

How farmers and scientists see soils

Mismatched models

Peasant farmers describe different kinds of soils and their uses according to categories which do not fit into the classification system of soil scientists. Conventional research and extension are therefore doomed to be irrelevant. Patrick Sikana argues that the scientists - rather than the farmers - will have to change their way of looking at soils.

Patrick Sikana

During community studies in the Northern Province of Zambia, the rural sociology section of a Farming Systems Research team realised that farmers have their own way of identifying local soils and land types for agricultural uses. When this was reported to other scientists, it was felt that, if local soil categories could be related to scientific classification, it would be easier for researchers and extensionists to communicate with farmers. So social and natural scientists joined to make a more in-depth study.

Five study areas were chosen to represent major languages (Bemba, Mambwe and Namwanga) and major land regions where soil surveys had already been made. A social science student from the University of Zambia and a soil science student from the Agricultural University of Norway resided in each study area for 2 weeks. In group interviews, the farmers were asked to name all the soils they use, plus other nearby soils. Then, individual farmers who were reportedly familiar with particular soil types were interviewed in depth about the nature and uses of that soil. Soil samples were taken, and texture, colour, location, micro-relief features (eg. termite mounds), drainage and vegetation were recorded.

Farmers' soil categories

The farmers identified 27 soil groups with 71 sub-categories. Their categories were not mutually exclusive (eg. see Chundu in Table 1). The soil types more important for farming generally had more sub-categories. Farmers agreed remarkably well on the features of different soil types. For example, out of 15 farmers in one study area who described a particular soil type, 13 said the top layer is hard when dry, 14 said the soil is slippery when wet and 12 said it tends to stick to the hoe when cultivating.

The main criteria used by the farmers to classify soils were colour of the top layer,

texture, consistency and organic matter content. Crops are chosen to suit soil type. For instance, black Wa Fita soil rich in organic matter is often found in the vegetable gardens on the *dambo* (wetland) fringes.

Poor fit with "science"

There was little correlation between local soil type and Zambian technical soil series, because farmers and scientists use different criteria to categorise soils.

Farmers are most interested in features of the topsoil, as these influence important management decisions. Soil scientists base their categories on elaborate chemical and physical analysis of the subsoil. They are less interested in the topsoil because they seek consistency and reliability. They argue that the topsoil varies constantly on account of numerous factors such as previous management practices, erosion and burning, whereas the subsoil maintains the characteristics intrinsic to that particular soil type. As the farmers have to deal with the numerous factors

which influence features of the topsoil, their perception of soil is more dynamic and their categories are less rigid.

Looking at the topsoil, farmers can recognise numerous local soils in an area where the technical system indicates only one soil type based on features of the subsoil. Conversely, soils with different subsoils may have similar topsoil properties, so farmers see these two distinct technical types as similar.

Farmers and scientists not only apply different criteria; they arrive at soil categories in different ways. The scientific system starts with a detailed description of the various chemical and physical properties, and sums these up into a single unit called a soil type. Farmers start the other way round. They arrive at a soil type first by observing a single most notable feature (be it colour, structure or consistency) and then give a more detailed description of the characteristics of that particular soil.

Thirsty soils, greedy crops

The farmers' system of categorising soils is orientated towards practice, whereas science aims at constructing universal models. This difference is reflected in the way soil fertility is assessed. Scientists use a standardised model involving measurement of the inherent chemical properties of the soil, while farmers use a wider range of criteria. In our study, this included limiting factors such as hardness to cultivate, so the heavy clayey soils were rated as less fertile than the lighter clayey types.

Furthermore, farmers assess fertility levels in a particular soil in terms of observed crop performance, which is affected by several factors other than the soil properties measured by scientists. Therefore, the farmers' perception of the fertility status of a particular soil changes constantly, taking into consideration the factors which favour or impede crop performance, such as plot age, location and previous use, weed infestation and pest build-up.

Farmers often used complex and metaphorical concepts to make sense of soils. The soil is "thirsty" if well drained and "weak" if not fertile. The soil can also get "tired" or "go mad" if it is cultivated continuously without fallowing. The soil may "cry" because it is so coarse that it makes a squeaking sound when walked on. Taken together, such concepts form a network of meaning, but they are not fixed in space and time. They do not describe the permanent condition of a soil type, but are used in relation to specific circumstances. For example, because cassava, a "greedy" crop, can make the soil "tired",



In assessing soil fertility, farmers take account of various factors which favour or impede crop performance. They are most interested in features of the topsoil.

Photo: WIDOC, Royal Tropical Institute, Amsterdam.

a plot of land on which cassava was previously grown must be managed in a particular way.

Practical knowledge

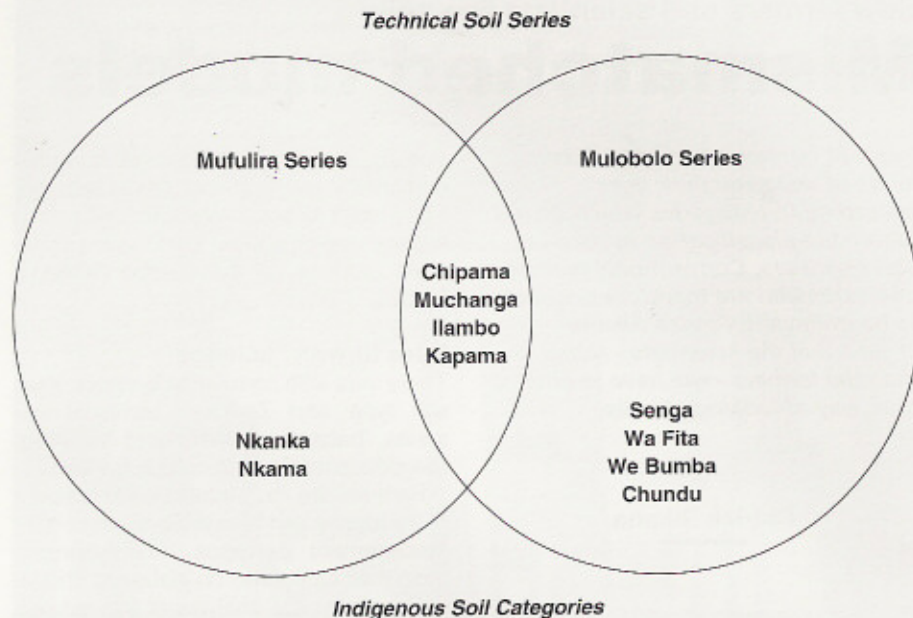
The local soil classification system reveals much about the nature of indigenous agricultural knowledge. It is relative and site-specific rather than absolute and universal. Each observed soil type is compared to other soils in the area. Thus, a soil type may be described as We Bamba no Muchanga Panomo (clay soil with a bit of sand) because it is being compared with another clayey type with less sand.

Farmers' classification is contextual. A soil may be identified according to the environment where it is found, eg. one soil in our study was named after the grass that grows on it, and another after an insect found in it.

Indigenous knowledge about soils is not possessed in a complete and encyclopedic fashion. In our study, a farmer was familiar on average with only three different soils, usually found on the land actually being farmed. Most farmers knew more names but could seldom give detailed descriptions of the soils beyond their fields. Different individuals possess different elements of local knowledge, based on their different practical experiences.

Science hanging in the air

When the results of this study were presented in Zambia, some scientists criticised that, if a local soil type x cannot be related to a technical soil series y, then the indigenous categories are hanging in the air, with no practical reference point to make them applicable on the ground. But, it would seem that it is the technical categories which are hanging in the air, judging by the limited applicability of research recommendations based on them. The present technical classification system



Farmers' categories for soil types do not coincide with the Zambian technical soil series used by scientists and extension workers to classify soils.

communicates information about soils to scientists but not to farmers.

To dismiss indigenous categories because they do not relate to previous soil research is to ignore an important resource that has potential to advance the productivity frontier. Since farmers' soil characterisation often involves detailed descriptions of soil properties in terms of advantages and limiting factors, such information could be systematised into relatively flexible general principles, on which research and extension could be based. The output will then be more meaningful, because the language and concepts used will be familiar to the farmers.

Need to "peasantise" science

Indigenous soil categories have practical validity in themselves, without having to "scientise" them by forcing them into the technical framework used by soil surveyors. Instead, they could be entry points for future scientific work. Science should attempt to enter the peasants' world of concepts and representations, in order to establish a sound base for a partnership with indigenous knowledge. Synthesis is possible where new elements from outside are transformed by the farmers to become part of their own knowledge system, eg. farmers could incorporate scientific insights into soil acidity and aluminum toxicity into their local soil management strategies.

Partnership between science and indigenous knowledge presents a challenge to conventional positivist science, given the dynamic and strategic nature of farmers' knowledge and practices. But science must come to terms with this dynamism, because this is what farmers' reality is all about.

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Note: This article comes from the study "Indigenous soil characterization and farmer participation in Northern Zambia" commissioned by the International Institute for Environment and Development, London, for the workshop "Beyond Farmer First: Rural People's Knowledge, Agricultural Research and Extension Practice", 27-29 October 1992, Institute of Development Studies, University of Sussex, Brighton, UK.

Criteria	Local names	
Colour	Red	Chilambe, Chipama, Katondo, Mulowe, Nkanka, Wa Kashika
	Black	Utife/Utifi, Wa Fita, Chundu
	White	Chipau, Wa Buta, Chimembe, Chundu
Texture	Sandy	Busenga, Lusenga, Senga, Muchanga
	Clayey	Aliumba, Imbulo, Chipau, Chundu, Ilambo/Nambwe, Nkande, We Bumba
	Gravelly	Changalawe, Musakalabwe, Nkanka-Chiwezela (subgroup of Nkanka)
Consistency	Hard	Chipama, Inkama/Mpaku, Kapama
Organic matter	Muddy	Chitipa, Wa Matipa
	Black	Wa Fita

Table 1: Characterisation of some soils by farmers in Northern Province, Zambia