FERARI
FERTILIZER RESEARCH & RESPONSIBLE IMPLEMENTATION

IFDC
Developing Agriculture from the Ground Up

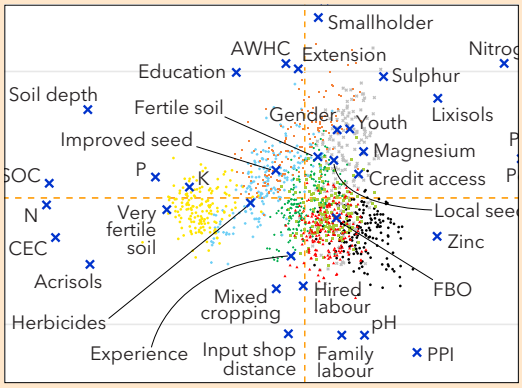
7TH QUARTER – OCTOBER 2021

QUARTERLY newsletter

FERARI RESEARCH

ACCEPTED PAPER

FERARI continues to provide research-based evidence on how to improve yields for improved food security and poverty reduction in Ghana. Our team, led by its economist and scientists from collaborating institutions, has written FERARI's maiden research article, "Characterization of Farmers and the Effect of Fertilization on Maize Yields in the Guinea Savannah, Sudan Savannah, and Transitional Agroecological Zones of Ghana." This article provides detailed statistical analysis on the difference in characteristics among farmers and raises critical concerns for improving farmer yields. It has been accepted for publication in the peer-reviewed journal EFB Bioeconomy Journal. The reviewers of the journal anticipate this article to be widely read, as it complements our publicized policy briefs and reports. We wish to acknowledge the contributions from our IFDC colleagues outside of the FERARI program, especially Dr. Sampson Agyin-Birikorang, Julie Kohler, and Meg Ross with regard to this achievement.



Detail of a chart presented in the paper, analyzing production factors.

FERARI FEATURE

FORMAL ESTABLISHMENT OF FERTILIZER PLATFORM GHANA CRYSTALLIZES

The Ghana Fertilizer Expansion Programme (GFEP) and the Ministry of Food and Agriculture (MoFA), with support from IFDC's FERARI program, held a second fertilizer stakeholder roundtable meeting at Alisa Hotel in Accra, September 23-24, 2021. This meeting involved discussion of a roadmap aimed at establishing the Fertilizer Platform Ghana (FPG), which had been agreed upon by the stakeholders at their first roundtable meeting held in April 2021.

With 100% attendance by invitees, participants included Nana Serwaa Amoako, Senior Advisor to the President on Agriculture; Hon. Emmanuel Agyei Anhwere, Vice Chair of the Parliamentary Select Committee on Food, Agriculture, and Cocoa Affairs (PSC-FAC); Hon. Dr. Godfred Seidu Jasaw, Deputy Ranking Member of PSC-FAC; Akoto Osei, Director of Crop Services (MoFA); Richard Tweneboah Kodua of the National Development Planning Commission; Dr. Oumou Camara, IFDC Regional Director for North and West Africa; and Dr. Prem Bindraban, IFDC FERARI Program Director.

Key private fertilizer sector players, such as representatives of businesses, apex farmer organizations and associations (Peasant Farmers Association of Ghana, CropLife Ghana, and Ghana Agri-Input Dealers Association), Council for Scientific and Industrial Research-Soil Research Institute (CSIR-SRI) and Savannah Agricultural Research Institute (CSIR-SARI), universities (University of Ghana, University for Development Studies [UDS], University of Energy and Natural Resources [UENR]), and development partners (IFDC's AfricaFertilizer.org and FERARI program, African Fertilizer and Agribusiness Partnership, Fertilizer Canada, and the 4R Foundation), were also present to actively contribute to, and ensure, a sustainable and inclusive FPG. Moreover, representatives from Ghana Customs Authorities and from the banking sector attended the meeting as well.

Participants enthusiastically discussed a draft constitution, membership, and management structure and made substantial inputs on attaining the goal and objectives

of the platform. Consequently, meeting participants agreed to hold a third stakeholder roundtable meeting in mid-November 2021 to concretize the establishment process by adopting finalized statutes. The FPG, which is now legally registered with the Registrar General's Department in Accra, is a multi-stakeholder dialogue mechanism for the sustainable development of the fertilizer sector in Ghana.

During the roundtable meeting, Dr. Jasaw lauded the FERARI program as a reliable source of information for the PSC-FAC.

His speech can be found at https://ifdc.org/2021/09/28/ghana-parliamentarian-lauds-feraris-work/.

▲ *Dr. Edward Yeboah, Director of the Soil Research Institute (CSIR-SRI), moderates a roundtable session.*

Reg No. CG213380921 TIN : C0061220930

Certificate of Incorporation

I hereby certify that

FERTILIZER PLATFORM GHANA LIMITED BY GUARANTEE

is this day incorporated under the Companies Act, 2019 (Act 992) and that the liability of its members is limited by guarantee.

Given under my hand and official seal at Accra, this 10th day of September 2021

For Registrar of Companies

▲ *The official Certificate of Incorporation for the Fertilizer Platform Ghana.*

▲ *Participants on the second day at the second fertilizer stakeholder roundtable meeting held in Accra on September 23-24, 2021.*

FERARI TEAM PROFILE

Anselme KOUAME: "I am an agronomist for the FERARI program. Last July 2021, I was a master's student and did my final internship at IFDC. I worked on crop modeling and yield response mapping of fertilizer. The aim of my study was to identify the key factors that drive the response of maize yield to fertilizer (NPK) in Ghana. Currently, I continue to analyze fertilizer yield responses using advanced statistical methods, modeling, and mapping techniques. I further support the development of FERARI's database system and will assist in hands-on training in the use of models and mapping." ■

FERARI TEAM PROFILE

Soua Jeanette MAMY: **"**I am an engineer in IT networking and database administration. In February 2021, I joined IFDC as an intern in contract management, which involves filing contracts online. I am now in the FERARI program serving as a database assistant in support of the FERARI database system. I am happy to have joined this team. Together, everyone achieves more!" ■

FERARI CROP TRIALS AND HARVESTING AT AAMUSTED

In 2021, FERARI and its partners, Kwame Nkrumah University of Science and Technology (KNUST), Akenten Appiah-Menka University of Skills Training and Entrepreneurial Development (AAMUSTED), UDS, CSIR-SARI, CSIR-SRI, and UENR, conducted 74 on-station, 90 on-farm, and 24 farmer-managed on-farm trials in the Guinea Savannah and Transitional agroecological zones of Ghana. The treatments in these trials were based on results from the previous year's experiment. The trials focused on the use of micro- and macronutrients to improve maize, rice, and soybean yields. At AAMUSTED, the trials were supported by five master's students and a dozen researchers who served as thesis supervisors. This module was repeated at UENR as well as UDS.

Experimental fields in Ashanti and Bono regions are currently being harvested. The students, together with researchers (thesis supervisors), collect data, including grain and biomass yields. During harvesting, a 9 square meter quadrant is selected within a plot. The plants in the selected area are counted before harvesting. Other data collected included the number of plants, cob number, and cob weight for maize. In soybean, pods per plant were recorded by randomly sampling five crop harvests. ■

▲▼ *On-station trials of maize (above) and soybean (below) at AAMUSTED.*

▲ *Maize cobs ready for harvesting (top left) and students record data on maize and soybean biomass after harvesting.*

FERARI IN DIALOGUE WITH MINISTRIES AND RESEARCH INSTITUTES

▲ *Hon. Dr. Godfred Seidu Jasaw, Deputy Ranking Member of the Parliamentary Select Committee on Food, Agriculture, and Cocoa Affairs meets with Dr. Bindraban (at left) in his office.*

Based on our experimental findings, farm surveys, and analyses of fertilizer yield response data from literature, FERARI's evidence base about the divergent impact of different fertilizer formulations on yield of maize, rice, and soybean is growing. Our findings have been communicated with the research institutions and MoFA, which has led to discussions between FERARI and these entities. A tripartite dialogue will take place soon. The demand for such evidence-based information is high and growing among stakeholders in the food and fertilizer value chains. ■

FARMER FIELD DAYS ATTRACT MORE THAN 200 SMALLHOLDER FARMERS

Over 200 smallholder farmers have visited the trial sites at Mampong and Dormaa in Ashanti and Bono regions of Ghana during field days organized by district's Department of Agriculture under MoFA. This event also brought together district directors of agriculture, students in agriculture-related programs, and smallholder and commercial farmers. The participants were also profiled for future follow-ups. At these events, students and researchers responsible for the trials explain their operations to the participants. The events are also captured by local media for broadcasting.

▲ *Local news media interviewed participants at the field day events.*

▲ *Students, farmers, and researchers at the field day events in Mampong and Dormaa in Ashanti and Bono regions of Ghana.*

FERARI STUDENTS CONDUCT TRIALS AT AAMUSTED

In Ghana, commercial maize crops are normally grown in the field with the application of chemical fertilizers made of nitrogen, phosphorus, and potassium in different combinations as a starter and top-dressed with ammonium sulfate or urea five to six weeks after planting. The major factors limiting maize production in Ghana are low soil nutrient levels, limited use of inputs (especially fertilizer and improved seeds), and untimely application of adequate quantities and balanced nutrients of fertilizers to improve plant yield and human health upon consumption. In view of this, the FERARI program is collaborating with AAMUSTED, with the aim of conducting 10 on-station and 15 on-farm fertilizer trials at its Asante Mampong campus, in the surrounding communities, and in Ejura Sekyedumase District. The following are case studies of two beneficiary students in the field.

FERARI STUDENT PROFILE

Martin APPIAH, Soil Science Master of Philosophy student: "I am studying maize growth, yield, and soil physicochemical property responses to different blends of macro- and micronutrients and different modes of application: soil (side placement) and foliar. Since many fertilizer programs in sub-Saharan Africa have focused on replenishing macronutrients mainly through soil application, my goal is to determine how application of both macro- and micronutrients (zinc- and sulfur-based fertilizer) through foliar application and in the soil will impact crop yield and nutrient content of maize grains. Field data collected so far show a positive crop response to the blend of macro- and micronutrients and to the different modes of application." ■

▼ *Determining maize plant internodes.*

▲ *Lush maize growth with application of inorganic fertilizer at four weeks after planting.*

FERARI STUDENT PROFILE

Deborah BOANTE, Agronomy Master of Philosophy student: "I am studying the effect of different fertilizers of major (N, P, K and S) and minor nutrient (Zn and B) formulations in the form of briquettes on growth, yield, and nutrient uptake of maize in the Transitional zone of Ghana. To alleviate the problem of low yield and to enhance the nutrient content of maize, nutrient management is an option, as plants utilize available inorganic nutrients to build ecologically sound and economically viable farming systems. Micronutrient applications are receiving attention because recent intensive farming activities due to the rise in population remove many micronutrients from the soil. Moreover, there is evidence that plants grown in soil deficient of micronutrients have a low nutrient content, which may affect crop yield and nutrition and the subsequent human diet. I applied briquettes of a blend of N, P, K, S, and micronutrients (Zn and B) to Wang-Dataa maize variety at AAMUSTED, Asante Mampong. These pellets were applied to maize plants through side placement to minimize wastage. Briquettes may have a higher use efficiency because they are placed 7-10 cm below the soil and 10 cm away from the plant. Maize plants grown with briquettes reveal better maize growth and higher yield than the control." ■

▲ *Application of briquettes to maize at two weeks after planting, resulting in well-formed maize cobs (inset).*

FERARI COLLABORATION: ANALYZING NUTRITIONAL QUALITY AT IARI

The Mineral Nutrition Lab in the Division of Plant Physiology at ICAR-Indian Agricultural Research Institute (IARI), New Delhi, India, engages mainly in basic and applied research on nutrient uptake and utilization by crop plants. Our laboratory is well equipped with necessary instrumentation, a field, and greenhouse facilities to carry out studies at physiological and molecular levels. During our collaboration with the FERARI project, we will study the "Impact of Fertilization on Grain Nutritional Quality for Human Health." The use of different combinations of macro- and micronutrients, as in the FERARI field trials on soybean, maize, and rice in Ghana, is one approach to biofortification. We will complement this experiment by analyzing the grain samples for elemental profiling, sulfur-containing amino acids, and phytic acid (anti-nutritional factor). The results from the field experiments conducted in Ghana will reveal the best treatment combinations, which will be then validated in our field at IARI. Currently, our lab has eight research staff working on various projects funded by national and international agencies. Presently, one master's student and four Ph.D. students are working on various aspects of crop nutrition along with eight master's and five Ph.D. alumni from the lab. The lab provides a congenial atmosphere in which to learn and gain hands-on experience in using sophisticated instrumentation. One aim of the FERARI network to provide hand-on-training to Ghanaian lab assistants in our laboratory. The successful completion of this project will reveal the best way to enhance grain nutrient concentration in staple food crops with minimum resources and capacity building of Ghanaian lab assistants. ■

▲ *The Mineral Nutrition Lab is headed by Dr. Renu Pandey, Principal Scientist at IARI's Division of Plant Physiology.*

▲ *Instrumentation for nutrient analysis by ICP-OES and CHNS Analyzer in IARI's Division of Plant Physiology.*

▲ *Metabolite (amino acid) analysis by HPLC in the Division of Plant Physiology, IARI, New Delhi, India.*

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