



**ANNUAL
COCOASOILS
FORUM 2024**



CocoaSoils

The CocoaSoils Program would like to thank the public and private sector partners, the Ministry of Agriculture and Rural Development, Cote d'Ivoire, Centre National de Recherche Agronomique (CNRA), Conseil du Café-Cacao (CCC), and Center for International Forestry Research and World Agroforestry (CIFOR-ICRAF).

About Report

This report covers activities and discussions at the 2024 Annual CocoaSoils Forum held in Abidjan, Cote d' Ivoire from 20 – 22 March 2024.

Photos

© Coulibaly Fongnonga, Leonard Rusinamhodzi

Licensed under a Creative Commons Attribution – Non-commercial 4.0 International License.

© 2024. CocoaSoils Program

Introduction

The CocoaSoils Program has continued to generate integrated soil fertility management recommendations for dissemination to cocoa farmers through private-public partnerships since its inception in 2018. The Annual CocoaSoils Forum, the major annual meeting of CocoaSoils partners and other stakeholders in the cocoa sector, has been held three times – in Ghana, Cameroon, and Nigeria. Following the tradition of hosting the event in each of the project's host countries, the Annual CocoaSoils Forum 2024 was held from 19 to 22 March in Abidjan. Holding the 2024 Forum in Cote d'Ivoire was an excellent opportunity for the partners and key stakeholders to reflect on the achievements made so far, share the experiences gained, reflect on the lessons, prioritize the challenges and opportunities, and plan towards even stronger partnership and greater effectiveness for the years ahead.

The week-long activities featured the Research for Development meeting, the Partnership for Delivery meeting, a field trip to the project's Core and Satellite trial sites, and a public forum. The program is presented in Annex 1 and a list of participants is available in Annex 2.

Meeting: Research for Development Day

The Research for Development (R4D) Meeting was held on 19th March 2024 and was facilitated by Professor Ken Giller of Wageningen University and Research. The theme for the meeting, '*The Future of Cocoa: Deep Learning and Facing Up to a Changing Landscape*', was borne out of the need to design and implement crop production systems that enable adaptation to climate change, mitigation of greenhouse gas emissions, and improvement in long-term sustainability.

The meeting showcased results from the Core and Satellite Trials. It enabled discussions on how CocoaSoils' work can enhance productivity, profitability, soil health, biodiversity, resilience, and reduced deforestation in cocoa systems. Novel findings from PhD student theses related to these issues were also presented. Presentations can be found [here](#).

The [presentation on the Core Trials](#) (multi-locational nutrient response trials) began with a brief description of the treatments and experimental design, data collection, and some challenges being encountered in the trials. Dr Stefan Hauser explained that data from some of the plots indicates that soil carbon content is positively related to the cocoa bean yield. The main challenges identified in the trials are related to abiotic factors. The next steps in the implementation of the trials, according to Dr Hauser, are identifying the most productive nutrient combinations and closely monitoring and managing both biotic and abiotic factors. He encouraged Core Trial managers to consistently collect and upload data to the server to prevent loss.

The CocoaSoils Satellite Trials emphasize the stepwise approach and the need for incremental adoption of Best Management Practices (BMPs) due to the diverse range of farmers in the cocoa sector. They also underscore the variations in real farm conditions among farmers, such as differences in tree age, canopy, tree variety, etc. Presenting preliminary results over three complete seasons, Dr Leonard Rusinamhodzi indicated that the data showed a significant difference between cocoa tree diversity and fertilizer application in their effects on bean yield. These findings suggest that the stepwise approach positively impacted bean yield. The [presentation](#) also outlined the next steps and the way forward for the satellite trials, including the possibility of reviewing treatment applications and the design.

Future research priorities

Working groups were tasked to identify future research priorities for Data and Analytics, Biodiversity and Deforestation, PhD studies, and the Core and Satellite trials. The following were the outcomes of the meeting:

a) Data and Analytics

- The group suggested the collection of data on weather parameters (e.g., wind) and nutrient cycling (e.g., decomposition of leaves). A further suggestion was for the project to collaborate with national meteorological agencies in the four countries if there are insufficient resources to acquire the needed devices to capture these data.
- Aside from the recommendations for future research, the group advised that (i) data on the project's server include basic analytics that make it easier for partners to relay information to extension systems and for their internal use; (ii) increased capacity building of National Research Institutes and private sector partners in the use of the server/data platform is needed; (iii) there is need for improved data quality protocol and data submission protocol to reduce the number of outliers submitted to the server, which is not useful.

b) Biodiversity and Deforestation

For research related to biodiversity and deforestation, the group suggested the following topics:

- Biodiversity across production landscapes using a landscape approach
- Topics that look beyond plants to include animals, soil microbes
- Compensating trade-offs between biodiversity and productivity.
- What motivates farmers to keep trees and what are the suitable incentives?
- How to measure compensatory effects of different types of biodiversity (negative and positive).
- What are the impacts of agroforestry on productivity?
- Investigate instruments that exist and could be implemented to eradicate illegal tree felling on cocoa farms. Identify the economic importance of trees that could encourage farmers to keep them.
- What trees can be associated with cocoa?
- What fauna lives within cocoa landscapes, and what roles do they play?

c) New PhD Topics

On future topics for PhD research, the following topics were recommended:

- Detailed eco-physiological studies
- Synchrony between podding and flowering patterns.
- Functioning of soil biomass accumulation (litter)
- Pruning effect on cocoa canopy, light use efficiency, and canopy photosynthesis.

- Agroforestry + cocoa tree design: what is the optimum combination, percentage shade, and type of shade?
- Decision support tools to recommend adequate shade in an agroforestry cocoa-based system.
- Pruning effects on cocoa and shade trees to manage the light environment.
- Irrigation and ISFM: what can we do and how?
- Spatial irrigation (slope, rough land)
- Understand the timing of pruning.
- Investigate the minimum land size to achieve living income (LI) for different categories of farmers.

d) Future of Core and Satellite Trials

On the Core and Satellite Trials, the following topics were proposed for future studies:

Core Trials

- Explore new measurements in existing trials including
 - GHG emissions across the N response curve – plus nutrient interactions
 - Accurate measurements of % nutrient recovery values for N, P, and K to feed the offtake model
 - Determination of critical nutrient concentrations in leaves – and use of hand-held devices
 - Monitoring of nutrient returns in litter and removal in pods
 - Impacts on soil health – soil biology

Satellite Trials

- Explore new measurements in existing trials including
 - Identifying “positive deviants” – top 5% of locations – are they consistently better? Can we determine why?
 - Conducting spatial analysis to understand the effects of soil/climate
 - Adding a treatment at 50% of the current offtake model recommendation (T4)
- The following research areas were proposed for a new set of Satellite Trials
 - Rehabilitation of existing plantations – e.g., Nigeria/Cameroon – coppicing (but need to compensate the farmer)

- Impact of establishing trials under different degrees of shade (full sun vs. agroforestry)
 - Understand the benefits/ potential of inseting (carbon balances)
 - Exploring biochar – assess and test
- Develop new fertilizer blends to recommend for cocoa (this needs to be done by CNRA/CCC, CRIG/ COCOBOD, CRIN, and IRAD).

Meeting: Partnership for Delivery (P4D) Day

The Partnership for Delivery (P4D) Committees under the CocoaSoils Program have transitioned into Cocoa Platforms under the CocoaSoils Use Case in the Excellence in Agronomy (EiA) Initiative of CGIAR. The platforms, which comprise representatives from the cocoa regulating authorities and private sector companies, are mandated to support research activities, validate research results, and coordinate the dissemination of research recommendations to cocoa farmers. The platforms are aligned with the Program's new research priorities and partnership expectations and have renewed their roles to co-design and validate an innovative, demand-led agronomy solution christened "the STEPWISE APP".

The P4D meeting, held on 20 March 2024, presented an opportunity to consolidate the criteria for the validation of envisaged recommendations from the Core Trials (CTs) and Satellite Trials (STs) and partners' role in the co-design and scaling of Integrated Soil Fertility Management (ISFM) solutions.

One of the highlights of the meeting was the presentation by the Monitoring and Evaluation (MEL) Team on '[The impact of training in Integrated Soil Fertility Management on Farm Performance and Welfare of Cocoa Farmers](#)'. The study found evidence of cocoa yield increases of 21% - 24% among farmers trained by the project. In addition, farmers trained by the project experienced between 11% and 16% increase in income. A presentation on [Knowledge, perception, and willingness to pay for cocoa rehabilitation in Ghana](#) highlighted the extent of cocoa farmers' willingness to pay for the rehabilitation of their farms and drew discussions about the lack of funding mechanisms to support farmers to undertake rehabilitation and how stakeholders can address this gap. [A study on the constraints and effectiveness of service delivery toward achieving sustainable cocoa intensification in Cameroon](#) was also presented. It was concluded that providing bundles of services to farmers increases the chances of matching demand with supply and increases satisfaction, but the efficiency and effectiveness of the service delivery system are currently low due to poor service integration.

Panel Discussion

Representatives of government, research institutes, and private sector companies explored the avenues for involving stakeholders in co-developing, validating, and scaling ISFM solutions through the CocoaSoils STEPWISE App for improved cocoa production. Two main strategies were proposed: government/public sector engagement and private sector engagement.

a) Co-developing STEPWISE recommendations

Government engagement: The panel agreed that advocacy can play a critical role in gaining governments' attention. Precillia Tata Ngome Ijang said that government engagements must start

with devising an advocacy strategy to raise awareness of the project, gain governments' buy-in on the recommendations the project is developing, and identify funding options for scaling the technology.

Private sector: Kam-rigne Laossi of Olam Food Ingredient (Ofi), who represented the private sector on the panel, suggested that engagement with the private sector must begin with leveraging initial results from the Satellite Trials to pilot the STEPWISE App using the extension networks of the private companies. This, he advised, would provide learnings that can be used to accelerate the validation process and affirm partners' commitment to the project.

b) Scaling

There was consensus to leverage existing public and private extension networks to scale the recommendations and ensure they align with government, private sector, and global priorities, standards, and regulations.

c) Validation

Partners want the project to get governments' buy-in before deploying the recommendations by leveraging the relationship with National Research Institutes to get governments to accept CocoaSoils' work.

Group Discussions

Four working groups, organized by country (Cote d'Ivoire, Cameroon, Ghana, and Nigeria), discussed the membership of the Cocoa Platforms in each country, potential dissemination methods for the recommendations, and areas for future research.

a) Membership of P4D platforms

The participants put forward names of organisations to invite to the platforms in each of the four countries.

Ghana

- Private sector: Mondelez International, Tony's Open Chain, Kuapa Kooko, Olam Food Ingredients, Nestle, Solidaridad, Cargill, Barry Callebaut, Cocoa Farmers Association, Mars, APNI, Agro-Eco, Tony Chocology, IFDC, Global Haulage.
- Public sector: COCOBOD (CRIG, CHED), MoFA, Crops Research Institute, Forestry Commission, Parliamentary Select Committee on [Food, Agriculture and Cocoa Affairs](#), Certification Bodies, Rainforest Alliance, Fairtrade, Universities (Kwame Nkrumah University of Science and Technology, University of Ghana etc).

Nigeria

- Cocoa Farmers Association of Nigeria (CFAN), Cocoa Association of Nigeria (CAN), Cocoa and Plantain Farmers Association of Nigeria (CPFAN).

Cameroon

- Community radio and communication services providers (MTN, Orange, CAMTEL, etc.), and the Ministry of Telecommunication.
- Lean on the existing sustainable cocoa committee rather than creating a new committee.

Cote d' Ivoire

- Private sector: ANADER, Famstrong, Beyond Beans, Guan Chong Berhad (GCB) Cocoa, Touton.
- Public sector: Conseil Café Cacao (CCC), Ministry of Water and Forests.
- Not-for-profit: World Cocoa Foundation.

b) Dissemination channels for ISFM recommendations

On the channels the project can leverage to disseminate the ISFM recommendations, the following channels were recommended:

Ghana

- Combination of mobile Apps, extension agents, and community information systems/centres.

Nigeria

- Mobile applications, audio and visual aids (Radio and TV), digital tools.
- Training of trainers' workshops with public and private extension agents, and lead farmers. The state extension agents cascade the training to the zones, blocks, and villages in the states.

Information dissemination should not just focus on production, but also on the markets, inputs, sources, and prices.

Recommendations need to be converted into digital and audio/visual forms. Additional findings/innovations from satellite and core trials should be included in the manuals.

Cameroon

- Farmer field days, demonstration plots, decision support tools (mobile app, etc.), and voice and text messages.

Concerning the mobile application, there is a need to decide whether we are developing a new application or integrating our recommendations into applications already developed by partners, and clarify who will be the end users (farmers, extension agents). Additional layers of information could also be needed, for instance on weather, market, pests and diseases, anonymous feedback about tools, and the information provided.

Cote d'Ivoire

- Mobile applications, manuals (developed into flyers, audiovisuals), community media, and short videos.

c) Timeline for sending out the first set of recommendations

Ghana and Cote d'Ivoire teams proposed a schedule for dissemination of the first set of recommendations from the project:

Ghana

- In one year.

Cote d'Ivoire

- End of 2025

d) Research Needs

On improving the implementation of the Satellite and Core Trials and the work of the Cocoa Platforms, the groups suggested the following:

Ghana

- There is the need to investigate all the available methods and approaches to determine which are not working well in different areas and propose a clear system for monitoring and evaluation.

Cameroon

- In terms of gaps, we have to prepare a summary of the results we have obtained so far to share with people who engaged with us at the beginning so that they are aware of what we have done so far.
- In terms of timeline, the first action is to identify someone who will lead the process and reactivate the national cocoa platform.

Cote d'Ivoire

- Investigate the economic value of fertilizer use.
- Identify the forms in which fertilizer should be applied.

Visit to Core and Satellite Trials

The field trip was undertaken on Thursday, March 21, 2024. The objective was for participants of the Annual CocoaSoils Forum (R4D and P4D days) to appreciate the two sets of field trials (Satellite and Core trials) in Cote d'Ivoire.

a) Satellite trial trip

The group visited the farm at Lakota with an internal experimental code of SOCI 122 (Satellite trial, Cote d'Ivoire, farm number 122). The plantation was established in 2003-2004, and the economic production age was reached in 2006-2007. The satellite trials were started at this farm in the main season of 2020 in partnership with Cargill. The farm was chosen for this trip mainly because of its representativeness of a typical satellite trial farm in Cote d'Ivoire although accessibility was also a significant consideration.

The meeting started with the farmer introducing himself and outlining the activities and processes done at the farm since the activity began. He also outlined his major learnings, including shifting from the common "farmer practice" of no fertilizer application to applying fertilizer on most of his farms after observing the high productivity associated with fertilizer application in T3 and T4 plots. However, it was not clear what rate of fertilizer application the farmer has been using and how far or close to the rates in T3/T4 (a subject of immediate future follow-up and inquiry).

Observations – the field was very well managed, largely under open sun though a few shade trees are present. There were no weeds in the field – the influence of a combination of mulch cover and good management. The four plots (T1-T4) were demarcated using metal pegs and different colored ribbons, and easily distinguishable. The original 25 trees from which data was initially collected were marked using paint (due to the high costs of printed bar codes). Several trees were affected by cocoa stem borer across the field and not confined to a particular plot.

Timing – at the time of the visit, the peak harvesting season had been completed and only a few pods were observed on a few trees. Due to this, the plot (T1-T4) differences could not be observed.



(A) CocoaSoils Forum 2024 participants interacting with the farmer during a field visit to Lakota: 21 March 2024: (B) one of the few trees with ripe pods.

b) Core Trial Trip

We visited the Barry Callebaut managed core trial site at Tiassalé (COCI002 – Core Trial, Cote d'Ivoire, trial number 2). The core trial manager and R&D officer, Kouakou Serge Pacôme oversaw proceedings during the visit. He welcomed the visiting group and outlined the design and layout of plots at the site. The trial is located on gently sloping land previously used as a rubber plantation. The research facility has several trials ongoing, very much aligned with the broader CocoaSoils work including testing several agroforestry combinations that border the trial on one side and some rubber plantations on the other side. The Core trial was established in September 2020 and is mostly under irrigation. The individual treatment plots of 5 m x 5 m have 9 clonal (variety CI01&CI014) cocoa trees in the center (3 x 3) and a hybrid on the four outer borders (16), i.e., 16 hybrids and 9 clonal trees for a total of 25 trees in each plot. After this outline, participants moved around the plantation to observe the trees, most of them bearing cocoa pods.

Observations – The core trial is well managed, and plots/trees are generally uniform in terms of establishment and growth. The trial is irrigated using water from a surface reservoir located at the bottom of the slope, and there are no major challenges with the irrigation infrastructure. The efficiency of the irrigation system provides us with a benchmark of the minimum investments needed to support a successful core trial. Visual comparisons of plots/treatments were not possible due to the vigorous growth and tree architecture.



Photo: Mr. Kouadio Serge Pacome (right) of Barry Callebaut welcomes participants to the Core Trial site at Tiassalé.

Public Forum

The public forum, which was held on 22 March 2024, brought partners and other stakeholders together to reflect on the achievements of the project, share the experiences gained, reflect on the lessons, prioritize the challenges and opportunities, and plan towards greater effectiveness for the years ahead.

It was attended by 65 representatives from public sector organisations, private sector companies, research institutions, and universities. These included Cote d'Ivoire's Ministry of Agriculture and Rural Development, Conseil du Café-Cacao, and Fonds Interprofessionnel pour la Recherche et le Conseil Agricoles; Ghana's Cocoa Board; Nigeria's Federal Ministry of Agriculture and Rural Development; cocoa research institutes in Cote d'Ivoire, Cameroon, Ghana, and Nigeria; Nestle, Barry Callebaut, Cargill, Yara, and Olam Food Ingredient.

The welcome address was delivered on behalf of the General Manager of the Conseil du Café-Cacao (CCC) by Mr Coulibaly Wattani. He said that farmers' quest to increase their production is contributing to the loss of forest cover, which has intensified climate change's impact on cocoa production in Cote d'Ivoire. As a result, the CCC has developed a special interest in the work of CocoaSoils, particularly how the project's work on Integrated Soil Fertility Management can contribute to sustainable cocoa production and the protection of the country's forest cover.

"I would like to thank all the members of the CocoaSoils project and assure them of our support", he remarked.

Dr. Simeon Ehui, Director General of the International Institute of Tropical Agriculture (IITA) and Dr. Amani Michel Kouakou, Deputy General Manager of Centre National de Recherche Agronomique (CNRA), delivered the opening remarks.

In a speech delivered virtually, Dr. Simeon Ehui said Africa's cocoa farms are not living up to their potential and this has resulted in low earnings for farmers despite high market prices for cocoa. The collective future of stakeholders in the cocoa industry, he said, is under threat due to limited knowledge of proper tree management and nutrition. He explained that this ignorance does not only jeopardise livelihoods but endangers the environment. Addressing this challenge, he explained, requires a holistic approach that involves integrating Good Agriculture Practices with conservation efforts and synchronising long-term research needs with diverse and sometimes conflicting needs of various stakeholders within the agricultural landscape. *"This effort is crucial for providing evidence-based policy recommendations that can uplift farmers' income significantly. This is a goal that is integral to the mission of the International Institute of Tropical Agriculture. Through initiatives like the CocoaSoils program and with the support of partners, such as Rainforest Alliance, UTZ and the Cocoa*

Forest Initiative, and through the backing of environmental and forestry policies, we are beginning to see how advanced technologies and practices can revolutionise cocoa production. These efforts are aimed at making sustainable and climate-smart farming accessible and appealing to farmers and policymakers. The CocoaSoils program exemplifies this new direction”, he said

Dr. Amani Michel Kouakou, Deputy General Manager of the Centre National de Recherche Agronomique (CNRA), Cote d'Ivoire, said that a recent study carried out by the CNRA shows that the soils suitable for cocoa cultivation have decreased from 90% in 1971 to 68% in 2021. The theme of this Annual Forum, he said, was of crucial importance to Côte d'Ivoire and the CNRA and hopes that the results and recommendations resulting from the activities of CocoaSoils can be widely disseminated to producers and decision-makers for sustainable cocoa farming in Côte d'Ivoire.

In an opening address on behalf of Cote d'Ivoire's Minister of State of the Ministry of Agriculture and Rural Development, Professor Angui Pascal, Head of Production and Food Safety at the Ministry, said that despite its contribution to Cote d'Ivoire's economy, cocoa production threatens the country's ecosystem. This threat, he remarked, has prompted the Ministry to encourage farmers to adopt practices that safeguard the environment. He explained that considering climate change's impact on cocoa production, the government has been exploring avenues to implement sustainable agriculture across the country through the promotion of agroforestry. To achieve this, the Ministry has been working with the Food and Agriculture Organisation to develop a national strategy for agroforestry. Speaking on the forum's relevance, he said he was happy to see that international research institutes and global stakeholders had converged in Abidjan to brainstorm on how to achieve sustainable cocoa production. *“The theme for the CocoaSoils Forum being sustainable production of cocoa through the promotion of soil fertility justifies the actions we have undertaken to promote sustainable production of cocoa. We believe that the discussions that will happen here among scientists will lead to recommendations on the best practices for cocoa production”, he said.*

In [a presentation](#) on the achievements and key learnings from the implementation of CocoaSoils, Dr. Leonard Rusinamhodzi shed light on the trial designs, offtake model, stepwise concept achievements, and key learnings. He explained that the primary goal of the CocoaSoils project is to increase yield by 25% among 90,000 farmers. Preliminary results from the Satellite Trials, according to Dr. Rusinamhodzi, support the effectiveness of the stepwise approach. He highlighted the importance of pruning and its effect on productivity, and the need for proper training of farmers and technicians for this activity. His presentation also covered data collection, storage, and analysis. He assured partners that they could access data on the data portal for their respective purposes. He encouraged participants to visit the CocoaSoils website to access knowledge products, including reports, manuals

for training and capacity building. He reiterated that the project has achieved some positive results with the offtake model fertilizer treatment.

The second half of the forum featured a panel discussion, a game, and group discussions.

Panel Discussion

Moderator: Ken Giller

Members: Laossi Kam-Rigne (OFI), Moses Ogunlade (CRIN), Amos Quaye (CRIG), Alain Kotaix (CNRA), Kouakou Serge Pacôme (Barry Callebaut), Tata Ngome Precillia Ijang (IRAD). Experts on the panel reflected on achievements, key learnings, and knowledge gaps that are yet to be addressed.

The main outputs of this discussion were suggestions on areas for further research and improving the project in general:

a) *Translate information emerging from CocoaSoils into actions for farmers*

- a. Extend the project to other regions where current activities are not in place.
- b. Continually update the manuals
- c. Consider how information from CocoaSoils can be incorporated into existing apps
- d. Consider bundling information and the forms these bundles should take

b) *Further research in existing Core Trials*

On future research topics, the panel recommended the following:

- e. Soil health (pH, soil organic matter)
- f. Investigate the residual effects of P and K due to long-term application of different treatments
- g. Calculate fertilizer/nutrient recovery rates
- h. Calculate nutrient removal/ opportunity for recycling of cocoa pods – contribution to nutrient balances
- i. Measure greenhouse gas emissions (GHG), and derive total carbon footprints
- j. Consider a treatment with a 50% rate of the off-take model recommendation in the Satellite Trials
- k. Investigate the feasibility and use of organic resources/approaches including composts and biochar
- l. Identify methods for re-use of cocoa pod husks/prunings
- m. Explore the use of legume cover crops in cocoa (e.g. *Pueraria*, *Centrosema*, *Arachis pintoii*)
- n. Explore the use of other plants in landscape elements for pest control (e.g., push-pull impacts of different species?)

- o. Explore targeted country/region-based approaches in renovation and rehabilitation

The panel discussion was followed by a working group session and a cocoa game activity.

Working Group Session

The aim of this session was to develop theories of change toward a more sustainable cocoa sector by identifying challenges, opportunities, and research gaps that CocoaSoils could potentially address. The discussions focused on three areas: rehabilitation and innovation, trial data, and climate change.

a) Renovation and Rehabilitation (R&R)

On renovation and rehabilitation, it was suggested to address the following research gaps:

1. Develop a rapid assessment tool for cocoa plantation status
 - a. e.g., age of trees, disease incidence, tree density
 - b. Link to a decision tree – to decide what approach under what circumstances.
2. Check existing databases and surveys to identify the location of old and moribund plantations that need R&R.
3. Identify the best alternative crops for resting soil and (maybe) reducing swollen shoot disease.
4. Explore intercropping options of temporary shade with plantain, cassava, or other food crops.
5. Develop demonstration farms using GAPs in areas where renovation is needed to encourage farmers to do renovation well (best variety, best management – including best ISFM strategy)

b) Trial data - future measurements in core and satellite trials

The group put forward the following suggestions for improving the two CocoaSoils trials:

- Develop a feasible protocol for sampling cocoa leaves for reliable nutrient analysis and assessment of the nutrient status of the trees. Relate the nutrient status to bean yields and total tree biomass.
- Develop a feasible protocol to estimate leaf area per tree and leaf area index.
- Monitor pod set and development from cherelle to mature pod. Quantify cherelle wilt and pod losses from flowering to maturity.
- Determine which parts of the tree [stem, main branches, other (smaller) branches] contribute to the total bean yield. Are pod losses different between these parts?
- Assess the role of the plantain in nutrient cycling – this topic is specifically for Cote d'Ivoire since the plantain is still present and producing (export with bunches, turn over with rotting plantain biomass).
- Monitor soil properties: Soil chemistry should be determined after 5 years of cocoa growth. Soil health should be monitored to assess if fertilizer application causes differences in soil

health parameters and specifically if it affects macro- and meso-fauna (ecosystem engineers such as earthworms, termites, ants, and any soil-dwelling and moving species).

- Intensify the monitoring of pests and diseases – the current problems with stem borers call for measures to combat them, yet little is known about the species attacking cocoa. Here entomologists should be invited to conduct research or advise CocoaSoils on methodologies to monitor insect pests. Such results would be related to bean yields and fertilizer application.
- Examine cocoa bean quality: the core trials provide perfect conditions to assess the effect of fertilizer application on bean quality and potential contaminant content.
- Assess the effects of fertilizer application on GHG emissions and their spatial and temporal distribution.
- Assess the internal resource allocation of cocoa trees and how it is affected by fertilizer application. Where are assimilates sent to within the tree at different nutrient supply levels and different nutrient compositions?
- Add new plots in the Satellite trials to test a lower rate in T4. The reason is the fact that in three of four countries, there is no N in the national fertilizer recommendation, and thus a reduced T4 rate such as 1/3, 2/3, or 1/2 could have effects as strong as the national recommendation due to a better nutrient balance. Currently this option would also be more affordable to farmers.

c) Climate Change: Climate change adaptation and mitigation - the role CocoaSoils can play.

What are the current efforts of the project?

- Promoting sustainable intensification practices among farmers
- Agroforestry

Other efforts that could be taken

- Investigate how farmers are currently adapting to climate change.
- Study the impact of climate change across different regions and region-specific responses to climate change.
- Explore how production areas are shifting and how these shifts conflict with forests and croplands
- Investigate how climate change impact yield and the production cycle e.g., changes in harvest period due to climate changes?
- Identify the dynamics of pest and disease incidences associated with changes in climate and what integrated pest management options could be used.
- Study interactions between fertilization and response to pest pressures

- Identify cocoa varieties that could be used for climate change adaptation e.g., drought- and disease-resistant varieties. CocoaSoils could partner with institutions working on such aspects.
- Understand how current cocoa varieties respond to nutrient application.
- Examine the practicalities of the recommendations to deal with climate change. E.g., where will it be cost-effective and beneficial to implement irrigation?
- Explore the potential of collective action towards climate change, including what farmers' associations are doing together to adapt to climate change?
- Explore how climate change impacts cocoa bean quality. For instance, how do changes in the production cycle due to climate change affect bean quality and flavor? Also, how do changes in post-harvest practices, e.g., bean drying period, due to climate change impact bean quality?
- What current climate change policies exist in the various countries and how do these affect cocoa?
- Identify and collaborate with other institutions, e.g., the West African Science Service Centre on Climate Change and Adapted Land Use (WASCAL), which works on climate change issues related to crop production.

Cocoa game: How stakeholder interactions and interventions in the cocoa supply chain impact the social, economic, and environmental dynamics on the ground, and (ii) reflect and discuss alternative solutions.

The cocoa game 'CamPod' was facilitated by LEAF Inspiring Change and Wageningen University & Research (WUR). CamPod is a strategic game designed to address sustainability in the Cocoa Supply Chain and explore the impacts of new regulations in production countries. The game was developed with stakeholders and researchers from Cameroon, the Netherlands, and Switzerland as part of the TradeHub project. At the CocoaSoils Forum, the game session drew participants from diverse backgrounds, including regulatory institutions, academia, government officials, and the private sector.

CamPod represents the Cocoa Supply Chain in Cameroon. Participants assumed various roles of key stakeholders, ranging from small to larger-scale cocoa producers from whom the local cooperative and a middleman "Coaxer" buy cocoa to buyers who buy the cocoa from the local cooperative and middlemen and export to international and European markets. Players' mission was to run their respective "businesses," managing operational and living costs over multiple years. Indicators such as remaining tree and forest cover, cocoa plantation density levels, school attendance rate, and volumes of exported cocoa over time were tracked to display the environmental, economic, and social impact of players' decision-making. Read a report on the game [here](#).

Closing Remarks by Dr. Bernard Vanlauwe

Dr. Vanlauwe thanked the participants, especially the key members of the organizing team for their contributions that made the Forum a success. He shared his vision for a vibrant CocoaSoils Use Case that will further contribute effectively to the cocoa sector through continued research and innovation delivery on pertinent challenges and opportunities, in collaboration with key stakeholders.

Dr. Vanlauwe expressed his delight at the contributions of young scientists who recently graduated from various universities following their postgraduate studies on cocoa with support from CocoaSoils. He explained that the funding mechanism for the CocoaSoils Use Case may be influenced by the CGIAR's changing structure, but he would work hard, supported by project members, to secure the needed resources for the Use Case's ongoing and future work. CocoaSoils will be part of a new and larger program of the CGIAR, which will house the Excellence in Agronomy (EiA) Initiative and a few others. Dr. Vanlauwe wished all participants well in taking on the tasks ahead in the interest of the cocoa sector.



Group Photo: Participants at the public forum held on March 22 in Abidjan.

Media coverage of the public forum on 22nd March

1. <https://www.youtube.com/watch?v=1BufyFe4ZyE> (15:40 – 17:22)
2. Solutions intégrées de gestion de la fertilité des sols dans le secteur du cacao: une centaine d'acteurs du secteur du cacao en réflexion à Abidjan : <https://news.abidjan.net/articles/729877/solutions-integrees-de-gestion-de-la-fertilite-des-sols-dans-le-secteur-du-cacao-une-centaine-dacteur-du-secteur-du-cacao-en-reflexion-a-abidjan>
3. Côte d'Ivoire-AIP/Forum cocoaSoils : Des experts planchent sur les nouveaux défis de l'industrie cacaoyère à Abidjan: <https://www.aip.ci/44419/cote-divoire-aip-forum-cocoasoils-des-experts-planchent-sur-les-nouveaux-defis-de-lindustrie-cacaoyere-a-abidjan/>

Annex 1: Program: Annual CocoaSoils Forum 2024, Abidjan, Cote d'Ivoire

Tuesday, 19 March 2024: Research-for-Development (R4D) Day

Venue: Silvermoon Hotel

Theme: The Future of Cocoa: Deep Learning and Facing Up to A Changing Landscape

A changing landscape (conditions/demands):

- Climate change, crashes in production and soaring prices
- Net zero carbon production systems
- Profitable and stable yields
- Regenerative agriculture and soil health
- Deforestation and the EU regulation
- Increased biodiversity and ecosystem services
- No child labour
- Gender equality

There is a need to design and implement crop production systems that enable adaptation to climate change, mitigation of greenhouse gas emissions, and improvement in long-term sustainability. During the R4D day, we will showcase field trial results and discuss how the work of CocoaSoils can contribute towards enhanced productivity, profitability, soil health, biodiversity, resilience, and reduced deforestation in cocoa systems. Novel findings from PhD student theses related to these issues will also be presented.

Meeting objectives:

- To show progress towards new fertilizer recommendations, and decision support systems on best agronomic practices for cocoa
- To chart the future research direction for Satellite Trials and new measurements in Core Trials

Content

1. To show progress towards new fertilizer recommendations, and decision support systems on the best agronomic practices for cocoa
 - Updates on progress with **multi-nutrient, multi-locational trials** (Core Trials)
 - Key conclusions from **First Generation** Satellite Trials
 - Updates on building the field experiment database – access for stakeholders
 - Updates on spatial analysis on deforestation, biodiversity, and ecosystem services
2. To chart the future research direction for Satellite Trials and new measurements in Core Trials
 - Brainstorming in groups, identification of research gaps with high potential to bring about major improvements in cocoa sustainability and productivity.
 - Country teams / Theme – develop country-specific plans to address the most important research gaps
 - Facing up to the future

Program – Science Committee Meeting

When	What	Who
09:00 – 09:10	<i>Welcome and Introductions</i>	Ken Giller (WUR), Bernard Vanlauwe (IITA), Robert Asiedu (IITA)
09:10 – 09:30	Deriving fertilizer recommendations for cocoa: an offtake model approach <ul style="list-style-type: none"> An outline of the conceptual basis and assumptions 	Ekatherina Vasquez (WUR) , Stefan Hauser (IITA), Leonard Rusinamhodzi (IITA)
09:30 – 09:50	Multi-nutrient, multi-locational trials – (Core Trials): preliminary results and general progress towards new recommendations	Stefan Hauser (IITA) , Ekatherina Vasquez (WUR), Leonard Rusinamhodzi (IITA)
09:50 - 10:10	First Generation Satellite Trials - preliminary results and key lessons [proof of stepwise approach]	Leonard Rusinamhodzi (IITA) , Stefan Hauser (IITA), Ekatherina Vasquez (WUR)
10:10 - 10:40	The Science of Pruning - is there a science or is it just an art?	Ambra Tosto (WUR)
10:40 - 10:50	Cocoa Break	
11:50 – 11:10	Biodiversity in cocoa plantations	Calum Maney, Marieke Sassen (UNEP-WCMC)
11:10 – 11:20	Deforestation - and the new EU rules	Marieke Sassen (UNEP-WCMC) , Eric Rahn (CIAT),
11:20 – 11:40	Data management in CocoaSoils – ontology and links to EIA data	Arun Pratihast (WUR) , Sander Janssen (WUR), Ekatherina Vasquez (WUR)
11:40 – 12:00	The effect of fertilizer application on soil biodiversity in cocoa	KOFFI Kouakou Stanislas (PhD Student - DIVO)
12:00 – 12:20	Genotypic differences in water deficit effects on leaf and crown traits in mature field-grown cocoa	Lucette Adet (WUR)
12:20 – 12:40	Deforestation-free cocoa in a changing climate: could production meet demand by 2060	Paulina Ansa Asante (Senckenberg Biodiversity and Climate Research Centre Frankfurt (SBiK-F))
13:00 – 14:00	Cocoa Energy Bar	
14:00 – 14:20	Climatic explanations for main season cocoa production anomalies in Cote d'Ivoire	Matthew Jones (WUR)
14:20 – 15:30	Group Discussions - Working groups to identify future research priorities focusing on: <ol style="list-style-type: none"> Future of Core and Satellite Trials Data and analytics Biodiversity and deforestation (new EU rules, etc.) 	Robert Asiedu (IITA), Marieke Sassen (WUR), Ken Giller (WUR), Stefan Hauser (IITA), Leonard Rusinamhodzi (IITA), Richard Asare (IITA)

	<i>4.New PhD research topics</i>	
15:30 – 16:00	<i>Group presentations</i>	Robert Asiedu (IITA), Ken Giller (WUR)
16:00 – 16:30	Cocoa Break	
16:30 – 17:00	<i>Summary, way forward and closure</i>	Ken Giller (WUR)/ Bernard Vanlauwe (IITA)

Wednesday, 20 March 2024: Partnership-for-Delivery (P4D) Day

Venue: Silvermoon Hotel

Theme: Fostering a stronger cocoa network for evidence-based agronomic solutions on productivity gains and environmental integrity

Introduction

The Partnership for Delivery (P4D) Committees under the CocoaSoils Program have transitioned into Cocoa Platforms under the CocoaSoils Use Case in the Excellence in Agronomy (EiA) Initiative of CGIAR. The platforms, which comprise representatives from the cocoa regulating authorities and private sector companies, are mandated to support research activities, validate research results, and coordinate the dissemination of research recommendations to cocoa farmers.

The platforms are aligned with the Program’s new research priorities and partnership expectations and have renewed their roles to co-design and validate an innovative, demand-led agronomy solution christened “the STEPWISE APP”. The forum will present an opportunity to consolidate the criteria for the validation of envisaged recommendations from the Core Trials (CTs) and Satellite Trials (STs) and partners’ contributions to scaling activities.

Objective

Improve cooperation on co-designing tools to increase adoption of research recommendations by farmers.

Expectations

- Consolidate the unique role of the platforms as intermediaries for turning access to data from research trials into recommendations for farmer usage
- Improved partners’ commitment to scaling activities, through the platforms’ advisory role on scaling. This includes both public and private sector partners.
- Pathway for co-development of agronomic solutions and improved dissemination of research recommendations

Program

When	What	Who
09:00 – 09:30	Welcome and Introductions	Robert Asiedu (IITA), Richard Asare (IITA)
09:30 – 10:15	Presentation: Impact of training in Integrated Soil Fertility Management (ISFM) on farm performance and welfare of cocoa farmers <i>Q&A and Discussion</i>	Rich Kofituo , Theresa Ampadu Boakye, and Richard Asare (IITA), Adolphe Mahyao (CNRA), Kayode Oluyole (CRIN), Tata Ngome Precillia Ijang (IRAD), and Frederick Amon-Armah (CRIG)
12:40 – 13:00	Achieving sustainable cocoa intensification in Cameroon: Current constraints and effectiveness of service delivery	Urcil Papito Kenfack Essougong (IITA)
10:15 – 10:45	Cocoa break	
10:45 – 12:15	Panel Discussion: Co-developing and disseminating agronomic solutions for improved cocoa production - roles of research and development partners	Moderator: Richard Asare (IITA) Panelists: Tata Ngome Precillia Ijang (IRAD), Kam-Rigne Laossi (OFI), Eric Bani (CHED), Lordbanjou Deola-Tayo (FMARD)
12:15 – 12:40	Presentation: Knowledge, perception, and willingness to pay for cocoa rehabilitation in Ghana – leveraging CGIAR’s Regional Initiative for planning. <i>Q&A and Discussion</i>	Richard Asare (IITA)
13:00 - 14:00	Cocoa Energy Bar	
14:00 – 15:30	Group Discussions: Functions of the Cocoa Platforms in the co-development of extension tools, including the STEPWISE APP	Facilitators: Leonard Rusinamhodzi/Richard Asare (IITA) Ghana team: Rich Kofituo (IITA) Nigeria team: Kayode Oluyole (CRIN) Cameroon team: Tata Ngome Precillia Ijang (IRAD) Côte d’Ivoire team: Adolphe Mahyao (CNRA)
15:30 – 15:45	Cocoa Break	
15:45 – 16:30	Group presentations	Richard Asare (IITA)
16:30 – 17:00	Summary, way forward and closure	Robert Asiedu (IITA), Richard Asare (IITA)

Thursday, 21 March 2024: Visit to Core and Satellite trials (field trip)

Main facilitator: Dr. Kotaix Acka Jacques Alain

Program

When	What	Who
06:00 - 06:30	Depart from Hotel	All
06:30 – 09:30	Trip to Satellite Trials at Lakota	Gnankou Amelie (ICRAF)
09:30 – 10:45	Interactions in the field at Lakota	Bamba Sahi/ Kouamé Daniel/ Kotaix Acka Jacques Alain
10:45 – 12:00	Travel to Core Trial (CT) site at Tiassale	Gnankou Amelie (ICRAF)
12:00 – 14:00	Interactions at the CT site and visits to tree nurseries and other programs of Barry Callebaut	Kouadio Serge Pacome Kouakou/ Aka Romain Aka (Barry Callebaut)
14:00 – 15:00	Lunch at Tiassale	All
15:00 – 18:00	Travel back to hotel in Abidjan	All

Friday, 22 March 2024: Forum Day

Venue: Movenpick Hotel

Theme: Public-private partnerships for delivering integrated soil fertility management solutions in the cocoa sector

The CocoaSoils Program has continued to generate integrated soil fertility management recommendations for dissemination to cocoa farmers through private-public partnerships since the project's inception in 2018. The major annual meeting of CocoaSoils partners and other stakeholders in the cocoa sector, the Forum, has been held three times – in Ghana, Cameroon, and Nigeria. Holding this year's Forum in Cote d'Ivoire is an excellent opportunity for the partners and key stakeholders to reflect on the achievements made so far, share the experiences gained, reflect on the lessons, prioritize the challenges and opportunities, and plan towards even stronger partnership and greater effectiveness for the years ahead.

Program

When	What	Who
10.00 – 10:50 Welcome and Opening		
	Chairman's remarks	Chairman
	Welcome address	Director General of CCC
	Remarks by IITA	Director General of IITA
	Remarks by CNRA	Director General of CNRA
	Remarks by FIRCA	Executive Director of FIRCA
	Opening address by the Ministry of Agriculture and Rural Development	The Honorable Minister of State
10.50 – 11:20 CocoaSoils so far		
30 min	CocoaSoils – achievements and key learnings	Richard Asare/Leonard Rusinamhodzi/Ken Giller
11.20 – 11:45 Cocoa break and group photo		
11.45 – 12:30 CocoaSoils - reflection on key learnings		
45 min	Expert panel reflections on achievements and key learnings; and what knowledge gaps are yet to be addressed	Moderator: Ken Giller (WUR) Panel: Laossi Kam-Rigne (OFI) Serge (Barry Calibaut), Moses Ogunlade (CRIN), Amos Quaye (CRIG), Alain Kotaix (CNRA), Tata Ngome Precillia Ijang (IRAD) Ken
12.30 – 13:30 Lunch break		
13.30 – 16:15 Cocoa Game and Working Groups [parallel sessions]		
A Serious Cocoa Game		
165 min	Participants will (i) experience how stakeholder interactions and interventions in the cocoa supply chain impact the social, economic, and environmental dynamics on the ground, and (ii) reflect and discuss alternative solutions.	Marieke Sassen (WUR) and Celine Dillmann
Working Groups		
165 min	Building on Key Learnings	Facilitators

	Developing theories of change towards a more sustainable cocoa sector: identifying challenges, opportunities, and research gaps to be potentially addressed by CocoaSoils.	Rehabilitation and renovation – Ken Trial data – Stefan Hauser Climate change – Paulina Asante
16.15 – 17:00 Discussion (of game debriefing and outputs from the groups) and closing		
35 min	Plenary discussion	
10 min	Closing remarks	Bernard Vanlauwe (IITA)
17.00 – 19:00 Cocktail reception		

Annex 2: View lists of participants [here](#).

Annex 3: View photos [here](#)