

## Your Unanswered Webinar Questions, Answered

The Q&A below answers questions that the presenters from the Agrilinks webinar, "[Soil Variation and Why it Matters](#)," could not get to during the webinar. In order to get the most out of the [Agrilinks webinar experience](#), we encourage you to listen to the [webinar recording](#) or read the transcripts found on the event page before reading the below Q&A.

1. How is this information getting back to the extension agents? It's great that we have this research but how are we effectively training the extension agents to make sure they understand soil variation and the inputs they should provide based on that?

*Hope Michelson:* This is an important issue to consider. That is, if projects or governments should decide to implement soil testing, how information should be communicated to farmers and what role should extension agents play. Our project uses a soil testing service that both tests the soils and generates management recommendations (specifically, mineral fertilizer types and amounts) for farmers based on the results of those tests.

2. Intervention implementers, and governments budgets are limited, how do we get at this important farmer-level soil information in a cost effective way?

Is there a role for the private sector to provide soil testing in a bundle with other inputs and finance/insurance?

*Michael Carter:* These two questions neatly complement each other. I would suggest the following as a way to get the information we need to answer them:

A first step is to get a handle on the returns to more precise, farmer level soil information. The three projects we discussed all open the door to determining the returns to this more precise information. For example, Caro's project in Mexico generated used a crop growth model to generate farmer specific soil amendment recommendations to achieve a target maize yield of 4.5 tons/hectare. One could then estimate the yield each farmer would achieve if they instead relied on standard, undifferentiated fertilizer recommendations. The shortfall (if any) in yields and, more important, farmer net income that would result from the boiler plate versus the more precise recommendation would give a rough idea of the *potential* value of the more precise information. If this potential value is high, then providing this information is potentially a bankable project (i.e., there is a business case for providing site specific information).

There are of course other constraints. Hope's project in Tanzania shows that farmers often face other constraints that seem to prevent them from acting on the more precise recommendations (e.g., only the boiler plate fertilizer is available for purchase). These constraints would have also to be lifted for the business case to fully follow through. While lifting these constraints may be difficult, we need to push forward and find out how much money is being left on the table when farmers do not have site-specific recommendations. Once that is known, next steps in figuring out whether or how to bundle site specific recommendations with inputs or other services will follow naturally.

3. If the farmers are provided with their soil specific information, and those tailored fertilizers or seeds are available at market, can they then afford them?

*Emilia Tjernström:* Both of these issues (availability and affordability) are absolutely key constraints. The main reason that we think carefully tailored recommendations are important is that the wrong recommendation can be disastrous for poor farmers, for whom a bag of fertilizer is a substantial financial burden. Spending money on mis-targeted fertilizer that does not increase your yields is very inefficient.

4. Are tailored cocktails of fertilizer or locally optimal seeds even available if the farmers are able to get specific information about their soil?

*Hope Michelson:* Availability of more specialized types of fertilizers varies considerably by country and even across regions within countries. For example, while SA (commonly recommended in our farmer sample) is not as widely available as DAP and Urea, it is available in Morogoro, the regional capital. More specialized blends are more challenging to find and may only be available in Dar es Salaam. As I mentioned during the webinar, the quality of these inputs and the capacity of agricultural input supply chains to deliver them is an area of active research.

5. The soil testing kit looks interesting but how close are to having precision Ag. tech. based perhaps on remote sensing for mapping soil fertility variation in Africa  
--Related to above: can high definition satellite technology be used to help determine variability?

*Michael Carter:* My work using high definition satellite technology is related to index insurance applications, and I am no expert on using this technology to detect crop nutrient deficiencies. That said, it is my understanding that this technology can be used to detect the color of leaves which can signal nutrient deficiencies in specific plot/sub-plot locations. Less clear to me is whether this technology can work in this way when the baseline soil/nutrient characteristics are

unknown. I was talking recently with David Lobell of Stanford (who works on remote sensing and yield estimation) and he mentioned that a refined measure that he uses to detect plant growth may make little in many areas of Africa maize production because plants are so nitrogen deficient that the plants simply look undernourished. I infer from this that we may not be able to make more refined inference on plants' 'micro-nutrient needs (and hence underlying soil deficiency) if everything is washed out by an overwhelming shortage of nitrogen.

Again, this is me as an economist talking, and it may well be possible to calibrate and use high resolution imagery to detect underlying soil quality patterns. It certainly sounds like a promising area for future work.

Hope Michelson: Another area where there is important work going on but LOTS to do. As I mentioned during the webinar, we are currently studying the local variability in soils in our sample to test how well we can predict field level soil quality and village-level variation in soil quality given observable characteristics (such as those available from remote sensing) as well as how well our field-level measures map up with the publically available measures of soil quality. I'm interested in identifying areas where variability is likely to be higher or lower on average so that governments and other practitioners can better target their testing.