

## FERARI FOCUS

### DRONE TRAINING FOR FERARI STAFF TO HELP UNDERSTAND MAIZE YIELD VARIABILITY



FERARI visited the University of Cape Coast to discuss a collaboration, led by Professor Benjamin Kofi Nyarko and endorsed by the vice-chancellor, Prof. Johnson Nyarko Boampong.

FERARI staff will be trained in field operations with drones for gathering farm-level images. Image processing and analytical methodologies will be developed to unravel the causes for the huge variability observed in maize yields. Student exchange will be encouraged, and the imagery will facilitate modeling and mapping. ■



Sample drone with camera and separate control unit

## FERARI FEATURE

### 2022 MASTERS STUDENT INTERNS DESIGN METHODS TO ENHANCE SOCIOECONOMIC DATA COLLECTION



Master's-level student interns from the University of Ghana have designed their data collection tools and gathered data from 886 farmers and 50 agricultural extension officers from the FERARI research area. The data pertained to socioeconomic topics, such as farm output commercialization, adoption of good agronomic practices, agriculture technology and innovation transfer models, and the role of agricultural projects in rural development. The data collection was executed by Basiru Alhassan, Collins Boahen Tutu (pictured above interviewing a farmer), Dorothy Kormetsoo Tetteh, and Fred Gyasi, as the four technical leads, with the support of research assistants and the FERARI program's head of socioeconomics.

Collins observed that the use of mineral fertilizers was low in Ahafo Region, since most of the farmers perceive their farmlands to be fertile. On the contrary, Dorothy observed that fertilizers are highly used in Northern Region. "It became clear to me that most farmers in Northern Region believed adding external inputs, such as mineral fertilizer, helps to increase their yields and that the present fertility level of the soil made it more obvious to do so. Nonetheless, the use of fertilizer in crop production is low due to the rise in fertilizer prices and the untimely availability of subsidized fertilizer." This is particularly true

for soybean production, for which farmers already use little fertilizer. According to Basiru, "More acreage is being committed to the production of legumes, such as soybean and groundnut, in the northern part of the country due to the increasing prices of fertilizer and its unavailability."

Marketing poses another challenge. Collins noted, "The major challenge farmers face is poor prices for farm produce, and some of the farmers expressed that they are unable to break even, despite selling all their harvested produce." Fred explained, "Not only does the high cost of production inputs lead to

their low use, but the poor feeder roads also make it difficult for farmers to cart their harvests to their homes and market easily and in a timely manner. The market women and other middlemen take advantage of the farmers' inability to transport their produce to the market by buying from them at the farm gate or their homes at lower prices." Some extension officers indicated that the extension service should expand its focus on production to include education on how farmers can improve their livelihoods through their farms, including the need to improve farmer-market linkages and boost farmers' bargaining power. ■

## FIELD OBSERVATIONS REPORTED BY GHANAIAN UNIVERSITY MASTERS STUDENT INTERNS

**Basiru Alhassan | "Fertilizer prices intensify legume production in the North"** - Much acreage has been committed to legume production in the northern part of Ghana due to the increasing cost of mineral fertilizers. Prices of fertilizer have more than doubled, and it is not readily available. Farmers have therefore indicated that they will not use fertilizer this season. Many farmers, particularly women, are resorting to soybean and groundnut production. These legumes require less fertilizer. Most farmlands are not very fertile and cannot support the production of maize without fertilizer application. But with legumes, farmers are assured of some yield that they can sell to buy maize for household consumption.



▲ Basiru Alhassan speaks with a farmer about fertilizer prices affecting her farm's yields.



▲ Dorothy Kormetsoo Tetteh takes notes on a soybean farmer's fertilizer access problems.

**Dorothy Kormetsoo Tetteh | "Soybean farmers are unable to use inorganic fertilizer due to price hikes and unavailability of subsidized fertilizer"** - In the Northern Region, most farmers believe adding external inputs, such as mineral fertilizer, helps increase yields and that the fertility of the soil makes the need for this more obvious. Even though the majority of farmers are aware of sustainable agricultural practices, such as cereal-legume rotation, they also indicated that the soil needs the addition of some sort of nutrient in order to attain a good yield. Despite this, they are unable to use mineral fertilizer in their soybean production due to the ongoing rise in fertilizer prices and the untimely availability of subsidized fertilizer.

**Collins Boahen Tutu** | *“Farmers complain of poor prices for produce amid high input costs”* - Most of the farmers in the Ahafo Region perceive their lands to be fertile and thus do not see the need to add any fertilizer, either mineral or organic, to their cultivated fields. The challenge that stood out was related to poor prices for farm produce that, according to the farmers, do not balance the cost of production because of the high cost of inputs. Some extension agents indicated the need for their services to go beyond teaching good production practices and extend to how farmers can make a good income from their production. Hence, they suggested that emphasis should be placed on improving farmer-market linkages and increasing farmers’ bargaining power for better prices.

**Fred Gyasi** | *“Market access hampers maize farming profitability”* - Aside from the high cost of inputs, bad roads leading to farming communities affect farmers, as they cannot send their yields to the market easily or timely. In the Asutifi District, market women and other middlemen go to the farming communities to buy bags of maize at low prices, which affects the farmers’ profitability. In the Techiman Municipal, maize kings, called Aburo, determine the minimum price that market actors should pay for a bag of maize. The true reflections on what affects farmers’ commercialization and profitability will be determined by analyzing the data collected. ■



▲ Fred Gyasi hears from a farmer about market access.

## PRELIMINARY RESULTS FROM UM6P MASTERS STUDENT INTERN RESEARCH



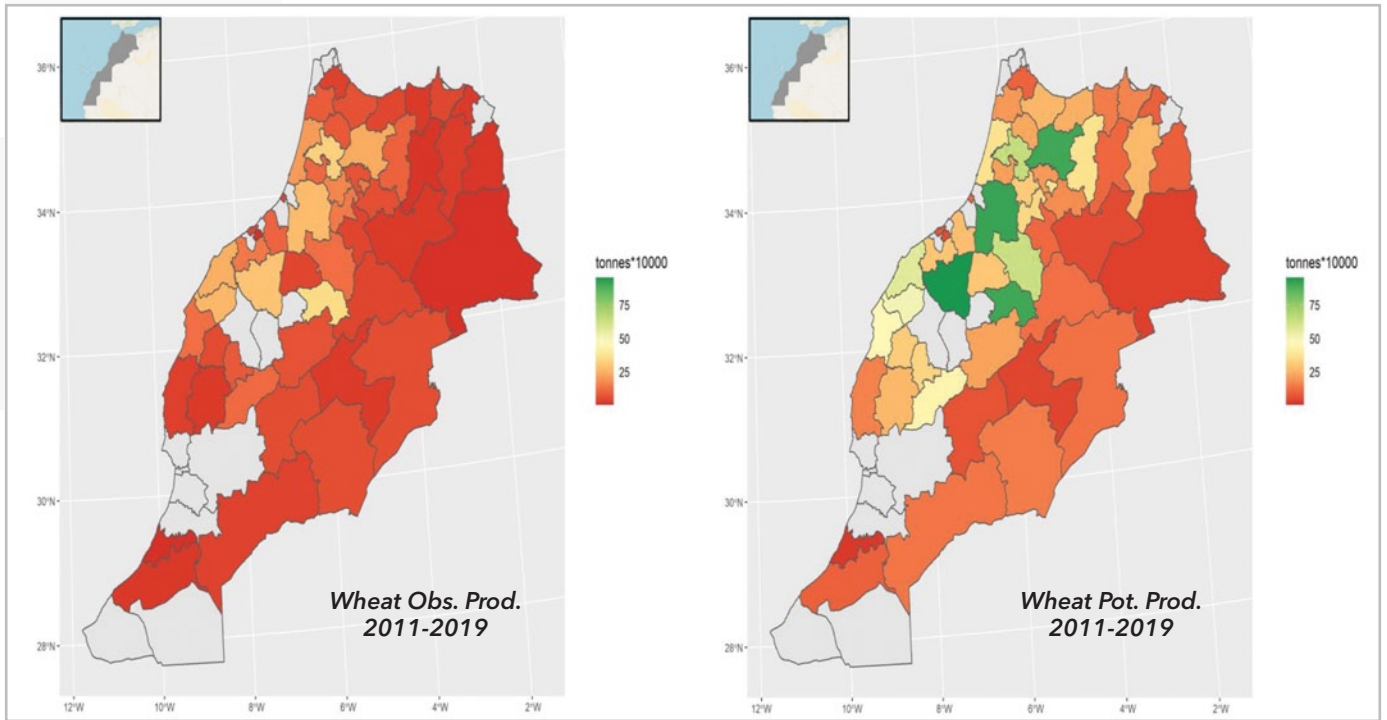
▲ Bouchra Darkaouia attends a technical analysis session with FERARI’s GIS specialist.

**Bouchra Darkaouia** | *“Analysis of wheat (*Triticum aestivum*) production capacity in Morocco using a simple Light-Use Efficiency Model (LINTUL) and geostatistical techniques”* - Preliminary results show that LINTUL-1 can be a useful tool to simulate the potential yield for the entire wheat cropping areas in Morocco and to obtain a good understanding of the yield gaps that are relevant to the local environment through an estimation of the theoretical maximum yield. As the amount of light intercepted by a crop and radiation use efficiency are key parameters for estimating this potential production, they have been used to investigate the interaction between crops and management and to explain yield differences in diverse production environments.

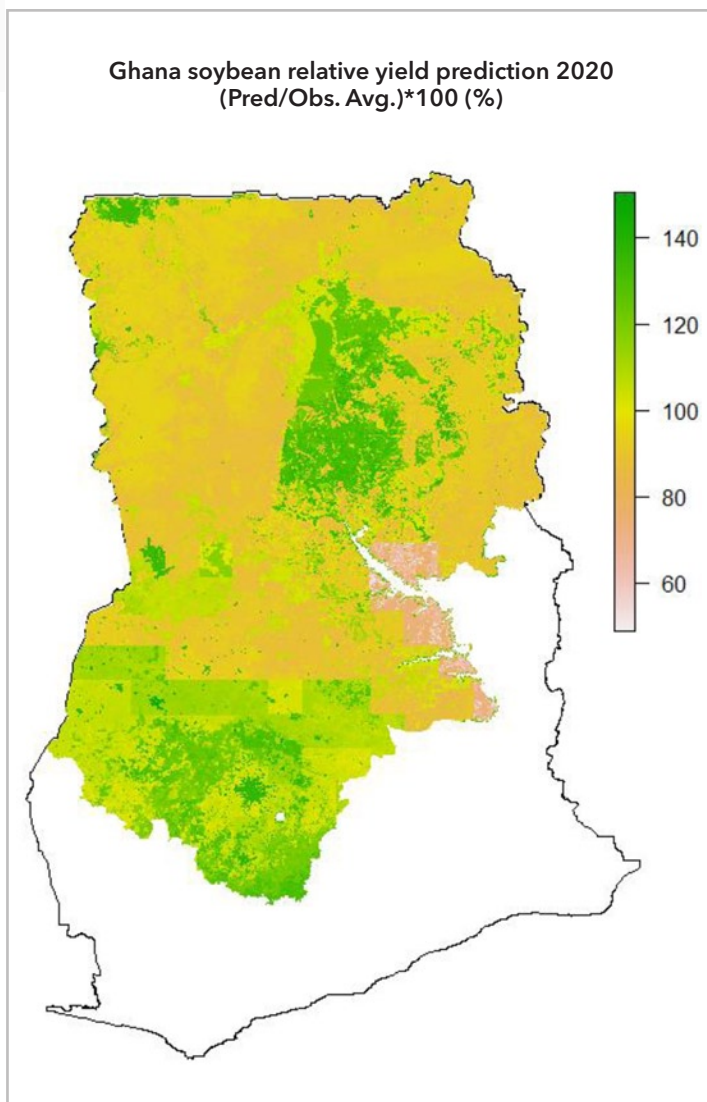
The following links show the process of data collection preparation and modeling used by Ms. Darkaouia:

- ✓ <https://www.linkedin.com/feed/update/urn:li:activity:6940326403124940800/>
- ✓ <https://www.linkedin.com/feed/update/urn:li:activity:6942066633670590464/>

▼ Maps comparing spatial provincial distribution of wheat production in the wheat cropping areas in Morocco, produced through the research of Bouchra Darkaouia using LINTUL and GIS techniques.

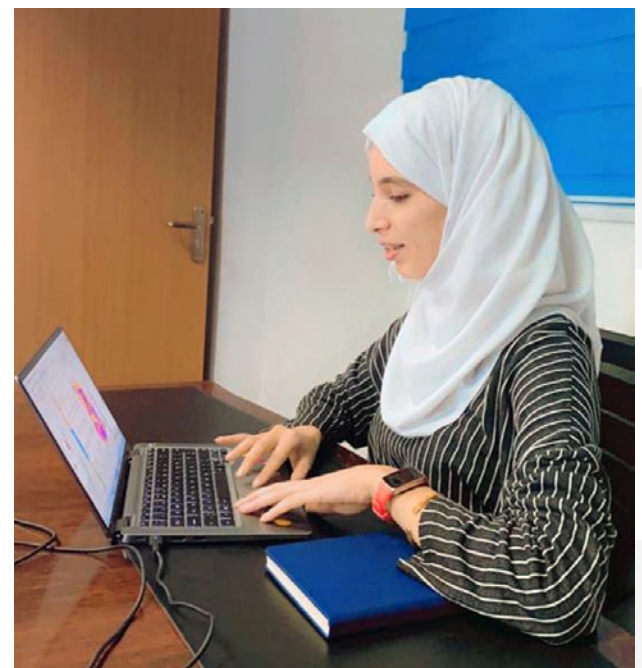


▼ Map produced by Lamia Jallal plotting the results from field trials of rice and soybean yield response to zinc, sulfur, and NPK

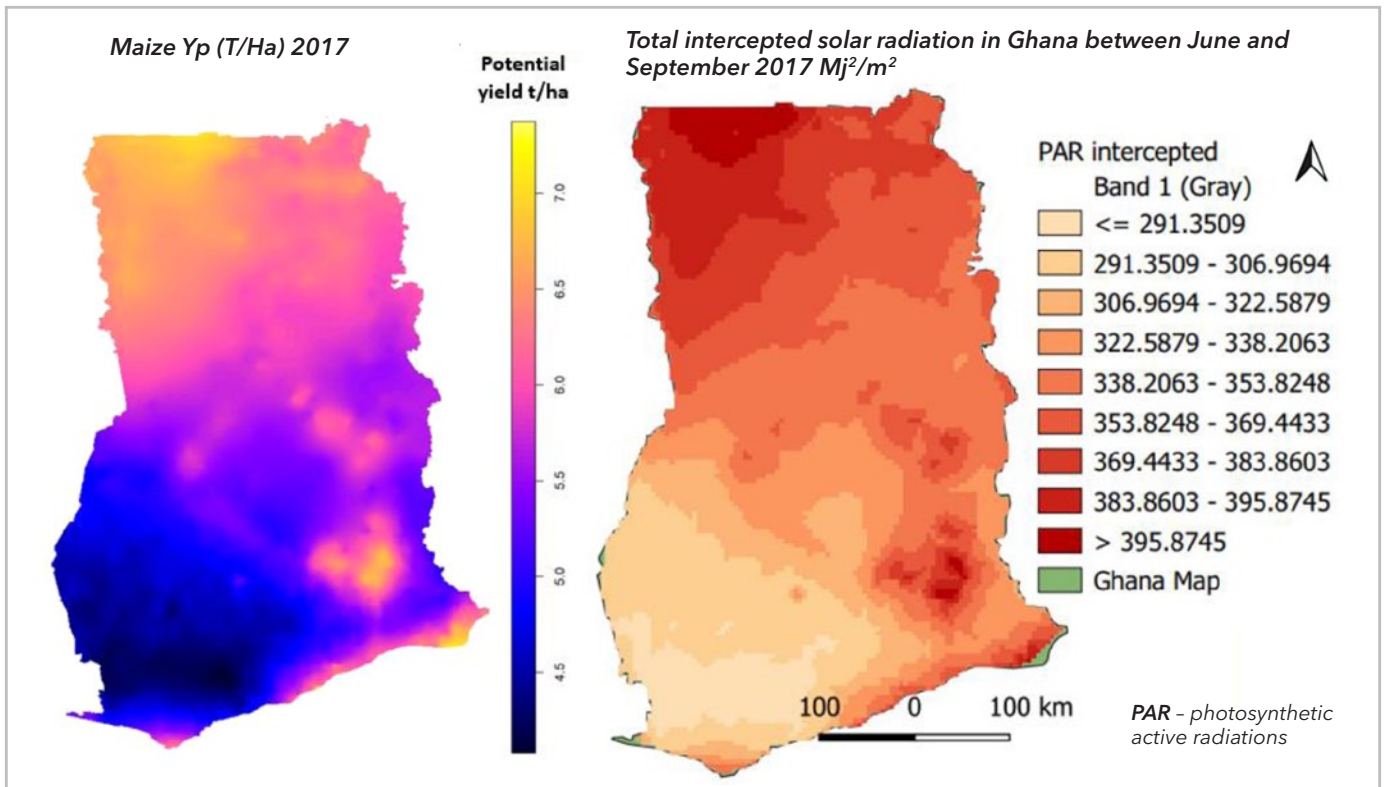


**Lamia Jallal | "Identifying drivers of rice and soybean yield response to fertilizer in Ghana"** –

Based on field trials from 2020, zinc, sulfur, and NPK were found to have a significant effect on rice and soybean production. Analysis also showed that temperature and precipitation are the most critical factors that can negatively influence both crops due to their poor distribution during their growing season and that acidic soil is not a good environment for plant growth. The base saturation also had a positive effect on both crops. Findings were expressed as relative yield response maps for Ghana, as illustrated for soybean.



▲ Lamia Jallal at work researching rice and soybean yield response drivers.



▲ Spatial pattern of Maize Potential Yield for Ghana.

**Mohamed Boullouz | "Light Use Efficiency (LINTUL) crop model effective for identifying driving factors for maize yield gap in Ghana"** - LINTUL-maize was found capable of simulating the potential yield of maize in Ghana. The simulation shows a high potential yield in the northern part of the country compared to the southern part, due to the high intercepted photosynthetic active radiations. A comparison of the observed yield in the field experiments and the simulated potential yield for the same locations showed a huge yield gap for maize, ranging from 14%

to 96%. Two-thirds of the yield gap was explained by soil organic matter, soil water-holding capacity, root zone depth, soil pH, rainfall, and nitrogen and sulfur fertilizer application. Basically, soil organic matter is the major driver of the yield gap for maize in the study location. Increasing soil organic matter by 1% reduced the yield gap by 1.3 metric tons per hectare (mt/ha). Increasing the capacity of the soil to hold water reduced the yield gap by 0.3 mt/ha. Interestingly, increasing soil pH from 4.94 to 6.67 resulted in an increase of the yield gap by 0.5 mt/ha. ■

## FIELD OBSERVATIONS FROM FERARI DOCTORAL STUDIES



▲ Ph.D. candidate Eugene Dela Setsoafia is studying mulching and organic manure use through field trials in Northern Ghana. The field pictured above shows traditional farmer practice without the use of mulch.



▲ Setsoafia is working with 81 farmers in field trials ongoing in the districts of Gonja West, Tolon, and West Mamprusi. The photo above shows the use of organic manure in the maize plot (with darker color) beyond the foreground plot.

**Eugene Dela Setsoafia** | *“Agronomic practices for improving nutrient use efficiency and enhancing on-farm productivity,” focusing on “Enhancing on-farm productivity: The effect of mulching and organic manure application with NPK on crop yield.”* - The study objective was to analyze the effect of mulching and organic manure integration with mineral fertilizers and improved seed varieties on crop yield, nutrient use efficiency, and soil fertility. The rationale behind the trials is to make fertilizer and improved seed packages available to farmers who practice mulching and organic manure application and then find out how they make decisions about fertilizer application, how they

interpret and apply knowledge about fertilizers, their perceptions on the effects of fertilizers, and how their perceptions and practices relate to expert knowledge.

Eighty-one farmers are participating in the trials in Gonja West, Tolon, and West Mamprusi districts. At the end of the trials, how the fertilizer and improved seeds interventions (packages) enhanced on-farm productivity and improved the livelihoods of the participating farmers will be determined. The trials will also reveal the technical efficiencies of mulching and organic manure application. ■

**FERARI**  
FERTILIZER RESEARCH & RESPONSIBLE IMPLEMENTATION

**IFDC**  
Developing Agriculture from the Ground Up

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