A second table indicates the expected yield increases and net return on investment for each crop. A third table shows the total net return on the investment in fertilizer – that is the total value of increased yield of each crop less the amount invested in fertilizer.

Step 2: Next a simple nutrient substitution table is used to adjust the output of the FOT to take into account other integrated soil fertility management (ISFM) practices the farmer is using that impact on nutrients supply. The ISFM practices to be included in the table are the use of various types of organic fertilizer (manure, compost, crop residues), intercropping and rotations with legumes, fallows and the results of selected soil tests. For each practice, the table will suggest how the fertilizer recommendations generated by the FOT should be adjusted.

Where to find the OFRA tools
The FOT tools are available at http://africasoilhealth.cabi.org/tools/fertilizer-tools
The reports section of the website http://africasoilhealth.cabi.org/reports/ contains value information, including the OFRA monograph series.

Step 3: Finally a fertilizer calibration tool is used to convert the recommendation, expressed as kg of fertilizer per hectare of land, to a more farmer-friendly measure. Few if any small-scale farmers will have access to scales to weigh out the fertilizer and not all will know the size of the plots they are using to grow each crop. To overcome this problem, the calibration tool is based on the use of items that are freely available and that can be adapted and used as calibrated measuring scoops. These include cut-down, discarded plastic bottles that previously held water or some other liquid; bottle tops, such as the crimped metal bottle-tops commonly used to cap beer or soda (known as crown corks); or rectangular containers, such as empty match boxes. The calibration tool runs on a computer.

First the dimensions of the container to be used are entered; the tool uses these to calculate the volume of the cylindrical or rectangular container. Secondly, the type of fertilizer being used is selected from a drop-down menu: not all fertilizers have the same density, so one bottle-cap full of one fertilizer will have a different weight to the same bottle-cap full of another type of fertilizer. Next the number of kg of fertilizer to be applied per hectare is entered, along with the method of application (broadcast, banding or point placement, also known as micro-dosing) and the distance between rows and plants within rows.

Based on the information provided, the calibration tool provides a user-friendly fertilizer recommendation; for example, instead of 40 kg DAP per hectare it might suggest a plastic water bottle lid full of DAP applied as a band 2.1 meters long.

The Fertilizer Optimisation Tool is an output of the Optimising Fertilizer Recommendations in Africa (OFRA) project. OFRA is a partnership between CABI International, the University of Nebraska Lincoln, USA and National Agricultural Research and Extension Systems in 13 countries in sub-Saharan Africa. It is supported by the Alliance for a Green Revolution in Africa (AGRA) Soil Health Program.

For more information contact: Dr Francis Tetteh
Email: fmarthy2002@yahoo.co.uk

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Farmers who do use mineral fertilizers often buy compound fertilizers unlikely to know precise acreages or have access to weighing equipment. Finally, recommendations are not user friendly: it is hard for farmers to spend on fertilizer. What is the best way to use that limited sum to provide with the greatest financial return? ‘Tailor-made’ but in all cases the solution provided will practices, such as use of manure. The recommendations generated for each circumstances, including hectares of the different crops grown, fertilizer tools to generate fertilizer recommendations which reflect farmers’ specific

The tools

3 complementary tools, based on the principle of fertilizer optimization, have been developed for use in a range of agro-ecological zones in Ghana.

The Excel Solver then generates a table showing how much of which type

The 3 complementary OFRA tools

Step 1: First the Fertilizer Optimisation Tool (FOT) is used. Different FOTs have been developed for different agroecological zones in Ghana. FOTs were developed for different crops in the following AEZ:

- Derived Savanna/Transitional
- North Guinea Savannah
- South Guinea Savannah
- South Sudan Savannah

The FOT currently runs on a computer or tablet. The FOT is based on a Microsoft Excel spreadsheet. It uses Solver, a standard tool within the Excel spreadsheet which can be used to identify optimal solutions. An even simpler ‘paper-based’ version is developed based on look-up tables that will need no electronic gadgets.

For the version currently available, using a computer or tablet onto which the FOT has been loaded, the extension worker and farmer together enter the hectares of the various crops being grown, the price of fertilizers available, the expected price for crop outputs and how much money the farmer has to invest in fertilizer. They then press the ‘optimize’ tab. The Excel Solver then generates a table showing how much of which type of fertilizer should be applied to which crops. The solution, expressed as kg of fertilizer per hectare, aims to maximize the financial return on the money spent on fertilizer.

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