Towards Integrated Soil Management

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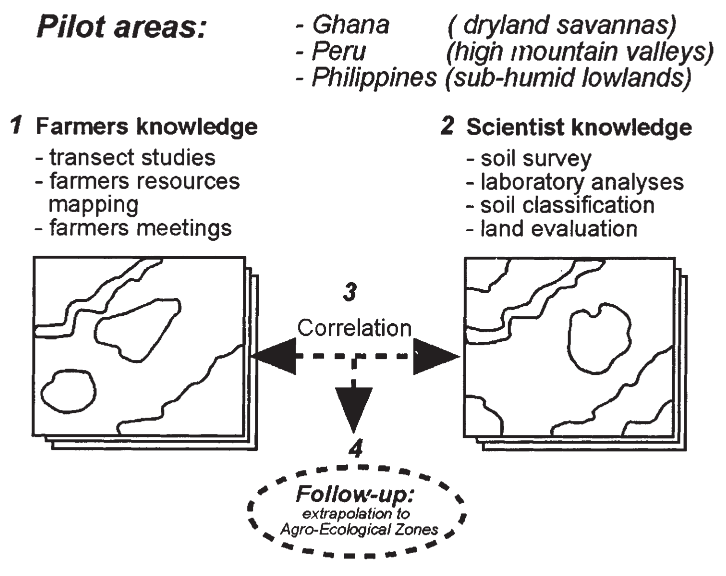
One of the first activities of the ILEIA collaborated research programme in the Philippines, Ghana, and Peru was the characterisation and evaluation of soils in six research sites by farmers and soil scientists. ISRIC subcontracted three national soil institutions in Ghana, Philippines and Peru (see below), to work in close cooperation with farmers and NGOs in the pilot areas on this task. The comparison and integration of views held by farmers and scientists about the soils was a major part of the project. The objective was to contribute to a participatory process aimed at solving soil-related production constraints in farming. The soil study proceeded from the following questions:

- Is it possible to correlate farmers (indigenous) soil knowledge with formal soil science?
- How do farmers manage their various soils to produce crops?
- How are farmers dealing with soil-related production constraints/ limitations?
- Is there a LEISA solution for land threatened by the degradation caused by present-day land uses?

Methodology

A schematic presentation of main activities is given in Figure 1. In the six research sites the national soil scientists first executed a classical field soil survey complemented by an analytical characterisation of soil samples. The research sites were selected by ILEIA staff, farmers and soil scientists. The farmers' and scientists' soil knowledge was correlated through joint field observations. For this purpose different approaches were used. In Ghana and Peru, farmers and scientists followed closely the traverses and soil pits used in conventional soil mapping. In the Philippines joint walk-throughs were made to observe different land uses and different soils. Farmers indicated soil changes and named the soils according to local custom and language. Scientists asked farmers a series of standard questions. These questions focused on recognition of different soil types, indicators for soil characterisation, local soil names, present and potential land uses and soil management operations. Land suitability questions focused on the dominant soil-related constraints to agricultural production and the management of soil-related constraints to productivity, a question that included a consideration of the ecological threats of present land use. These farmer-scientist dialogues had a different character in the three countries. In Ghana, a series of standard questions were used (Asiamah and Spaargaren, 1997). In the Philippines the farmers were asked to make soil and land use observations by categorising their observations by using the basic human senses - sight, hearing, smell and sound (Conception and Batjes, 1997). In Peru, besides the use of standard soil characterisation questions, the dialogue had a rather free character, especially when production constraints were discussed (Kauffman and Valencia, 1998). In addition to the fieldwork, plenary sessions were held, in which the farmers and scientists discussed the results of the fieldwork. Farmers frequently mentioned non-soil related constraints to production, which were discussed and included in the reports.

Figure 1 – A schematic presentation of four major project activities



Results

The research sites in North Ghana are located in a nearly level to weak undulating plain with long slopes towards valley bottoms with slope gradients between 1 to 5 %. A large number of soil types is distinguished by both farmers and soil scientists (see Figure 2: Farmer and scientists soil maps).

In the Philippines the pilot areas are located in the broad alluvial plain of Central Luzon. Soils are pre dominantly poorly drained, dark grey coloured clays. In Peru the research sites are situated in the north and the centre of the Andean mountains. Both areas have a strongly dissected mountainous landform and are situated between 2700 and 4500 m above sea level. Variation in soil types is largely determined by geological parent material, slope and altitude zone.

More information on the environmental conditions of the pilot areas is given in the country sections in this Newsletter. For detailed information reference is made to the project reports (Asiamah and Spaargaren, 1997; Conception and Batjes, 1997; Kauffman and Valencia, 1998).

Knowledge compared

To a certain extent it is possible to correlate farmers soil knowledge with formal soil science. However, correlation of local soil names cannot always be made in a consistent way, because of the different criteria and rules used by farmers and scientists. Farmers have a pragmatic way of characterising and classifying soils based on their strong practical focus. For example, they will mainly consider topsoil properties when weighing up agricultural soil use. When looking at soil as a building material, generally only subsoil properties are taken into account. Soil science views soil properties over a standardised control soil depth for multi-purpose assessments.
An additional difficulty is the variation in local soil names, which can be very large depending on the variation in idioms and languages in a region. Nonetheless, it is recommended that the potential use of indigenous soil names should be maximally explored for strengthened communication between the stakeholders at local level.

Agreement about problems

From the results in the research sites, it follows that farmers and scientists were ►

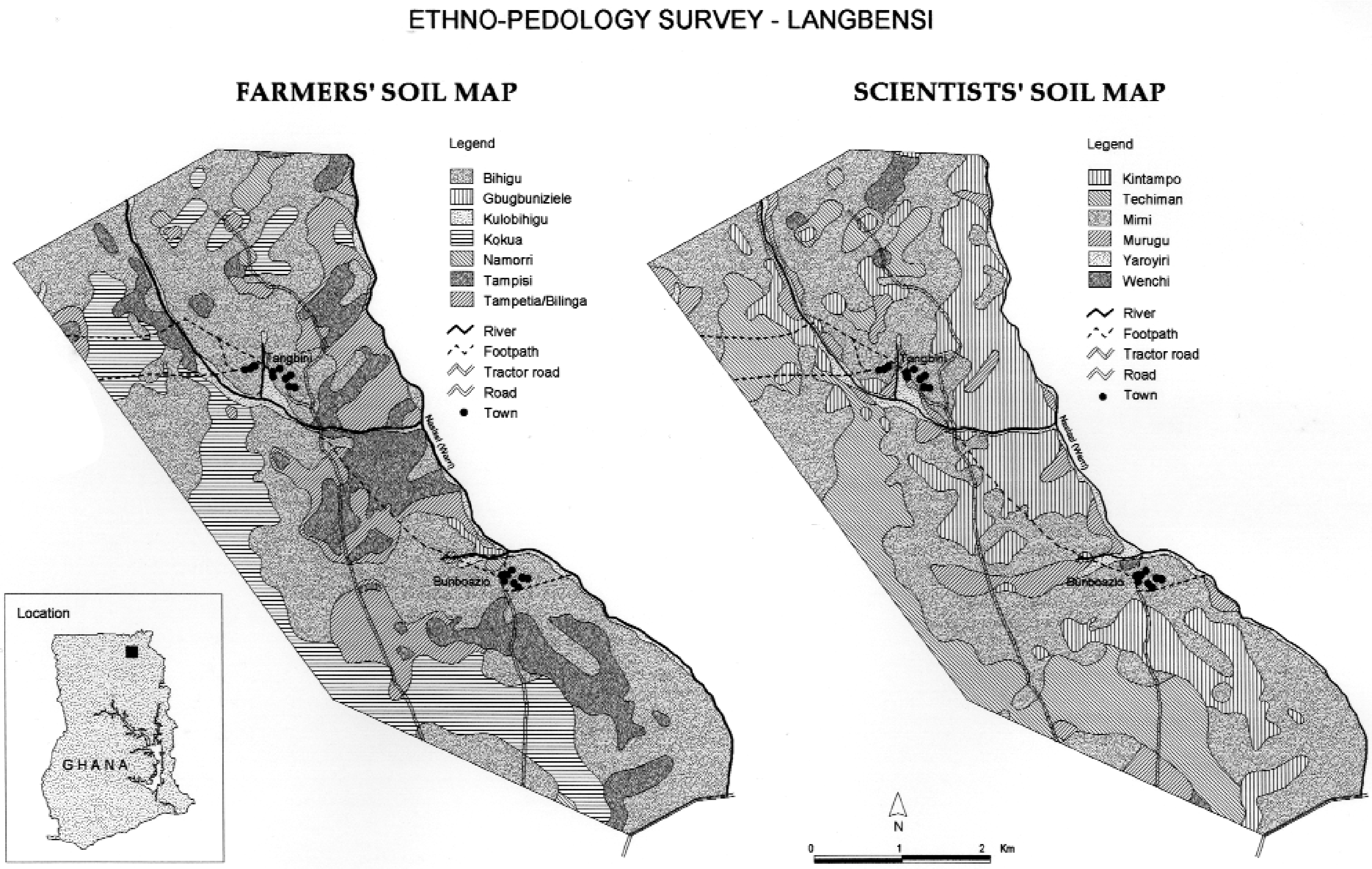


Figure 2 – Farmer and scientists soil maps

able to discuss soil-related production constraints, the local soil management techniques and potential solutions for how to overcome these constraints. The three main soil-related production constraints, indicated by both farmers and scientists in the research sites are related to water availability, plant nutrients (soil fertility), and soil degradation. The participatory process of farmers and scientists on how to solve these three constraints in a joint effort should result in the development of an Integrated Soil Management (ISM) approach.

Towards Integrated Soil Management

ISM will help to realise the agronomic potential of existing soil types, and prevent the reduction of this potential by further soil degradation. ISM will require the simultaneous application of water and soil conservation measures and organic and inorganic soil fertility measures (the latter including amendments such as local by-products and rock phosphate). ISM will contribute strongly to efficient water-use in rain-fed agriculture in the semi-arid and seasonally dry (sub-)tropics, a major challenge given anticipated population growth and accompanying food needs, especially in sub-Sahara Africa. A cornerstone of the ISM approach is the recognition of the importance of soil organic matter to preserve soil fertility and soil physical properties. Therefore one of the goals is to look for those land uses and soil management practices, which will maintain or increase soil organic matter content. Such considerations are also important in the context of enhancing terrestrial C-sinks with a view to mitigating atmospheric CO^2 levels as emphasised in the Kyoto protocol on climate change. The synergism of the various elements of such an ISM approach is especially important (Breman, 1997; Kauffman 1996). However, an ISM approach involves considerable investment. For soil and water conservation and organic fertility measures, these consist mainly of labour time; for inorganic soil amendments, mainly of money. ISM should have a sound economic basis, because the full benefits of these investments will only appear after several years. This is partly caused by learning effects: farmers may need considerable time to become acquainted with the new technologies involved in ISM, and to adapt them to local circumstances. Moreover, there are considerable time lags in the bio-physical process of soil improvement itself (Koning et al. 1997).

A recommended follow-up activity for these studies is the extrapolation of results from the research sites to the respective major ecological zones (see Figure 1 Stage 4). Such an activity will provide a tool for transferring results to policy levels responsible for policy measures for the proposed ISM approach. ■

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