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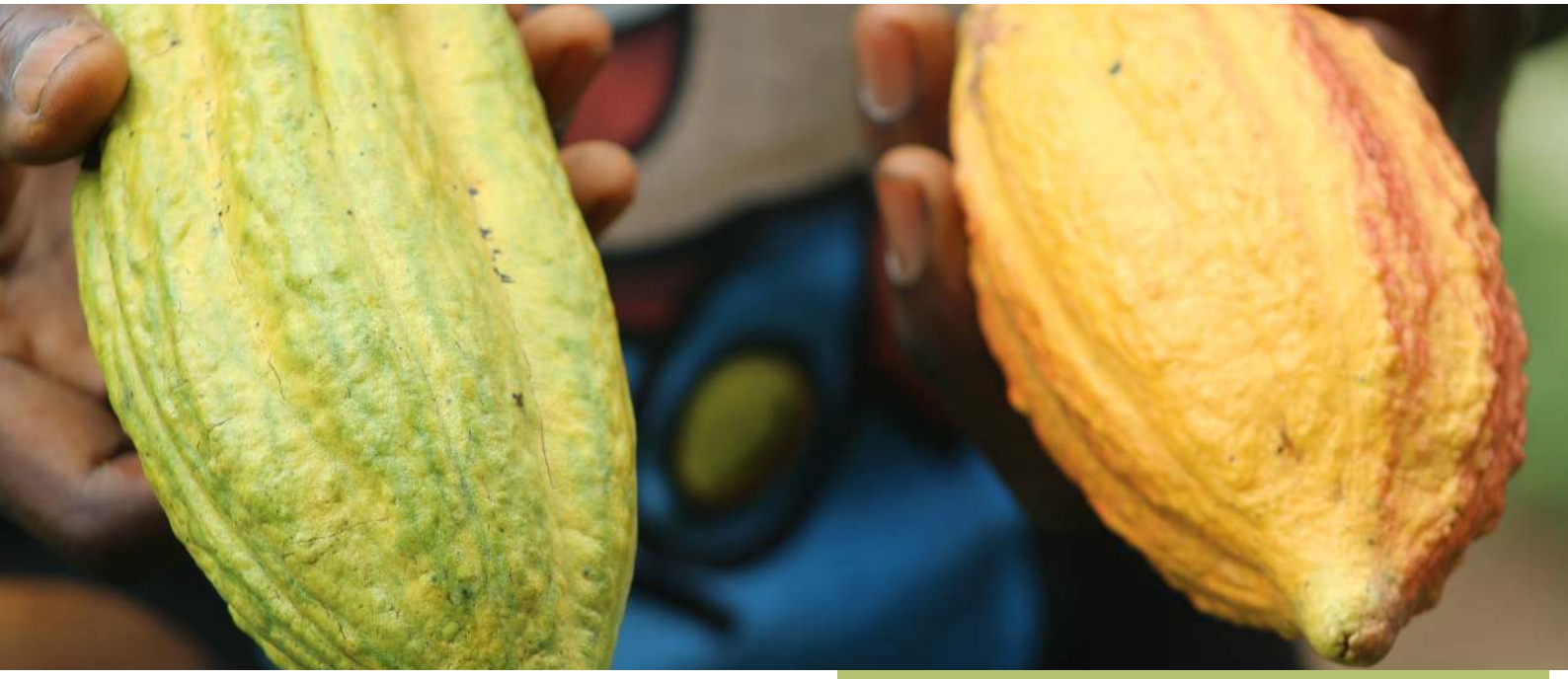
COCOASOILS GAZETTE



The CocoaSoils Program is a public-private consortium led by the International Institute of Tropical Agriculture and Wageningen University and Research. The Sustainable Trade Initiative (IDH) provides a convening role to bring partners together in an environment where they can share knowledge and ideas in the 'pre-competitive' space.
CocoaSoils has been created to address the issue of decline in productivity in cocoa and improve the livelihoods of farmers, while avoiding deforestation. The program has two main arms: Research for Development (R4D) and Partnership for Delivery (P4D). The R4D focuses on generating new knowledge on best management practices for cocoa production including long-term trials on mineral nutrition across the tropics, while the P4D focuses on translating current knowledge into guidance that can be used through existing dissemination channels in order to empower farmers and improve their livelihoods. This edition of the CocoaSoils Gazette spells out the P4D agenda of the program.

COCOASOILS PARTNERSHIP FOR DELIVERY (P4D) AGENDA

The CocoaSoils Program supports the move toward the greater involvement of multiple partners (i.e. government extension systems, the private sector, NGOs, farmer organizations and community-based extension workers) in cocoa service provision to reach 90,000 smallholder cocoa farmers directly and another 180,000 indirectly.
The P4D component of the program combines state of the art scientific research with the latest extension delivery innovations to develop training manuals for dissemination of locally appropriate knowledge to address the challenging issue of soil fertility management for cocoa and other management practices.

OVERVIEW:

Activities will focus on capacity development and training of trainers based on the program's "Stepwise Approach". This approach works on the continuous improvement of tools such as Farmer Field Schools, Farmer Learning Groups and Video Viewing Clubs.
The cocoa private sector delivery channel will serve as the main entry door, as it is envisaged that they will be in charge of the field dissemination of the validated ISFM packages.

Under this framework, a steering committee would be set up in each country to oversee the planning of the partnerships and carrying out the strategic vision of the P4D at country level. It is

anticipated that within the technical extension working group operating under the country Public and Private Platforms (PPP), the P4D committee will comprise the following:

- Facilitating organizations that represent public-sector interests and could lead in the cocoa ISFM policy advice.
- A private-sector entity that is in the need of cocoa ISFM innovation and is ready to contribute to the partnership.
- A knowledge and technology provider, which may be an academic or research institution that is public, private or mixed.

The institutional framework for the P4D at country level will be the existing cocoa PPPs which are well established in Côte d'Ivoire and Ghana and to a lesser extent in Cameroon. In these countries for instance, the dedicated working group in charge of cocoa extension under the PPP will provide the necessary support for testing, scaling and institutionalization through policy dialogue of the expected cocoa ISFM findings. In Nigeria, the framework will be set around a public facilitating organization, which is the Cocoa Research Institute of Nigeria.

The key initial step for the P4D agenda will be a compilation of the existing knowledge and dissemination channels used to communicate Cocoa ISFM at country level. A cocoa ISFM curriculum development workshop will be organized as a next step of a Training of trainer workshop.
This baseline training knowledge will be updated progressively as the Core and Satellite trials of the R4D component generate new findings. The P4D in-country committee will then assess the impact of different delivery models and provide timely state of the art quality control for both the ISFM content and dissemination channels.

Contribution by: Dr. Njankoua Wandji DND
d.njankoua@cgiar.org

Biodiversity & Ecosystem Services in CocoaSoils

Reduced productivity, population growth and ever-changing climatic conditions are driving farmers to seek new lands for farming, at the expense of the remaining forests, biodiversity and the ecosystem services they support. Climate change threatens future cocoa production due to increasing temperatures and variability in rainfall. However, climate smart cocoa production can help enhance cocoa farm productivity while adapting to changing climatic conditions and support forest conservation. Under the CocoaSoils program, the UN Environment World Conservation Monitoring Centre (UNEP-WCMC) seeks to inform sustainable intensification policy and planning by assessing and mapping the risk to biodiversity and ecosystem services due to (potential) cocoa expansion in the selected regions across West Africa, now and in the future. The program also explores the potential for sustainable cocoa systems (such as climate smart cocoa) to mitigate negative impacts and support biodiversity and ecosystem services at different scales. Data is currently being collected to map and identify the areas across the cocoa belt that are most important for biodiversity and ecosystem services.
In a later stage of the program, there will be an assessment of the potential implications of up-scaling climate smart approaches, including their potential to help mitigate negative impacts and help provide co-benefits for biodiversity and ecosystem services. This work will be undertaken in collaboration with the International Centre for Tropical Agriculture (CIAT).
Finally, an approach identifying ecosystem functions and processes that are important at the local level to support local landscape level planning will be developed and tested.

Contribution by: Marieke Sassen
marieke.sassen@unep-wcmc.org

Deforestation Monitoring – *A tool to help traceability for deforestation free cocoa sourcing*

The drivers of deforestation in the cocoa producing landscapes of West Africa, Indonesia and Latin America are diverse and complex. Usually this sort of complex problem requires multi-stakeholder negotiations which can take up a lot of time, and it is impossible to find a single solution. However, the longer we wait in taking action, the less forest will be left. One immediate effort that can contribute in lowering the pressure on forests and also help chocolate companies to meet their sustainability goals is by guaranteeing that the cocoa is sourced from deforestation free farms. While setting up a 100% traceable supply chain is in itself a huge challenge, tools are needed to provide an objective assessment that the farms where the cocoa is sourced from, is indeed deforestation free. Chocolate companies are not the only ones faced with the challenge of minimizing its impact on deforestation, research projects, such as the CocoaSoils Program, aiming for sustainable intensification, must show that they are not promoting deforestation themselves but rather contribute to halting it.

Therefore, within the CocoaSoils Program, the International Centre for Tropical Agriculture (CIAT) is setting up a monitoring, evaluation and learning platform to assess deforestation in near real time over the cocoa growing areas of West Africa. This provides the required information on spatially explicit changes in either forest loss or forest gain (e.g. reforestation efforts). Hotspots of deforestation can be identified, monitored and analysed with greater detail. High resolution Sentinel satellite imagery allows to closely monitor land-use change occurring around the CocoaSoils trial sites at 10 meter resolution. Representative non-CocoaSoils related cocoa growing sites chosen randomly serve as a control to judge the effect of the CocoaSoils Program's activities on deforestation. This will allow an objective evaluation of (un)expected deforestation dynamics due to cocoa farming in general and in relation to the project activities in particular, providing options for response. This same approach can potentially be taken up by the chocolate companies in aiding their decision making towards deforestation free cocoa sourcing and even by providing evidence for forest benefiting activities related to their projects on the ground. This tool is timely in providing actionable ways to respond to the Cocoa & Forests Initiative Framework for Action.
Another activity for evaluating the success of the CocoaSoils Program's efforts to promote sustainable intensification is achieved by mapping cocoa areas. This provides the means to quantify whether the area of cocoa potentially decreases

simultaneously with increasing cocoa yields. This is achieved by training a neural network algorithm using 40 satellite derived indices. The first results have been collected in Indonesia and are very promising. This mapping will be further tested in West Africa.

Contribution by: Eric Rahn
e.rahn@cgiar.org

Cocoa WEPAL samples and quality control

Leaf sampling is an important tool for detecting nutrient deficiencies and for providing fertilizer recommendations, but it only works when there is quantitative data available on the relationships between tissue nutrient concentrations and yield. Unraveling these relationships for cocoa is a key objective of the CocoaSoils Core Trials. To achieve this objective, good-quality analysis of a large number of tissue samples will be required.

The Wageningen based organization WEPAL (Wageningen Evaluating Programs for Analytical Laboratories) has over 50 years of experience in testing the quality of laboratories that analyse plant, soil, sediment and organic waste samples. Every three months, over 500 laboratories from all around the world assess the accuracy of their analysis by testing several of the wide variety of WEPAL reference samples that are available. With the help of colleagues from Mondelez we arranged with WEPAL to prepare a new cocoa leaf standard. This involved importing 10 kg of cocoa leaves from Ghana which were milled and mixed thoroughly according to the well-established WEPAL procedures. Recently, reference material IPE 241 (Cacao) was tested by the WEPAL community, and from the remaining material we have received 50 samples of 20 grams each, to be used for quality control within the CocoaSoils Program.

WEPAL Cocoa leaf reference sample IPE 241.

Leaf sampling is an important tool for detecting nutrient deficiencies and for providing fertilizer recommendations, but the quality control will be two-fold. Firstly, all laboratories carrying out analysis for the CocoaSoils Program will be expected to be, or to become, WEPAL participants. Secondly, the WEPAL reference samples will be distributed among the Core trial managers, to be included in each round of laboratory analysis. The results from the analysis of the WEPAL reference samples will provide information about the reliability of the analysis of the other samples. If the results are very divergent, this may be a reason to re-do (part of) the analysis.
A protocol for tissue sample analysis and quality assurance will be made available in the Protocol repository of CocoaSoils.

Contribution by: Lotte Woittiez, Nick Cryer
lotte.woittiez@wur.nl, nicholas.cryer@mdlz.com

Bridging two cocoa initiatives - *CocoaSoils and CCAFS's Climate Smart Cocoa*

Climate change is constantly increasing pressure on cocoa productivity, and the effects are evident. To curb the situation, Climate smart agricultural (CSA) practices are being promoted to help farmers cope with climate change. Research has shown that the impact of climate change will not be equal in all cocoa growing areas in the world.
Climate Change Agriculture and Food Security (CCAFS) program of the Consultative Group on International Agricultural Research (CGIAR) has a scaling project on climate smart value chains. This program trains cocoa farmers on coping strategies in such a way that site-specific information are taken into consideration. In order to do so, CCAFS has developed current and future suitability maps for cocoa in West Africa. In collaboration with Rainforest Alliance, Root Capital, Sustainable Food Lab, IITA, CIAT and cocoa companies, a climate smart cocoa manual has been developed for the adaptation needs of different cocoa growing areas together with World Cocoa Foundation (WCF). Next to site-specific information, this program also takes into consideration farmer specific information as the capacity of farmers to adopt climate smart technologies and strategies varies widely.

The carefully tailored STEPWISE practices are designed according to cocoa farming zones (Transform, Adjust and Cope) and responds to the climate hazards in these zones. The Stepwise practices are CSA training packages which focus on a prioritization of climate smart cocoa (CSC) practices according to the changing climate in the three climate impact zones in Ghana.
Engagement with the cocoa sector partners on climate smart agriculture, shows that there is also a clear demand for better scientific support of management practices including shade, pruning regimes and fertilizer recommendations. This is because, in addition to climate variability and climate change, poor soil fertility has been identified as a major constraint to increased productivity of cocoa. Furthermore, sustainable intensification of cocoa production is often highlighted as an opportunity to conserve the last forest patches in the West African cocoa belt. This alone would have a large impact on climate change mitigation.
Most of the companies partnering under the CCAFS program are collaborators and partners on the CocoaSoils program as well.

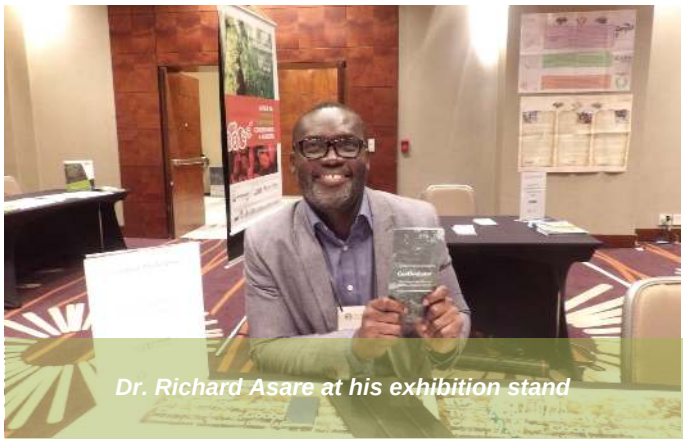
Contribution by: Mustapha Dalaa, Rich Kofi Kofituo
m.dalaa@cgiar.org r.kofituo@cgiar.org

The CanOvaLator outdoored at the WCF Partnership Meeting

The just ended partnership meeting of the World Cocoa Foundation under the theme “The New Frontiers of Cocoa Sustainability”, which took place at the Hilton Morumbi in São Paulo, Brazil from October 24-25, 2018 was a melting pot for networking of all major stakeholders in the cocoa sector across the globe.

As part of this two-day event, the Coordinator for the CocoaSoils Program, Dr. Richard Asare was invited as a panelist on “Pathways to Productivity” and to participate as a marketplace exhibitor, where he showcased his latest innovation, the “CanOvaLator” – The canopy cover calculator for cocoa growing systems.

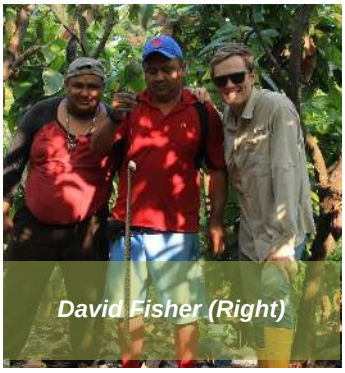
The CanOvaLator is an offline Mobile App that computes the amount of canopy cover provided by 28 different tree species per unit area for cocoa cultivation. This user-friendly tool is a transformed output of a research study by Asare and Ræbild (2016), which shows that the Crown Area of an individual species is dependent on the age of the tree manifested in the diameter at breast height (DBH).
The Mobile App allows a user to specify a farm size and the DBH of trees planted on the farm. The App then computes the crown area for each of the trees and finally computes the Percentage Canopy Cover provided by these trees with respect to the farm size.
Its target user group includes extension officers, researchers, farmers and other service delivery agents in cocoa farming.
Click here to download brochure.



Dr. Richard Asare at his exhibition stand

Tree biomass in intensively pruned systems in Ecuador - *MSc thesis David Fisher*

From January to October 2018, David Fisher (on the right) did his MSc thesis research on the biomass and nutrient distribution of cocoa trees in Ecuador, where he was hosted by the intensively managed and highly productive La Chola plantation. The trees in the plantation were regularly pruned (Figure 2) to a maximum height of 3 meters. For his research, David did destructive sampling of 15 trees (variety CCN51) divided over three age groups (1, 6, and 11 years old), and he took vegetative measurements on 21-year old trees. David observed that the biomass of the trees increased more or less linearly in the first 11 years and then started to plateau. Despite the pruning and the height control, he also found strong relationships between biomass and other tree parameters that are easier to measure, particularly the sum of stem basal area at 30 cm above ground level, after the jorquette. He derived the following allometric equation:



David Fisher (Right)

biomass = -0.392 + 0.11 x Sum of basal area

This equation fitted the data very well (R^2 adj = 0.89), and it was then used to predict the biomass of the 21-year-old trees (Figure 2). The total standing cocoa biomass per hectare was estimated to be between 30 and 35 tonnes per hectare in plantations of more than 11 years old.
David also looked at the distribution of biomass over the different plant components (Figure 3, left). If we compare the results with the data from Fabian (previous newsletter and Figure 3, right) then we see that the results are remarkably similar, but the trees from Ecuador were a bit leafier in the first year, and a bit less leafy when they became older. Finally, David also collected samples for tissue nutrient analysis. This data showed some unexpected patterns and details of the analysis would be featured in the next edition of the newsletter.

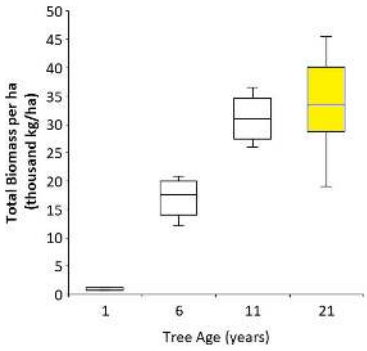


Fig 2: Dry biomass per hectare at different tree ages. The biomass of the 21-year-old trees (yellow box) was estimated using the allometric equation.

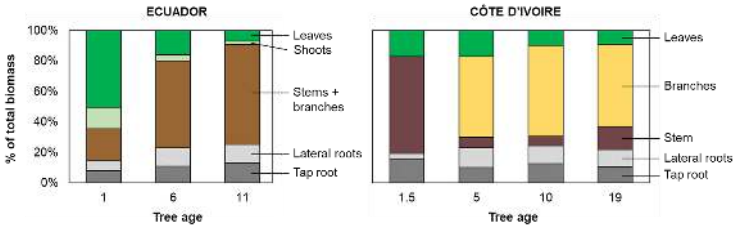


Fig 3: Division of biomass per tree over different tree components, as measured in Ecuador (left) and Côte d'Ivoire (right).

A recently pruned field in Ecuador.

Contribution by:Mars, Egbert Spaans, and the team at La Chola plantation, David Fisher and Lotte Woittiez
Keith.Ingram@effem.com, espaans@agroanalisis.com.ec, david.fisher@wur.nl, lotte.woittiez@wur.nl

CocoaSoils Launched in Nigeria

The last launch of the CocoaSoils program was done in Ibadan, in the Oyo State of Nigeria. The program which was the fourth and last of four in-country launches across West Africa dubbed, ***"Sustainable intensification of cocoa production through the development and dissemination of Integrated Soil Fertility Management"*** took place at the Headquarters of the Cocoa Research Institute of Nigeria (CRIN), on October 16, 2018.
The two-part program was patronized by about 112 scientists, experts and key partners. Partners present included IITA, Contec Global, Federal Ministry of Agriculture and Rural Development (FMARD), National Co-operative Financing Agency of Nigeria (CFAN), marketers, processors, farmers, local universities, government agencies/ ministries, multi-lateral organizations and other private NGOs.

The program started with a speech by the Director and Chief Executive of CRIN, Dr. Olayiwola Olubamiwa. In his welcome address he reiterated that *"history and data confirm that cocoa production would dwindle by 20% by the year 2050 due to aging farmers, land degradation and aged cocoa trees which calls for prompt action"*. He craved the indulgence of all present to ensure the efficient management of the program and stressed the need for collaboration for a successful program.
The Project Coordinator, Dr. Richard Asare, then gave a general overview and background of the CocoaSoils Program. In his speech, he stated that increasing cocoa production by increasing farm sizes was not feasible due to the lack of arable land. He therefore reiterated the importance of increasing productivity of cocoa and reducing the land size under cocoa cultivation. His speech was followed by that of Dr. Quadri Lekan, Director of Tree crop unit, who stood in for The Minister of Agriculture and Rural Development, Chief Audu Ogbeh. In his speech he stated *"that cocoa contributes 30% to the national GDP and employs over 3,000,000 smallholder farmers. However, its fortunes have declined in recent times due to a plethora of problems ranging from production related issues such as old plantations, aging farmers, poor soil management, climate change, poor planting materials, processing, marketing and trade".* He thus commended CRIN and the CocoaSoils Program for their immense contributions to the improvement of cocoa production in Nigeria. The technical session continued with a brief presentation by the Coordinator and a question and answer section. He took participants through the different components

Group photo of participants at the launch

of the project and answered pertinent questions from participants This was followed by a presentation on the P4D component of the CocoaSoils program by the P4D Specialist, Dr. Njankoua Wandji DND. The separate P4D presentation was the first of its kind throughout the launches across the four participating countries and it enabled the participants to appreciate this component in details.
The program ended with the launch of the CocoaSoils program by Dr. Quadri Lekan, Dr. Richard Asare and Dr. Olayiwola Olubamiwa.

Dr. Quadri Lekan and some dignitaries cutting the ribbon to launch the program

CocoaSoils on CRTV - Cameroon

As part of the launch of the CocoaSoils Program in Cameroon, the Project Coordinator was given the opportunity to elaborate on the CocoaSoils Program on the morning show of CRTV, the Cameroonian national television station. He was interviewed by Madame Bernice Bate, the head of the Environment Sustainable Development Segment of the station.

The Project Coordinator systematically answered questions ranging from what the CocoaSoils Program entailed, the choice of the four countries in West Africa undertaking trials and why the program is being implemented at this time.

Dr. Richard Asare and Madame Bernice Bate

Modeling biodiversity responses to cocoa farming

Calum Maney, is a project intern on the Global Biodiversity Modelling program with UNEP-WCMC working on modelling biodiversity responses to cocoa farming across the globe and especially in West Africa. Over the past two months, he has reviewed scientific papers where biodiversity has been measured across wild and farmed landscapes, and contacted authors to ask them if they would be interested in contributing to the project by offering their findings.
All of this research data has been collected within the framework of the PREDICTS Project. The PREDICTS - Projecting Responses of Ecological Diversity in Changing Terrestrial Systems - is a collaborative project aiming to use a meta-analytic approach to investigate how local biodiversity typically responds to human pressures such as land-use change, pollution, invasive species and infrastructure, and ultimately improve our ability to predict future biodiversity changes.(http://www.predicts.org.uk/).

Calum identified about 25 studies with useful data and used them alongside studies already collected within the PREDICTS database to create a model to broadly describe how biodiversity responds to cocoa farming, with the aim of comparing how well the quality of traditional agroforestry-based systems' biodiversity measures up to both remnant primary forest and more intensively managed systems in full-sun.
He is currently also investigating trends in biodiversity over time in order to examine how different methods of cultivating cocoa might influence biodiversity over periods of up to 80 years. He hopes his work will help lay the groundwork for tools used in the planning of future cocoa production with respect to land use and nature under the CocoaSoils program.

Hougni Deo-Gratias - Ph. D. Student on CocoaSoils

Hougni Deo-Gratias, is a PhD student at Plant Production Systems (PPS), Wageningen University and Research (WUR). He has been an agricultural extension officer for 8 years in Benin, his home country. After his MSc in Sustainable Agricultural Development, he joined the National Agricultural Research Institute (NARI) as a Research Assistant. At this position, he was involved in cotton breeding.
Site-specific recommendations are central to improve cocoa yields while using efficiently nutrient resources including mineral fertilizers and organic sources. Targeted recommendations can only be developed, if understanding and management of nutrient cycling in cocoa farms is improved.
Under the CocoaSoils Program, the main goal of his research project is to explore the potential of Integrated Soil Fertility Management (ISFM) practices in cocoa. From a broad perspective at the farm level, detailed insights will be sought at the cocoa plot level. Intrinsic soil limiting conditions for cocoa growth and production will be assessed. Thus, two main aspects will be covered: the role of litter decomposition in nutrient release and the recycling of cocoa husk which is currently regarded as an agricultural waste and a source of inoculum of pathogens like *Phytophthora sp*. that causes black pod disease.
His fieldwork will include fertilizer trials in contrasting agroecological zones, surveys and on-station and laboratory experiments. He will be based in Nigeria, and will enjoy collaboration between Wageningen University and Research (WUR), the International Institute for Tropical Agriculture (IITA), the Cocoa Research Institute of Nigeria (CRIN) and the National Agricultural Research Institute (NARI). Altogether, the findings will allow the development of a framework to analyze fertilization options and co-design improvements in cocoa farming systems.

CocoaSoils Discussion Forum

What are your burning questions about enhancing cocoa production, maintenance of soil fertility, the challenges facing smallholder cocoa farmers, etc?

The CocoaSoils team has access to a very wide range of scientific and business expertise through the many partner institutions and companies who are collaborating. Please pose your questions to the coordinator at R.Asare@cgiar.org and we are open to a discussion in the next edition of our newsletter.

Upcoming Events

The CocoaSoils Annual Forum

Date: 21 - 25 January 2018
Venue: Accra, Ghana

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Click here to download previous edition of the CocoaSoils Gazette.
Editing and Layout: Selom Akande
Communications Officer for CocoaSoils
Website: www.cocoasoils.org
Do you have a story to share? Send it to: Sa.Akande@cgiar.org