

REPORT ON THE 2nd AFRICAN CONFERENCE ON PRECISION
AGRICULTURE
GHANA SATELLITE SITE



The APNI's 2nd African Conference on Precision Agriculture was a three-day conference held in Nairobi, with the Ghana satellite site hosted by CSIR-SARI, at the Mariam Hotel, Tamale - Ghana, from the 7th of December to the 9th of December 2022.

After the registration of participants earlier in the morning, day one of the conference started at 8:30 am GMT. Dr. Richard Oteng-Frimpong, the satellite site host, welcomed participants to the conference and informed participants that it was going to be a hybrid conference, which will feature live presentations, virtual sessions, and pre-recorded videos. He encouraged participants to write down questions or suggestions for presenters, both in-house and those who were going to present outside the Ghana satellite site, if they had any, to be typed into the live feed of the host site to be read and addressed duly. He made some housekeeping announcements and entreated participants to make the most of the knowledge that will be shared over the three days of the conference.

Pre-recorded welcome messages were played, first from the Director General of APNI, Kaushik Majumdar, and then from AAPA President, Dr. Kwame Frimpong. Kaushik Majumdar in his message welcomed all participants and said he was delighted there were 10 satellite sites this year. He communicated his deepest gratitude for the support and enthusiasm of the local organizers of these sites to make the conference a success. Kwame Frimpong in his message expressed his regret that all participants could not attend, but also expressed his excitement about the satellite sites that give the opportunity to explore and have the full benefits of such a conference. He said it was his hope that the conference will be attractive, stimulating, and rewarding to all.

The Ghana satellite site then joined the live virtual presentation of two keynote speakers. Jose Paulo Molin in his presentation titled "*Tropical Precision Agriculture: The Brazilian Experience*", discussed Brazil's almost 25 years of Precision Agriculture (PA) and the expectations of Agro-Digital to deepen and expand precision agriculture practices. He also touched on some major events of precision agriculture, the number of publications in PA, adoption numbers of PA, and Agro digital solutions, and ended with the challenges and risks.



Live feed projection

Ruth Sitienei’s presentation on “*Harnessing Soil Health to create more Restorative and Resilient Food Systems in the Central Highlands Eco-Region Foodscape*”, explored the need for Regenerative Food Systems. She said Regenerative Food Systems encompass production on land and in water, listing Farming (croplands), Livestock (grazing lands), Aquaculture (land and sea-based), and Fisheries (fresh and salt waters). She explained what the Central Highlands Ecoregion Foodscape looked like, soil nutrient gaps, and strategies to improve the food systems.

The local session of the Ghana satellite site commenced soon after the virtual keynote presentations. Haruna Abdulai’s presentation on “*Enhancing Crop Yield in Smallholder Farming Systems of Northern Ghana: The Role of 4R Nutrient Stewardship*” looked at the 4R Solution project, where the 4R principles, are simply using the **Right Source** of nutrients, applied at the **Right Rate**, at the **Right Time**, and in the **Right Place**. He further discussed soils in Northern Ghana with little nutrient reserves which easily deplete upon cropping with no nutrient application,

dissemination of 4R practices, 4R knowledge products, and adoption successes of the 4R principles. After the presentation, some participants had the following questions and comments;

- What would be the role of 4R in addressing low plant density as identified in Kpandai? (*Emmanuel Y. Wandaat, CSIR-SARI*)
- Training on weed management was not present in the presentation, considering the high usage of agrochemicals by smallholder farmers. What is being done in that regard? (*Emmanuel Y. Wandaat, CSIR-SARI*)
- How do you intend to harness traditional practices and knowledge in 4R practices? (*Ayisha Gomda, Tamale Technical University-TaTU*)
- Considering the minimal increase in yield, comparing 4R practices to farmer practices, would you still recommend these practices to the farmers? (*Hammond Abeka, CSIR-SARI*)

The second presenter, Hammond Abeka, presented the topic “*Soil nitrogen loss in a Ferric Luvisol through leaching after applying different rates of granular and briquette NPK fertilizers*”. He took participants through why nutrient loss consideration is crucial for effective and efficient fertilizer recommendation. He concluded that irrespective of the rate of application, briquetting fertilizer minimizes nitrogen leached and enhances recovery efficiency relative to their granular counterparts. The following questions and suggestions came up after the presentation;

- What is the weight of each briquette to inform the rate of application? (*Dr. Abukari Mutari, CSIR-SARI*)
- What is the objective of the briquette fertilizer? Is it to fertilize the soil or to fertilize the crop? Because there was mini fertilizer left in the soil after harvest. (*Prosper Amenuvor, CSIR-SARI*)
- If *Kihera et al. (2020)* noted that high leaching could be observed from controlled plots than fertilized, what then is the essence to monitor the leaching of fertilized fields? (*Dr. Askia Mohammed, TaTU*)
- Why not consider total rainfall rather than effective rainfall in the analysis? (*Ramson Adombilla, CSIR-SARI*)
- Considering the effective rooting depth of maize (0.9 m), will available N at 60 cm soil depth be classified leaching? (*Ramson Adombilla, CSIR-SARI*)

- Soil water content monitoring is relevant to such a study. (*Ramson Adombilla, CSIR-SARI*)
- Ascertain drainage direction to help in experimental plot layout. (*Ramson Adombilla, CSIR-SARI*)
- Consider using Wetting Front Detector for Nitrate monitoring (*Ramson Adombilla, CSIR-SARI*)
- Design a simple subsurface drainage system to collect leachate (*Ramson Adombilla, CSIR-SARI*)

Boadu-Ayebofo Asante's "*Spatial-Temporal Assessment of Drought in the Northern Region, Ghana*" was the third presentation in the local session. His work dwelled on the spatial-temporal dynamics in the Northern region of Ghana through remote sensing, GIS, and other higher statistics derived from the MODIS platform. He said in his conclusion that the MODIS land surface temperature product was appropriate for use in VTCI modeling. Also, drought happenings in the region did not show a statistically significant trend. He recommended other variables such as humidity and wind speed, to be included in further studies to enhance the understanding of drought in the region. Participants had the following suggestions for the presenter;

- P-value indicates differences and not variability or haphazardness. The variant is best indicated by the coefficient of variation (CV%). (*Dr. Askia Mohammed, TaTU*)
- Data limitation could be the cause of the non-significant drought experienced for the region. (*Ramson Adombilla, CSIR-SARI*)
- Climate data not less than 30 years should be considered in future works to improve accuracy of forecast.



In-house presentations

The Ghana satellite site then joined the live session for the third keynote presentation by Dr, John Fulton titled “*Overview of Precision Agriculture Education in North America*”. He discussed digital and precision agriculture education, topics to be considered, challenges, and the current solution to address the challenges. The live session streaming continued with a four-member panel discussion on *Precision Agriculture Education*, moderated by Steve Philips. After the panel discussion which saw the close of day for the host site, the Ghana satellite site continued with a plenary session of recorded presentations under the theme Precision Nutrient Management moderated by Aniss Bouraqqadi. The presentations, in the order in which it was played, included;

- *4Rs As An Entry Point for Precision Agriculture in Smallholder Farming Systems of Africa* – **Samuel Njoroge**
- *Driving Up Large-Scale Irrigated Wheat Yields through variable rate fertilizer application in Zambia* – **Jacopo Parigiani**
- *Predicting canopy Nitrogen Content based on UAVs and satellites data fusion in citrus orchards* – **Avioz Dagan**
- *Virtual Agronomist Getting Soil Information and Agronomic Advice into Farmers’ Hands* – **Keith Shephard**

Dr. Oteng-Frimpong, after the last presentation, entreated participants to come early the next day, as the live plenary session was going to start at 8:15 am GMT, and adjourned the conference at 4:21 pm GMT.

Conference day two started at 8:01 am GMT, after the registration of participants earlier in the morning. The moderator welcomed participants and informed them the satellite site will join in on the live session from the host site in a few minutes, and that there were going to be some in-house presentations, as well as some recorded ones. He also reminded participants to write down questions if they had any during presentations to be typed in and read at the host site and included in the report.

In John Fulton's (ISPA President) pre-recorded welcome message, he expressed his excitement about being part of the conference virtually for the satellite sites, and in person at the host site. He gave a little history of ISPA, and what they do, and said twelve years of consistency has seen the growth of membership. He encouraged participants to become members and consider becoming country representatives as it has many benefits. He also urged people to visit the ISPA website and follow their social media platforms (address and social media handles were shared on the screen).



Participants listening attentively to live presentations

Remote Sensing: From Plot towards Landscape Scales, was the title of the fourth keynote presentation by Francelino Rodrigues. He took participants through what the Lincoln Agritech group does and their interests, by discussing vegetative stress indicators, how to establish vegetation stress indicators using RS as proxy, Crop Observation, Management, and Production Analysis Services System (COMPASS). That presentation was immediately followed by a previously recorded plenary session of four presentations including;

- *How 20 Years of Precision Agriculture Experience can benefit Small Landholders* - Robert Blair

- *Farmers' Perception and Willingness to Adopt Drone Technology in Agriculture* - Femi Adekoya
- *From Drone to Satellite – Does It Work?* - Mats Söderström
- *Agricultural Data Market to Empower African Farmers* - Faissal Sehbaoui

The Ghana satellite site then started its local session. The first presenter was Baba Yussif Kassim, whose presentation was titled *Implementing Field-Based High Throughput Plant Phenotyping*. His presentation looked at implementing High Throughput Plant Phenotyping under field conditions to identify vegetation indices associated with leaf spot tolerance in groundnut using open-source tools. His presentation prompted the following questions and responses;

- Are generated outputs or data evaluated against measured data for accuracy? (*Ramson Adombilla, CSIR-SARI*)
- How can the leaf color (browning/ yellowing) be used to differentiate disease and maturity? (*Dr. Abukari Mutari, CSIR-SARI*)
- At this stage of the study, the challenge is distinguishing diseased leaves from yellowed leaves which are not diseased. AI presents a good approach to help with the study. In AI, we can distinguish between which portions of the fields are diseased (*Boadu-Ayebofo Asante, CSIR-SARI*)

Dr. Mustapha Mohammed then presented on *Rhizobial symbionts of Kersting's groundnut: Insights into their biodiversity in African soils and potential utilization as inoculants in sustainable agriculture*. His work looked at the need for strategies to reverse the decline in soil fertility to meet the food demand of the growing population, grain legumes, and their importance in cropping systems due to their N₂ fixing ability. In his conclusion, he said, African soils harbor phylogenetically novel rhizobial symbionts yet to be properly described. Also, rhizobia nodulating grain legumes are highly effective and can be used for inoculant formulation to increase yields in N-deficient soils. The questions below came up after the presentation.

- If there are differences in the strains of rhizobia between different locations in Ghana, even between UDS and Nyankpala areas, then how can an inoculant be developed that will be effective in the whole of Northern Ghana? (*Joshua Gumah, SEND Ghana*)
- What was the technique or method used for isolating the Rhizobium bacteria from the nodules of Kersting's groundnut? (*Dr. Abdul Aziz Abdul Latif, CSIR-SARI*)

- What makes native rhizobia not effective or efficient? (*Hammond Abeka, CSIR-SARI*)



In-house presentations

The next presenter was Ramson Adombilla, with a work titled *Irrigation Regimes and Mulching Effect on Fruit Yield and Water Stress Index of Tomato (Solannum lycopersicum L.) Varieties in the Guinea Savannah Agroecology of Ghana*. His presentation focused on the crop water demand of tomatoes, estimation of crop water stress index (CWSI), treatment effects on total fruit yield, and CWSI of tomatoes. His presentation triggered quite a number of questions as listed below.

- How did you account for water absorbed by the various levels of mulches added? (*Hammond Abeka, CSIR-SARI*)
- The constant supply of water to the soil will lead to nematode buildup. The nematode is primarily responsible for root knots. How will you deal with this problem in tomato cultivation? (*Ibrahim Yussif Jnr, TaTU*)
- Are there reasons why Petomech which is an OPV variety was used or compared to the Mongal tomato variety which is a hybrid variety, noting that hybrids normally give higher yields than OPVs? (*Yakubu Zakari, MoFA- SEND Ghana*)
- Considering the fact that water is becoming scarce, how do we ensure that the irrigation volume is not beyond the infiltration rate of the soil resulting in a runoff and the possibilities of temporal anaerobic conditions in the soil? (*Prosper Amenuvor, CSIR-SARI*)
- Will this experiment reduce the influx of tomatoes being imported into the country? (*Emmanuel Wandaat, CSIR-SARI*)

- Shelf-life of tomatoes should be conducted vis-à-vis water nutrient management on the field. (*Dr. Abukari Mutari*)



Participants ask questions and make comments during the discussion segments

The satellite site again joined in the live session of the host site for the fifth keynote presentation by Myrtille Lacoste titled *Global Renewal and Future of On-farm Experimentation*. She discussed accelerated learning co-constructed knowledge, and how On-farm Experimentation (OFE) is a force for innovation through joint exploration that renews experimentation. She also touched on OFE's ability to rebalance hierarchies of knowledge, innovative Ecosystem Platforms, and

Precision Agriculture Pathways. After her presentation, Myrtille again moderated a panel discussion on *On-farm Experimentation*, with Louis Longchamps, Ivan Adolwa, James Taylor, and Davis Gathumbi as panelists.

A plenary session of pre-recorded presentations was played for participants. They were;

- *Decentralized Research: An Opportunity to Accelerate the Transition towards Sustainable Food Production* – Louis Longchamps
- *Improving Lime and Fertilizer Recommendations for Smallholders using Co-Variate Zoning and Low-Cost Mir Soil Testing Technology* - Thomas Terhovens Urselmann
- *Scaling Ag Technologies to Unlock Value for Agriculture in Africa: insights from UM6P-Al Moutmir case in Morocco* – Nawfel Roudies
- *Farmer-led Approaches to Digital and Data Innovations* - Claire Rhodes

The second day of the conference ended at 4:06 pm.

After the registration of participants earlier in the morning, the third day of the conference started at 8:36 am GMT, with a live panel discussion on *Building Soil Health* moderated by Pauline Chivenge. The panelists were John Wendt, Ruth Njoroge, and Job Kihara.

The final keynote presentation was made by Femi Adekoya on *Precision Agriculture in Africa: The Youth are Ready*. He took participants through how agriculture has evolved, where we are in Africa, and how we can accelerate our growth by leveraging on the youth and their strengths. He also mentioned some youth-leading innovations and advancing smart farming and precision agriculture, and recommendations in education, youth inclusion programs, research engagements, policy development, and finance towards Research and Youth-led AgTech startups/SMEs. He concluded with his Integral Aerial Precision and Precision Field Academy initiatives that he is handling.

Dr. Steve Philips informed participants that the conference had 647 participants from 34 countries, with 18 in Africa, and 140 presenters. He mentioned the conference locations and host organizations, and duly acknowledged and thanked the satellite sites hosts and IT directors for the laudable work done, and exhibitors and sponsors for coming on board to make the conference a success. Two Early Career awards were given to Femi Adekoya of Nigeria, and Mbulisi of South Africa. A participant had this to say with regard Mr. Adekoya's presentation;

- Indeed African youth can make a difference in Agriculture. I would humbly suggest that we go back to the basics to address the problem of using farming and agriculture-related activities as a form of punishment in basic and secondary schools. We should rather change the narrative to make agriculture more attractive and marketable.

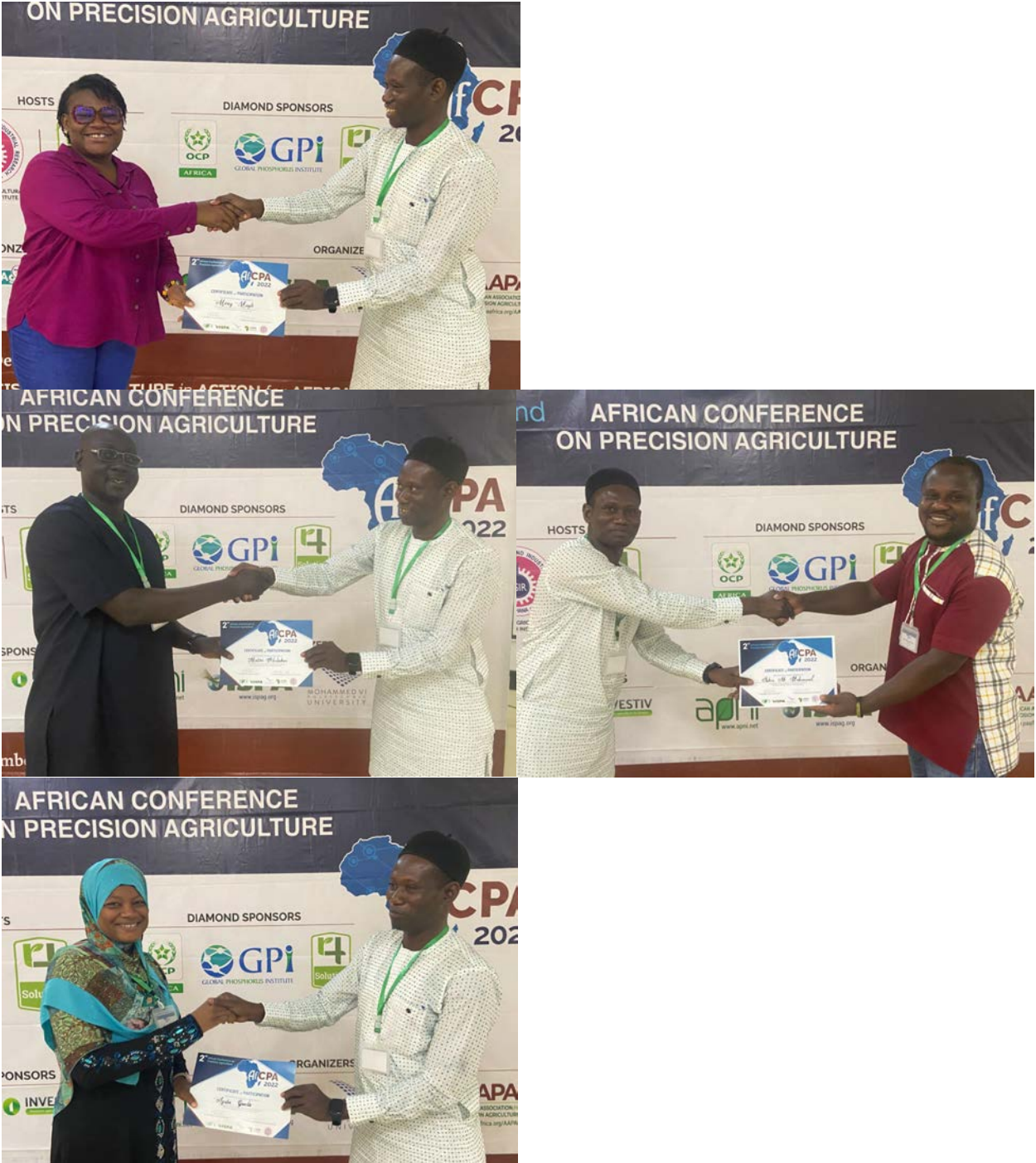
The Ghana satellite site watched the final pre-recorded plenary session. The presentations are listed below;

- *Decision-making Tools in Soil Management and Plant Nutrition On-farm Research and Observation Plot: Between Reality and Challenges* – Mouna Mechri
- *Precision Farming and Automation in Africa: Challenges and Opportunities* – Rachid Serraj
- *GNSS and SBAS Technologies for Precision Agriculture in Africa* – Agnes Kobusinge

General Participants Observations

- If publicity of the call for abstracts and the conference itself had come earlier, I would have loved to make a presentation.
- Great coordination of live feeds, local sessions, and even recorded presentations. Well done to the satellite organizers.
- The idea of satellite sites for such a prestigious conference is worth noting. I believe it has given the opportunity for a large number of participants to be part of a great knowledge-sharing hub.
- The conference venue was a good choice, easily accessible to all, conducive environment and great food.
- I was skeptical about the sessions that required joining into live sessions knowing how internet issues can disturb such programs. However, I am very impressed at how the transitions from one session into another were done, especially how on time and clear the live feed was on all the days.
- Make room for more in-house presentations at the next conference.
- It has been a very insightful conference. I look forward to being a part of the 3rd AfCPA.

Dr. Richard Oteng-Frimpong, the satellite site host and moderator after the final presentations, thanked everyone for being good participants. Certificates of participation were handed over to participants, and the conference came to a final close at 12:41 pm GMT.



Participants receiving certificates of participation

Breakdown of the Ghana satellite site participants

- 38 participants
- 33 males
- 5 females
- 6 presenters

Attached is a list of participants.

ATTENDANCE

No	Name	Organization	Email
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