouping	Makonde name	Species or (sub)family	Soil fertility	Type of uses*
1. Crops				
	Chitundi	<i>Dioscorea alata</i>	high	edible tubers, animal feed
	Muhogo	<i>Manihot esculente</i>	medium	Med., Vet., Cer., Poi., edible tubers and leaves, animal feed, firewood
	Ntesa	<i>Arachis hypogea</i>	medium	Med., Vet., Cer., edible seeds, animal feed
2. Plants of disturbed areas but still fertile or cultivated				
	Chileumbuzi	<i>Cyperus</i> spp.	medium	-
	Jami ya chikonga	[Poaceae]	high	animal feed
	Jami ya nakushukuru	<i>Commelina</i> sp.	high	animal feed
	Minyominyomi	<i>Bidens pilosa</i>	medium	Med., animal feed
	Mjalahu	<i>Crotalaria</i> sp.	high	Med.
	Nakushukuru	<i>Commelina benghalensis</i>	high	-
	Nambole	<i>Panicum maximum</i>	medium	Cer., animal feed
	PWD	<i>Tridax procumbens</i>	high	Med., Vet., animal feed
3. Plants of areas recently left to fallow - areas which are "exhausted"				
	Chipanga makali	-	high	-
	Chipunga	<i>Setaria</i> sp.	medium	-
	Jami ya nakatumbaku	[Asteraceae]	high	animal feed
	Liwawanyima	<i>Hibiscus</i> sp.	medium	-
	Mbigili (1)	<i>Acanthospermum hispidum</i>	medium	Med.
	Mbigili (2)	<i>Oxygonum sinuatum</i>	medium	Med.
	Lusunga	<i>Launaea</i> spp.	high	animal feed
	Mjini	[Lamiacea]	high	Med., animal feed, fertilizer
	Nachisuvele	<i>Setaria verticillata</i>	medium	Cer., animal feed
	Nachitani	<i>Eleusine indica</i>	medium	animal feed
	Nakatumbaku	[Vernonidae]	medium	-
	Nanyanda	<i>Gloriosa superba</i>	medium	Poi., edible tuber after processing
4. Plants from 2nd or 3rd year fallow - when it starts to be a dense vegetation				
	Chidwanga	-	medium	-
	Chikonga	<i>Digitaria</i> sp.	high	for making baskets
	Chiyeye	-	medium	-
	Indondo	<i>Arisaema</i> sp.	medium	Med., Poi., for making soap
	Jami ya lipukutanyedi	-	medium	-
	Nanchilanga	<i>Striga asiatica</i>	low	-

* Med. = medicinal; Vet. = veterinarian; Cer. = ceremonial; Poi. = Poisonous

Table 2 Classification of 53 plant species according to their likelihood of occurring together as perceived by Mr Napite, a local plant expert of south Eastern Tanzania. The association of the plant species with soil fertility and their type of uses are also indicated. (continued)

Grouping	Makonde name	Species or (sub)family	Soil fertility	Type of uses *
5. Plants of thick forests				
	Lihongo	<i>Cissus</i> sp.	medium	Med., Vet.
	Mbendu	-	high	Med., Vet., edible seeds
	Mchendeche	-	high	for making ropes
	Mkung'u	-	high	Med., edible fruits, animal feed, firewood
	Mkungulu	<i>Strychnos pungens</i>	high	Med., firewood
	Mmalala	-	high	Med., animal feed, firewood and building poles
	Mnami	-	high	Med.,
	Mputiputi	-	high	Med., for lighting fire (trad. matches)
	Mpwipwi	-	high	Med., edible fruits, animal feed
	Msimbulale	-	medium	Med.
	Mtapuchi	-	high	Med., fertilizer, firewood, building poles
	Mtochi	-	high	Med., edible fruits, animal feed
	Mtolo	<i>Saba comorensis</i>	high	Med., edible fruits, animal feed, ropes
	Ndegachitundu	<i>Salacia leptoclada</i>	high	for making baskets
	Numukamongo	<i>Canavalia</i> sp.	high	Med., Vet.,
	Nung'anung'a	-	high	Med.
6. Plants of thick forests - but different for previous				
	Chiteteha	<i>Dalechampia scandens</i>	high	-
	Lidingili	<i>Astripomoea malvaceae</i>	high	Med., animal feed
	Mdudu	-	high	Med.
	Mnembelembe	<i>Cassia</i> sp.	high	Med., Vet., firewood, building poles
	Mpumbulu	-	high	Med., firewood
	Mtambulo	<i>Combretum stenanthoides</i>	high	Med.
	Nahimana	<i>Salacia erecta</i>	high	Med., animal feed, for making baskets
	Nkolong'ombe	<i>Baphia</i> sp.	high	Med., building poles

* Med. = medicinal; Vet. = veterinarian; Cer. = ceremonial; Poi. = Poisonous