



Research Brief

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NEW FERTILIZER RECOMMENDATIONS FOR GHANA

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Introduction

The Soil Research Institute (SRI) is one of the 13 Research Institutes under the Council for Scientific and Industrial Research (CSIR). The institute is over 60 years old. Its mandate is to undertake scientific research to generate information and technologies for effective planning, utilization and management of the soil resources of Ghana for sustainable Agriculture, Industry and Environment.

The research programmes of the Institute are:

- Soil classification and land evaluation
- Soil fertility management; including fertilizer recommendations for various crops
- Soil conservation and mechanization
- Environment and climate change
- Laboratory analytical services

Some of the major achievements include conducting fertilizer experimentation towards the development of fertilizer recommendations for various crops across the various ecological zones. A recent project carried out by the Institute to update fertilizer recommendation in Ghana is OFRA (Optimizing Fertilizer Recommendation for Africa) Project. The current fertilizer rates update was undertaken to provide accurate fertilizer recommendations for the new crop varieties that have been introduced into the country over the past 3 decades. The OFRA project was funded by AGRA through CAB International with technical support from the University of Nebraska, Lincoln. This project was implemented in 13 Sub-Saharan African countries including Ghana.

The OFRA Project.

Background

Ghana's agriculture is characterized by low crop yields, mainly due to low soil fertility, soil erosion and inappropriate land use leading to soil degradation. Fertilizer nutrient application in Ghana is approximately 10 kg ha⁻¹ (CSD-MoFA, 2013) while depletion rates range from about 40 to 60 kg of nitrogen, phosphorus, and potassium (NPK) ha⁻¹ yr⁻¹ (FAO, 2005) and among the highest in Africa. Food security is therefore at risk, making the country more dependent on food imports

from external sources, thus putting pressure on Ghana's foreign exchange reserves. The important food crops in Ghana are maize, rice, sorghum, millet, cassava as well as cowpea and soybean. Among the cereals, maize is the most important with about 750,000 ha allocated for its production annually. Cowpea is a very important legume food crop with soybean also becoming important as cash crop. The yields of these crops are however, low because of low soil fertility and low external input application. The Abuja summit on fertilizer declared that Sub-Saharan Africa (SSA) can only increase food production and alleviate poverty when fertilizer use is increased. A key limitation to farmer's use of fertilizer in Ghana is lack of fertilizer recommendations that could result in high yields and good profits for farmers. The goal of the project was to help improve efficiency and profitability in fertilizer use in Ghana within the framework of Integrated Soil Fertility Management (ISFM) practices under smallholder farming. The geographic focus of the project was in three agro-ecologies: the Guinea Savanna, Sudan Savanna and Forest Savanna Transition zones which form the bread basket of Ghana.

The following objectives were pursued:

- Improved use of research data to support fertilizer recommendations
- Increased use of spatial information for extrapolation of nutrient response functions and decision tools for optimizing use by farmers
- Improved relevance of fertilizer recommendations in an ISFM framework for stakeholders
- Improved access to information and communication materials for extension

Fertilizer use in Ghana is increasing year after year since the introduction of subsidy on fertilizer (MoFA, 2011), and farmers have realized the economic benefit in fertilizer application to key staple crops like maize (for example) which has good market due to World Food Programme, and other food relief activities in the sub-region, Farmers are willing to follow good agricultural practices (GAP) to improve yields and income. This is therefore an opportune moment to fine-tune fertilizer recommendations for improved fertilizer use efficiency and improved soil and crop productivity.

The main strategies used include the following:

- Reviewed existing data on fertilizer recommendation in Ghana and used the results to plan for nutrient response trials needed to validate interpretations derived from the review and fill in the gaps.
- Fertilizer response curves for various crops were used in the calculations of the maximum economic returns for the farmer. Trials were carried out using common protocols that were designed and agreed with the 12 partner countries with the support of UNL and CABI. Data were stored in a common database developed for Ghana and other sub-grantees to benefit from data sharing to strengthen algorithms.

Validation and harmonization of fertilizer recommendations results from OFRA and SARI

AGRA organized a key stakeholder workshop in Ho in September 2016 to harmonize all fertilizer recommendations from OFRA/SRI and SARI as well as information from SADA and GhaSIS soil maps to guide the formulation of fertilizer blends for farmers in the breadbasket zone. The Ghana Soil Health Consortium also organized a follow-up workshop in Kumasi to build the sense of ownership among stakeholders by bringing all stakeholders together especially the policy implementers (MoFA), Soil Scientists, fertilizer blending companies (OLAM, AFCOTT, AMG,

Yara, Wienco, Chemico, ETG, Omnifert, Louis Dreyfus Commodities) SRI-OFRA and SARI to validate the fertilizer recommendations. The fertilizer recommendations and blends are presented in Table 1.

Table 1: Fertilizer recommendations for maize, cassava, soybean and rice in the Forest-Savannah Transition and Guinea Savannah zones of Ghana.

CROP	AGRO- ECOLOGY	NPK RECOMMENDATIONS	RECOMMENDED BLENDS
Maize	Forest-Savannah Transition Zone	N-P ₂ O ₅ -K ₂ O: 90-60-60 +1.7 Zn	N-P ₂ O ₅ -K ₂ O: 15-20-20+0.7 Zn (6 bags/ha + 2 bags/ha urea)
Maize	Guinea Savannah zone	N-P ₂ O ₅ -K ₂ O: 100-40-40	N-P ₂ O ₅ -K ₂ O: 15-20-20 (4 bags/ha + 3 bags/ha urea)
Cassava	Forest Savannah Transition zone	N-P ₂ O ₅ -K ₂ O: 100-30-30	N-P ₂ O ₅ -K ₂ O:17-10-10 (6 bags/ha + 2 bags/ha urea or 4.5 bags/ha SOA)
Soybean	All Ecologies	N-P ₂ O ₅ -K ₂ O: 20-60-30 + 0.8Zn	N-P ₂ O ₅ -K ₂ O: 12-30-17 + 0.4Zn (4 bags/ha)
Rice (Upland)	Guinea Savanna zone	N-P ₂ O ₅ -K ₂ O: 90-40-40	N-P ₂ O ₅ -K ₂ O: 15-15-15 (6 bags/ha + 2 bags/ha urea or 4 bags/ha SOA)
Rice (Lowland)	Guinea Savanna zone	N-P ₂ O ₅ -K ₂ O: 90-60-60	N-P ₂ O ₅ -K ₂ O: 15-15-15 (8 bags/ha + 2 bags/ha urea or SOA)

Recommendation

It is recommended that fertilizer producing companies work closely with CSIR-SRI in the development and validation of fertilizer blends for up-scaling with small holder farmers in the Forest-Savannah Transition and Guinea Savannah zones of Ghana, towards achieving improved cropland productivity for food security, poverty reduction and environmental sustenance.

For the farmers to reap the maximum benefit of fertilizer use, they have to be trained on the 4 Rs, which refers to **Right Timing, Right Quantity, Right Placement** and **Right Quality** of fertilizers.

References

1. FAO. 2005. Fertilizer use by crop in Ghana, FAO. Rome.