Local and Scientific Soil knowledge

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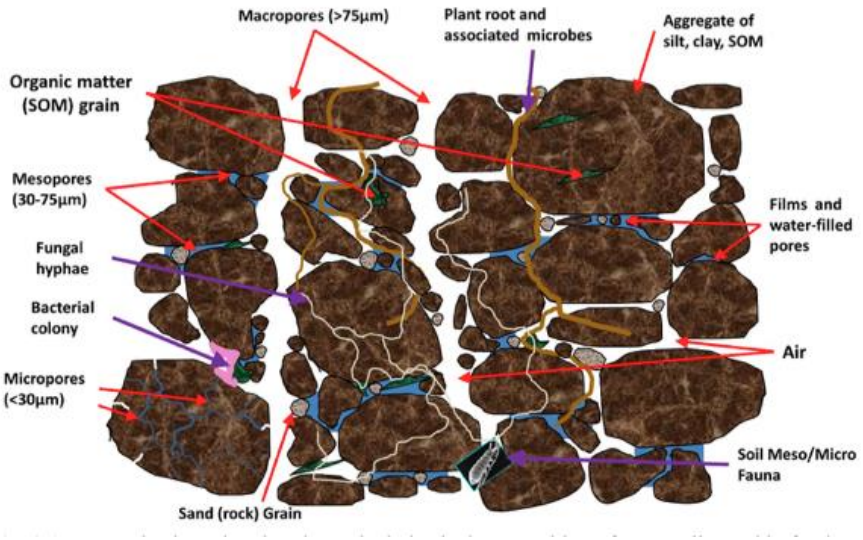
Introduction

- Widely acknowledged that farmers understand much about their soils.
- This 'local soil knowledge' (**LSK**) is often expressed in terms different from scientists' soil knowledge (**SSK**).
- Soil knowledge can be distinguished in 3 areas; this helps to move beyond the idea that knowledge is just soil classification or management practices[1] ():
  - '**Kosmos**' – what we believe about soil's place in the universe (e.g. a component of "mother earth" in many cultures)
  - '**Corpus**' – what we know about soils in general, e.g. "texture is the result of the proportions of sand, silt, and clay"
  - '**Praxis**' -- all of our practical and management knowledge, e.g. when is best to till, why/why not not to till, why legumes, how does manure regenerate a soil, etc.

[1] Barrera-Bassols and Zinck, 2003

Farmers in Peru discuss their expertise in soils



A scientific model of a soil

There is promise in combining local and scientific soil knowledge in order to:

1. Interpret and share research findings, e.g. where do soil practice innovations work and not work, and why?

- Farmers noted that perennial forage options to build soil health work need deeper soils to guarantee survival in the dry season.
- If a soil is not minimally fertile, legumes will fail to grow and cannot help soils and other crops, so effort and seed is wasted.
- Indicator ‘weed’ species delineate soil quality for choices in land use

Also, combining local and scientific soil knowledge can:

2. Build engagement of both farmer researchers and outside researchers because they share a common set of concepts and have discussed their knowledge systems, bringing forth useful examples of each.

- E.g. aggregate stability (SSK) vs. “soil softness” (LSK) or workability, tilth

3. Increase research effectiveness or efficiency by using LSK indicators in SSK and vice versa.

- E.g. use farmers’ classification of soil status as a covariate or factor for investigating OxC interactions.

How does it play out in practice?

Matching information from soil carbon (SSK) to farmers' assessments (LSK) of soil fertility.

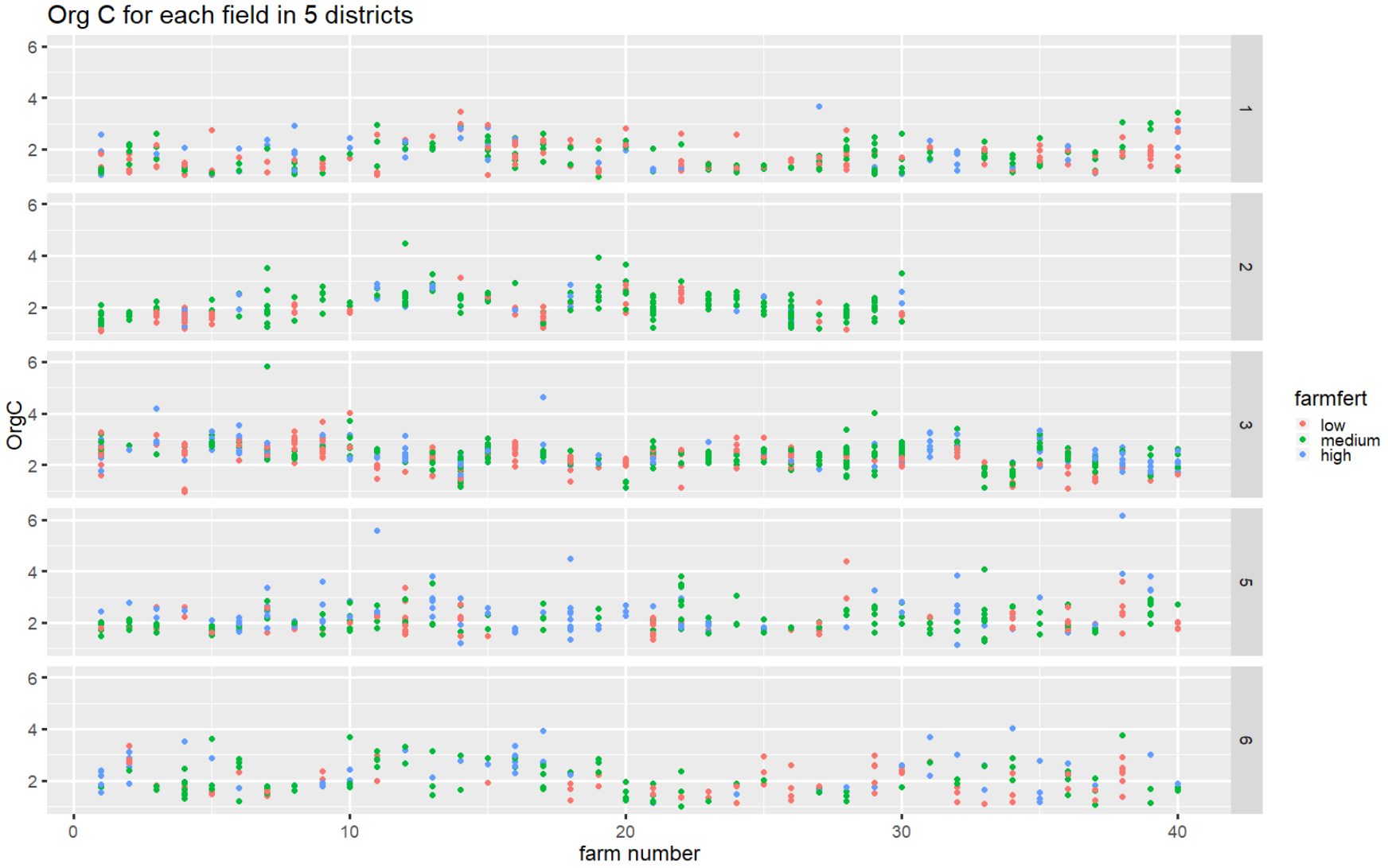
Increasing soil C

High

Med

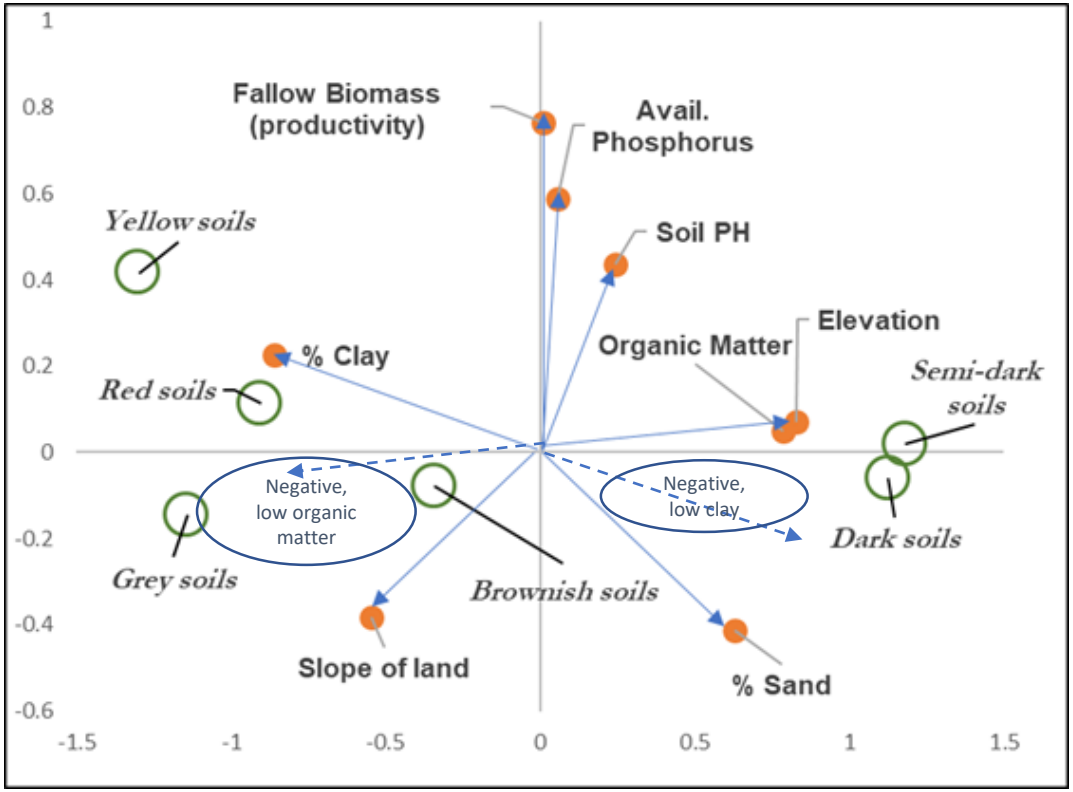
Low

Type of pattern we would expect on most farms if Org. C was well correlated to farmer rating



Soil color as a way farmers name soils in the Andes:

-- seems to reflect texture, organic matter, soil forming conditions, rather than productive potential



This is a PCA or *principal components analysis* biplot, the one important thing to know is that **samples described by LSK (green circles) are correlated with SSK indicators (red points)** that align with them

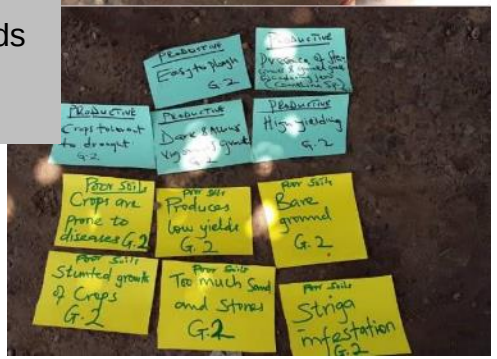
Nevertheless, in-depth dialogues to establish components of soil health usually succeed at generating learning and alignment between scientific and local knowledge:

Nasarri Sorghum and Finger millet projects: workshop in Uganda eliciting farmer knowledge on soil health

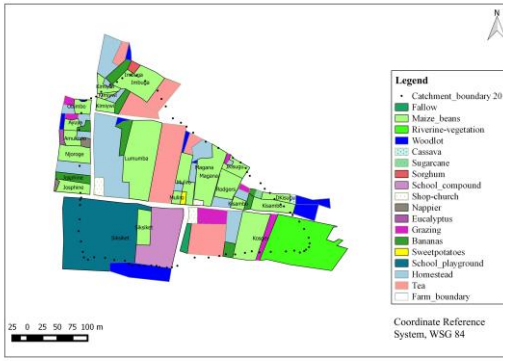
Farmer in Peru explains farmer groups' most frequent soil health indicators

Dark soil
Worms
Deep soil
Soft Soil
Retains water
Versatile for crops

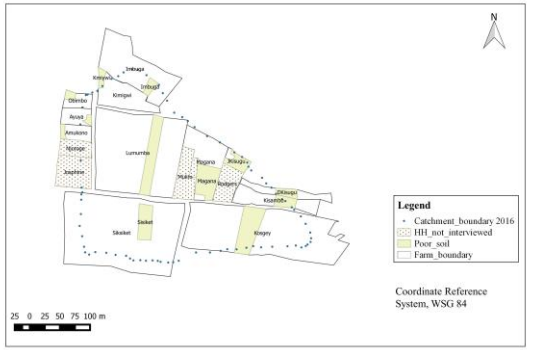
Easy to plow
Dark soils
Allow vigorous growth
High yields
Resistant to drought
Presence of indicator weeds
Soil covered
No striga



Anchor hub: knowledge exchange and scientific grounding – why we are interested in soil carbon



Map of 10 years catchment



Map of 10 years catchment Poor soil

Participatory mapping of soil quality in Kenya

E. Barrios et al. – INPAC-S process for participatory development of soil health indicators (images from INPAC-S manual)

Sometimes alignment of LSK and SSK is hard.

E.g. "…*farmers base their perceptions of soil quality and soil type on crop yields…In Kenya, farmers' reported soil type is a reasonable predictor of objective soil fertility indicators while farmer-reported soil quality is not*…" (Berazneva et al 2018)

What is going on?
Can we understand more about when and why alignment is as expected?

Some hypotheses:

1. Farmers generally rely on crop performance to assess soil and that is influenced by many other factors in addition to soil fertility.
2. Farmers understand a lot about their soil fertility/ soil health but we are poor at eliciting that understanding. Simply asking a farmer to 'rate the soil with a score of low, medium or high' is not adequate for finding out their understanding.
    - includes many possible sub hypotheses about understanding motives, questions, scales, etc
3. The soil fertility indicators scientists use (e.g. organic C content in the example above) are actually poor predictors of fertility or health
4. 'Soil Fertility' or 'Soil Health' is too broad a concept to be useful operationally for either farmers or researchers. It needs to be broken down.

Questions for discussion:

1. Is there an example of the use of local soils knowledge you would like to share that sheds light on these hypotheses or demonstrates other points about learning between local and global soil knowledge?
2. If we better understood how to gather and share local soil knowledge and use it in FRNs in combination with SSK, how would this be helpful?
3. What would next steps be to create this better understanding?

Works cited and interesting resources:

Barrera-Bassols, Narciso, and Joseph Alfred Zinck. "Ethnopedology: a worldwide view on the soil knowledge of local people." Geoderma 111, no. 3-4 (2003): 171-195.

Berazneva et al., 2018. Empirical assessment of subjective and objective soil fertility metrics in east Africa: Implications for researchers and policy makers. World Development 105: 367-382. https://doi.org/10.1016/j.worlddev.2017.12.009

Farming for Change: a Participatory Teaching Guide on Agroecology, Climate Change, Nutrition and Social Equity. Available from the Soils, Food, and Healthy Communities Organization at https://soilandfood.org/

INPAC-S participatory indicator development process, available from the agroecology knowledge hub at http://www.fao.org/agroecology/database/detail/en/c/1157676/

Soil health tool kit at www.smallholder-sha.org

Sustainable Intensification Assessment Methods Manual: working draft including a number of metrics regarding sustainability of soil management; available at https://www.k-state.edu/siil/documents/docs_siframework/Sustainable%20Intensification%20Assessment%20Methods%20Manual%20-%2010.24.17c.pdf