COCOASOILS GAZETTE

The CocoaSoils Program (a Norwegian Government-NORAD funded initiative), a public-private consortium has been created to address the issues of decline in productivity in cocoa and improve the livelihoods of smallholder cocoa farmers, while avoiding deforestation. The program has two main arms: Research for Development (R4D) and Partnership for Delivery (P4D). The R4D focuses on developing the protocols, establishing trials as well as data collection and management, while the P4D focuses on disseminating the recommendations from these trials in order to empower farmers and improve their livelihoods.

PUBLIC CONSULTATION

The CocoaSoils project is about generating knowledge and sharing this knowledge with the general public. By now, the first datasets and papers are being produced by the different consortium members. To make sure that these outputs are attributed to the people who significantly contributed to them, the CocoaSoils Program is developing authorship and ownership guidelines for publications and datasets.

Guidelines for authorship of scientific papers are already quite 'mainstream', but this is not the case for guidelines for the publication of datasets. To make sure that the guidelines are fair and state-of-the-art, the program would like to get your inputs through a small public consultation. Please have a look at the draft guidelines for dataset (here) and for papers, chapters and theses (here) and leave your comments. The consultation closes on 28 April 2019.

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OVERVIEW:

- Public Consultation - Authorship guidelines
- Field and Plot mapping
- Developing a cocoa ontology
- Maize Heat maps
- Agro-ecological zoning of cocoa growing areas
- Disseminating ISFM recommendations through existing networks
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FIELD AND PLOT MAPPING

IIn the last months, the WENR data team has been occupied with reviewing the spatial data from the Core Trials. Most of the trial managers have already captured the field and plot coordinates. These coordinates have been processed in a GIS programme to map the field and plot boundaries. In the 15 x 15 m plots, the varying GPS accuracies sometimes led to very crooked boundary lines, so the programme has created virtual plot boundaries instead for each trial site. These virtual plots will be exactly 15 x 15 meters, and they are planted with virtual trees at 3 x 3 meter intervals, resulting in 25 trees per plot.

Each plot and tree, in every trial site, will have an automated, consistent and uniquely generated identifier. The uniquely generated plot IDs and tree IDs will be translated into barcodes that will be printed and tagged

on each corresponding tree and plot in each core trial site. These barcodes will be stored in the ODK forms for seamless and errorless data collection.

In addition to generating plot maps and tree IDs, the WENR team is creating the digital elevation models (DEM) and slope maps for all core trial sites. At a later stage, satellite trial fields will follow a similar procedure.


Coordinate System: WGS 1984 UTM Zone 32N
Projection: Transverse Mercator
Datum: WGS 1984
False Easting: 500,000.0000
False Northing: 0.0000
Central Meridian: 9.0000
Scale Factor: 0.9996
Latitude Of Origin: 0.0000
Units: Meter
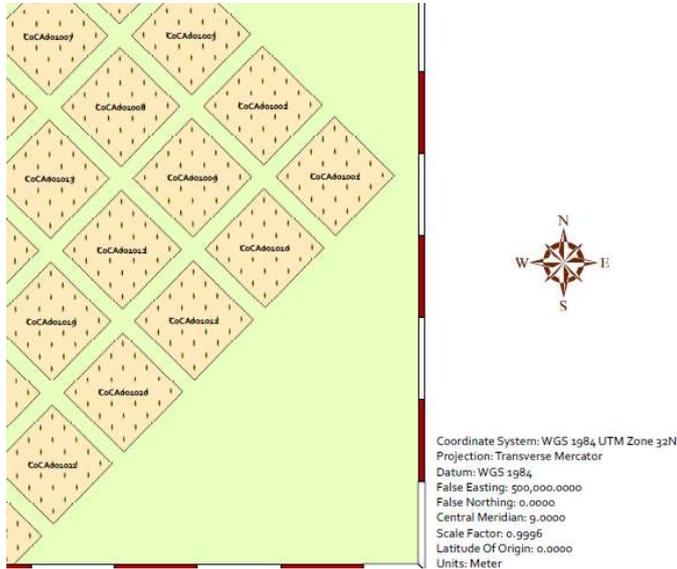
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Developing a cocoa ontology

To get a good overview of all the data that is needed to be collected, and to make this data understandable, storable and analysable, the Wageningen teams from WENR and PPS are working on a so-called cocoa ontology. The website of the Crop Ontology Curation Tool (http://www.cropontology.org) says the following about crop ontologies: In ontologies, terms bear a particular, logically defined relationship to each other, allowing computational reasoning on data annotated with a structured vocabulary. This is useful, for example, when measuring cocoa yields. With a good cocoa ontology, it should be easy to understand what was measured (quantity of air-dry beans, fermented beans, pods), how the measurements were carried out (pod count, bean classes, total weight), and at what level (tree, plot, pod). So, with a good ontology, data becomes interpretable and reusable. Understanding the relationships between different tree components (trunks, branches, leaves, pods, cherelles, beans) also makes it possible to store and analyse the data in a smart and efficient way. More importantly, the construction of an ontology helps to structure our thinking and to acquaint the data scientists with cocoa terminology.

In the coming month, we will continue the ontology development exercise. An invitation will go out soon to all project partners, to join the discussion and to share relevant protocols, like the pod count protocol shared by CRIN. A progress update on will be given in due course.
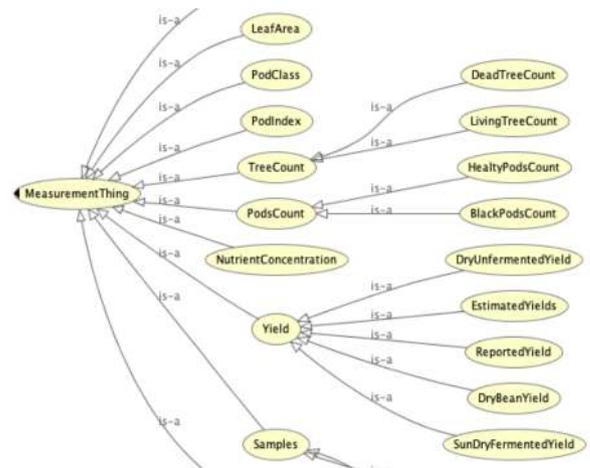
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Maize Heat Maps

In some Core Trials, the maize has already been harvested, either at plot level or at field level. This article showcases the Core Trial field of IITA Nigeria, because it is a good example of the power of maize uniformity crops to show soil fertility gradients. The field had a strict row column layout in which each plot and subplot had a specific row and column coordinate. This therefore, made it possible to represent the entire field as a regular grid. This grid was plotted as a heatmap with colours representing the value of total biomass at each subplot coordinate. The map shows colours ranging from red

(low biomass) to white (high biomass). Each coloured square represents a subplot, laid out within a 3x3 grid. The black lines indicate the plot boundaries.

The map shows that there are areas of high fertility on the right and in the bottom left quarter of the field, but that there is poorer fertility in the top section. This information from the maize harvest will be useful in defining the blocking structure of the fertility trial.
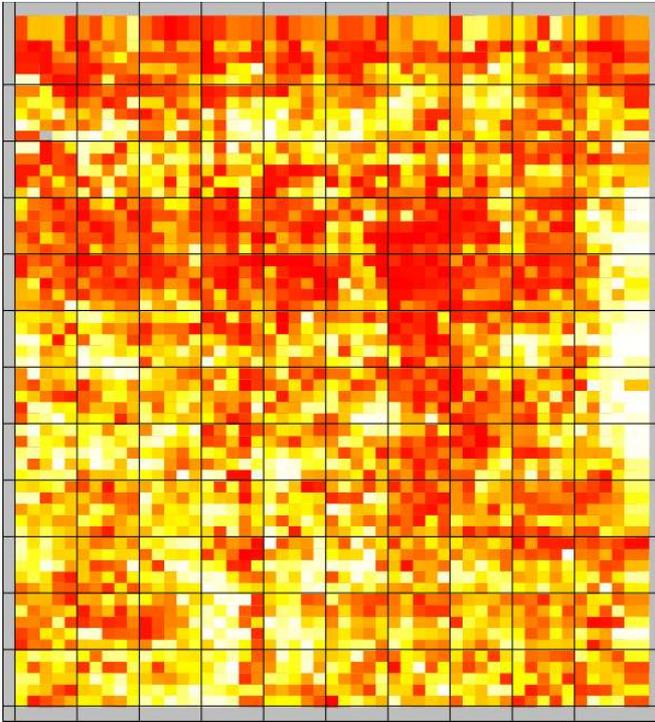
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Agro-ecological zoning of cocoa growing areas

Agro-climatic and agro-ecological zoning of crops is a very useful way to understand the diversity of environmental conditions in which the crop is grown. Agro-climatic zones refer exclusively to climate, whereas agro-ecological zones include other environmental variables such as soil characteristics. These zones delineate areas with homogeneous climate or agro-ecologies and therefore indicate similar limitations and management recommendation needs. Within the CocoaSoils project, the agro-ecological zoning is used for selecting cocoa farmers to be part in the baseline survey and satellite trials, which enables to make sure that much of the diversity of environmental conditions is well represented.

Agro-ecological zones are usually developed on national, regional, continental or global scales. The defined zones will likely be different depending on the scale of interest and objective.For CocoaSoils, CIAT has developed agro-

climatic and agro-ecological zones taking into consideration only the cocoa growing areas of West Africa and Cameroon. This has resulted in a zoning which likely differs from existing agro-ecological zones due to its exclusive focus on cocoa.
Seven distinct agro-climatic zones have been identified, namely

- A cool and humid zone (e.g. Cameroon).
- A hot zone with high maximum temperature of warmest month and with a strong dry season (northern Côte d'Ivoire and Ghana).
- A hot zone with high minimum and low maximum temperature of warmest and coldest month, respectively, and a humid dry season (southern Côte d'Ivoire and Ghana)
- A cool zone with high maximum and low minimum temperature of warmest and coldest month, respectively, and a strong dry season (North-western Côte d'Ivoire),
- A hot zone with high minimum temperature of coldest month, high annual precipitation yet strong dry season (eastern Nigeria).
- A zone with attributes of several of the above described clusters and finally
- A marginal zone with strong limitations for cocoa growing, either due to temperature or water related stresses.

A recently published soil nutrient map was used to identify distinct areas with similar soil nutrient characteristics. The distribution of the soil nutrients were highly controlled by climate and particularly by precipitation. According to the identified clusters for the cocoa growing areas, the soils of Côte d'Ivoire and Ghana are the least fertile, while soils in Nigeria and Cameroon are more fertile yet with high aluminium levels. Nigeria has higher iron levels, while Cameroon is characterized by high copper levels.
Finally, 35 agro-ecological zones were derived by combining the agro-climatic zones with the soil nutrient clusters. The maps can be viewed here. Any feedback, particularly from local partners of Côte d'Ivoire, Ghana, Nigeria and Cameroon is highly appreciated.

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Disseminating ISFM recommendations through existing networks

The CocoaSoils program is constructed on two important pillars. The first pillar is the Research for Development (R4D) pillar. In this component the program aims to gain

more knowledge about cocoa agronomy and nutrient management. This leads to Integrated Soil Fertility Management (ISFM) recommendations. These recommendations will be used in the second pillar of the program: Partnership for Delivery (P4D). In this component, the recommendations is expected to reach at least 90,000 cocoa farmers in West-Africa. At this stage of the program, a baseline study is carried out to map the farmers that the program will reach. After this mapping, the recommendations will be disseminated within the networks to test the results of it.

Because the CocoaSoils program is made up of a consortium of 18 partners, including private sector companies, a huge network of cocoa farmers in West-Africa is already connected to the program. A number of private sector companies that are already part of the CocoaSoils consortium could play a vital role in this by opening up (parts of) their farmers' networks. Using these existing dissemination networks of the CocoaSoils partners is needed for achieving the target of reaching 90,000 farmers. At the same time, it benefits the companies because their networks will have access to training materials and increases their cocoa yields. This shows the importance of a well-connected consortium where every party has its own role to play and contribution to make to the program, in order for all partners to benefit from this cooperation.

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Maiden Annual Forum - 2019

The maiden annual Forum for the CocoaSoils program has been held at the Hill View Guest Center in Teiman, Accra, Ghana on January 24, 2019. The forum followed a three-day Science Committee meeting in which the research and project partners came together to assess the project implementation, assure transparent and accessible dissemination of research outcomes, and provide inputs into the research of the different partners.

The forum brought together program coordinators, representatives from national and international research institutes, government representatives, non-program industry companies, farmer organizations, in-country cocoa authorities, farmers and the media among others. The annual forum aims at building a common understanding of the CocoaSoils program by sharing the outline and progress so far, and engaging partners to further strengthen agronomic research in West- and Central Africa.
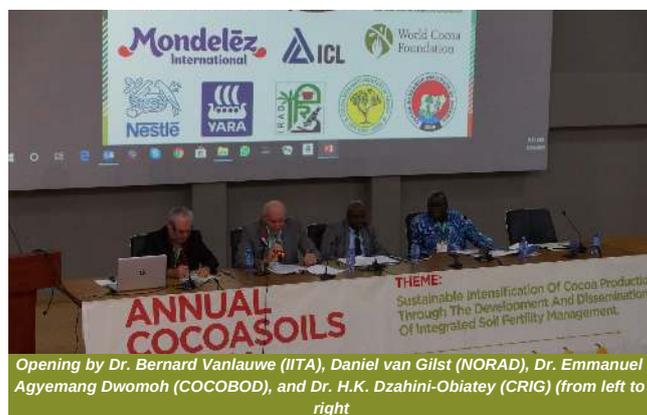
Opening by Dr. Bernard Vanlauwe (IITA), Daniel van Gilst (NORAD), Dr. Emmanuel Agyemang Dwomoh (COCOBOD), and Dr. H.K. Dzahini-Obiatey (CRIG) (from left to right

Mr. Emmanuel Agyemang Dwomoh addressing conference participants

Mr. Emmanuel Agyemang Dwomoh interacting with Dr. Olayiwola Olubamiwa(Chief Executive of Cocoa Research of Nigeria) and other dignitaries at the conference

Participants interacting during poster exhibition

The program which is funded by the Norwegian Agency for Development Cooperation NORAD is poised to translate the results from the research into practice by highlightng public-private partnerships as an important

part of the program. The forum was a platform not only to speak to the audience on the outputs of the program but also to gain inputs from various experts to improve the program.

Daniel van Gilst, the representative from NORAD took the opportunity to explain the global impact the program will make with the results and implementation of the research. He further explained that "the problem of poor soil management is an important one because too many people are affected by cocoa and too many households depend on cocoa".

Mr. Emmanuel Agyemang Dwomoh, the Deputy Chief Executive of the Ghana COCOBOD who was also in attendance, emphasized in a speech that the Ghana COCOBOD is committed to the success of all the activities within the program and hopes that the research component will filter down to the farmers and positively affect cocoa production in Ghana.

The forum was characterised by presentations from various experts within the CocoaSoils program and as a side attraction, a marketplace poster exhibition, where various trial managers and students on the project, exhibited their research and progress.

Maiden baseline coordinators' meeting
Training of enumerators for baseline survey

The Monitoring and Evaluation Unit of the CocoaSoils Program has organized its maiden coordinators' meeting and training of enumerators for Ghana, at the Cocoa Research Institute of Ghana in Tafo. The objective of this meeting was to have a common understanding and agree on the methodology of the baseline tool to be used across the four countries in West Africa.

The just ended training was attended by 16 enumerators and 4 baseline coordinators from Ghana, Côte d'Ivoire, Cameroon and Nigeria. This was followed by a pre-test of the tool in Obodanase, a cocoa growing village in the Eastern region of Ghana.

Coordinator addressing enumerators

Coordinator explaining the Baseline tool to enumerators

Enumerator interacting with farmer

Coordinator addressing enumerators

Enumerator interacting with farmer

Urcil Kenfack Essougong - Ph. D. Student on CocoaSoils

Urcil Kenfack Essougong, is a PhD student at Plant Production Systems (PPS), and Knowledge Technology and Innovation (KTI) groups at Wageningen University and Research (WUR). He has an International Master of Science in Rural Development from Ghent University (Belgium) and a degree as an agronomic engineer in agricultural economics and rural sociology from Dschang University (Cameroon). He has previously worked as a consultant and a monitoring & evaluation officer for national NGOs and the World Agroforestry Centre in Cameroon; contributing to the implementation of rural development projects, and research activities.

Under the CocoaSoils Program, his research aims to understand the factors driving cocoa farmers' behaviour, the adoption of Integrated Soil Fertility Management (ISFM), and farmers' needs in terms of Decision Support Tools (DSTs). Moving towards sustainable cocoa intensification implies a change in current cocoa farming practices. To induce this change, understanding the

factors that affect current farmers behaviour is essential. Likewise, it is of utmost importance that the program develops DSTs that address prospective end-users' needs and take into account their realities. So, as an entry point, his research will look into cocoa farmers diversity in relation to soil fertility management. Then attention will be paid to the effectiveness of ongoing interventions in the cocoa sector and lessons drawn to improve CocoaSoils intervention. Furthermore, farmers and extension agents' needs, expectations and preferences in terms of DSTs will be investigated. Finally, he will focus on understanding the determinants of ISFM adoption, and how it is affected by the use of DSTs.

He will be based in Cameroon and will enjoy the collaboration between Wageningen University and Research (WUR), The International Institute for Tropical Agriculture (IITA), and the Institute for Agricultural Research and Development (IRAD). His fieldworks will include surveys, focus group discussions (FGDs), field observation and a series of in-depth interview with cocoa farmers, extension agents and key informants.
The research findings will :

- Inform the design of appropriate DSTs for sustainable cocoa intensification;
- Increase the understanding of the institutional arrangement necessary for their implementation;
- Help to identify possible synergies among different stakeholder promoting sustainable cocoa intensification,
- Increase the understanding of the diversity of farmers motivations and aspirations behind specific behavior, the patterns of multiple components technologies adoption.
- Inform policies for a better targeting and tailoring of supports to farmers.

Urcil Kenfack Essougong, PhD student on the CocoaSoils Program

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Upcoming Events

The CocoaSoils Enumerators' Training

Cameroon: 8 - 10 April, 2019
Nigeria: 8 - 10 April, 2019
Côte d'Ivoire: 15 - 17 April, 2019

P4D Committee Meeting - Côte d'Ivoire

Date: 25 April 2019
Venue: Abidjan, Côte d'Ivoire

The CocoaSoils Annual Forum

Date: 20 - 24 January 2019
Venue: Yaoundé, Cameroon

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.