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Annex 8: Report of Sub-Regional Workshop on Soil Fertility Management in Cocoa Production

REPORT ON THE SUB-REGIONAL WORKSHOP ON SOIL FERTILITY MANAGEMENT

Hotel Etoile du Sud, Grand Bassam, 26-28 February 2013

Introduction

Under the implementation of the African Cocoa Initiative project, the World Cocoa Foundation (WCF) in conjunction with the Ministry of Agriculture of Côte d'Ivoire organised a sub-regional workshop on soil fertility management in cocoa cultivation. The workshop took place on 26-28 February in the Hotel Etoile du Sud, Grand Bassam, Côte d'Ivoire.

Over 70 stakeholders in the cocoa sector from four countries attended this workshop - Cameroon, Côte d'Ivoire, Ghana and Nigeria. NGOs, research institutions and farmers were also represented at the workshop. Each country and research structure was called on to share its various experiences in soil fertility management. At the end of the workshop, the recommendations adopted will be taken into account by the countries in the programmes to be rolled out under the ACI project.

Recommendations

Participants at the workshop made the following recommendations based on the workshop discussions:

Scientific

- Mainstreaming agroforestry in cocoa research to enhance the planting and utilization of trees and other tree crops in cocoa fields.
- Formulation and production of good quality site-specific fertiliser
- Updating training tools for the extension services to include soil fertility management
- Making an inventory of soil analysis laboratory resources
- Supporting research institutions in continuing with the composting programmes
- Harmonisation of soil analysis methods in the sub-region
- Establishment of intra-regional collaboration among soil scientists to share knowledge and also augment manpower requirement of the regions
- Compilation and evaluation of agroforestry experience and recommend a list of key species to be promoted in cocoa cultivation in West and Central Africa.

Commercial

- Developing innovative ways to make the fertilizer available and accessible to small holder cocoa farmers at the right time
- Making fertilizers affordable to farmers by providing credit facilities with requisite arrangements for loan recovery
- Exploiting synergies between the cocoa beans collection logistics and fertiliser supply chain in order to minimise transport-related costs.
- Eliminating “non value adding” elements in the fertiliser supply chain to reduce costs
- Setting up or extending the financing mechanism to spread the risks on the fertiliser credits.

Policy

- Creation of a sub-regional working group on soil fertility mangement
- Pursuing regional policies and strategies to promote fertilizer use in West Africa, namely the ECOWAS strategy to promote the rational use of mineral fertilisers and integrated soil fertility management.
- Harmonising training programmes to ensure the veracity of information passed on to cocoa farmers
- Supporting the national agricultural policy institutions to promote fertiliser use
- Incorporation of agroforestry in training of extension service personnel at the agriculture and forestry faculties in the Universities.
- Creating favourable conditions for the production, supply and distribution of inputs
- Setting up or reinforcing the fertiliser regulatory mechanism
- Establishment of survilence system in the various countries to check both the quality and quantity of fertilizers on the market.
- Government support in creating an appropriate environment for the importing and exporting of fertilizers.

Opening ceremony

The opening ceremony was marked by three speeches. The first address was given by **Mr. Koffi Louis**, Principal Private Secretary, representing the Mayor of the municipality of Grand Bassam. He wished a warm and cordial welcome to the workshop participants and a pleasant stay in this town with its fascinating history. He underlined the increasing scarcity of land resources and the importance of practising intensive cultivation, hence the importance of this soil fertility management workshop.

Mr. Sona Ebai, Chief of Party of the African Cocoa Initiative (ACI) project, in the second speech, presented the evolution of WCF investments (18 million dollars in 2009 to 76 million dollars currently) and the number of members, from seventy in 2009 to the current 103. He emphasised that the key factor of the WCF intervention is the improvement in the living and working environment of producers whilst taken the environmental aspect into account.

Dr. Adetunji Adeleke Oredipe, Advisor to the Nigerian Minister for Agriculture, recalled the role played by Nigeria in transferring improved planting materials to the CNRA in the past. Dr. Oredipe also spoke of the new strategy adopted for the cocoa sector in the country, the aim being to achieve 20% of the world market with 500,000 MT production in the medium term and 1 million tonnes in the long term.

Dr. Brédoumy Kouassi Soumaila, Director General of Production and Food Safety, representing the Minister for Agriculture of Côte d'Ivoire, thanked the organisers and experts on behalf of the Ivorian Government. He pointed out the importance of cocoa cultivation to the Ivorian economy and the need to address the problem of declining soil fertility in Côte d'Ivoire. He also indicated that the Ivorian Government was expecting important recommendations from this workshop in order to improve productivity in cocoa producing areas. With this, the Director General declared the workshop open.

Workshop sequence

The workshop continued in plenary session, during which presentations were given by soil science experts from various countries and research institutions who were called on to share their diverse experiences.

Day 1 – February 26, 2013

Presentation of soil fertility knowledge and practices

The case of Cameroon was presented by **Dr. Jetro Njukeng**, Researcher with IRAD

Fertilisers are not used widely in cocoa cultivation. The effect of fertilisers on production is closely linked to the growing and light conditions. Unprofitable in shade, fertilisers are effective for cocoa trees grown in full sun and only if all the other growing conditions are controlled properly.

The soils are mainly yellow ferralitic, leached or not (Acrisols, Ferralsols, Nitisol), with low to medium fertility and an acid pH (3.8 to 5.9), on metamorphic rocks that can develop aluminium toxicity from place to place. Fluvisols make up 10% of the surface area while Ferralsols make up 60% of soils in the region. Concentrated in the lowlands, highly denatured, with low absorbent complex and with no mineral reserves the Ferrasols have very limited fertility potential. These soils are mainly acid, clayey and red or yellow in colour depending on the length of the wet season. Acrisols make up the remaining 30% of all soils listed; they are only slightly ferralitic and highly denatured.

Several studies have been conducted and many technologies developed. But empowering farmers to improve their livelihoods using these technologies and scientific results requires efforts in terms of extension, capacity building (of farmers and extension workers) and funding.

The case of Côte d'Ivoire was presented by **Dr. Emmanuel Kassin**, Researcher with CNRA

Dr. Kassin emphasised the need to develop new intensive cultivation systems that are essential to the sustainability of cocoa cultivation and the knowledge of the new production environment (soil and climate). The technical itineraries of the soil mapping commenced in 1963 until today could then be adapted to four pedalogical areas sub-divided using the 1960 map.

Morphological examination of soil in cocoa growing areas revealed high levels of macro nutrients in higher and middle slopes, which are favourable for cocoa production. However, the lower slopes are low in macro nutrients and supceptible to surface water. These lands are therefore not suitable for cocoa production.

The case of Ghana was presented by **Dr. Alex Afrifa**, Researcher with CRIG

The first cocoa was grown in Ghana in 1879 and the production depended on exploiting the fertility of forest soils. This contributed to the degradation and reduction of nutrients in the soils. Cocoa farmers therefore became migrants who moved from one region to the next in the search of forest soils. Currently, 75% of production is in Acrisols, 10% in Lixisols, 9% in Ferralsols, 3% in Nitisols and the remaining 3% in other types of soil. After 130 years of growing cocoa in these soils, a 2006 survey showed that the levels of nutrients remaining in the soils are: Nitrogen (92%), Phosphorous (37%) and Potassium (94%). Organic and mineral fertilisers are used to replace nutrients.

Four granular formulations and one foliar formulation have been developed in conjunction with the fertiliser manufacturers. Little research has been carried out into a specific formulation for the different production sites. Poultry manure and composting of cocoa pods are encouraged. Current research is focusing on: 1. Fertiliser x Variety x Shade interaction, 2. Nitrogen from an improved source that does not reduce the yield, 3. Recommendation of site-specific fertilisers, 4. Determining the nutrient ratios in the soils suitable for cocoa cultivation.

The case of Nigeria was presented by **Dr. Moses Ogunlade**, Researcher with CRIN

The degradation and drop in soil fertility are just some of the reasons for the low cocoa production in Nigeria. Most fields are old and deprived of nutrients and 85% of farmers do not use fertilisers. The critical nutrient levels for cocoa cultivation are:

- Total nitrogen: 0.9 g/kg
- Available phosphorous: 12 mg/kg
- Exchangeable potassium: 0.3 cmol/kg
- Exchangeable calcium: 5 cmol/kg
- Exchangeable magnesium: 0.9 cmol/kg

However, on average, less than 12 mg/kg of phosphorous is available in the majority of soils in which cocoa is produced. An analysis of the nutrients removed through pod harvest indicates that each 1000 kg of beans removes 20 kg of Nitrogen, 4 kg of Phosphorous and 10 kg of Potassium from the soil. On- going fertilizer trials are mostly on-station and with a few trials on farmer fields. The use fertilizers were based on the nutrient status of the soils where the trials were conducted. The current research is foucing on:

1. Introducing to farmers the composting of cocoa pods in the Cross River State communities
2. The use of test kits for rapid testing instead of conventional analytical methods.

Prospects for soil fertility in West and Central Africa

A farmer, Dr. Joel Joffre and Dr. Brédoumy Soumaila spoke on this theme.

The farmer, **Joseph N'Gouandi**, shared his experience in the region of Indénié Djuablin of using a legume for shade. The soil fertility was restored after seven years under the PROSTAB project. He also hoped that this project would be extended throughout the country to preserve the soils.

Dr. Joel Joffre pointed out that the decision to use fertilisers depends on the decision-maker, in other words the producer, and is based on his cost price. Thus, although well aware of the importance of using fertilisers, he will only be inclined to acquire some if he sees a threefold profit from using it. In addition, the selling price for the production and the cost of manufacturing the fertiliser are dependent on exogenous factors that are difficult to control and leave the farmers with no choice. However, it is possible to act on the distribution chain by reducing the links in the chain to make fertilizer affordable.

For this reason, he recommends bringing the fertiliser closer to the farmer, establishing synergies between the production collection logistics and the fertiliser, entrusting the research programmes to the national structures that already have experience in this field, avoiding adulteration and above all introducing an efficient repression system.

Dr. Bredoumy Soumaila cited the ECOWAS strategy on fertilisers that aims to resolve the main constraints of the fertiliser market in West Africa and promote the rational use of mineral fertilisers and integrated soil fertility management. He then explained that the agricultural policy in Côte d'Ivoire takes the promotion of fertilisers into account (preferential tax regime, grants, liberalisation of supplies and introduction of a regulation mechanism). He also announced the promotion strategy for the use of fertilisers. This is targeting the sustainable increase in the use of fertilisers to create modern and competitive farming. Côte d'Ivoire is also planning a regulatory mechanism for this sector.

Day 2 – February 27, 2013

Fertiliser formulations for cocoa

The first intervention was from **Laura Lansipohja** representing YARA Ghana. She made it quite clear that Yara was at the forefront of producing formulations. In 1992, Yara in conjunction with IDEFOR, changed from the NPK formula 0-20-20+MgO to 0-23-19+10CaO+6S+5MgO. In 2003, the formulation 0-22-18 +9CaO+7S+6MgO was introduced onto the market. The aim was to replace exports in order to maintain and even increase cocoa production in Ghana. In 2009, Yara LivaNitrabor was introduced to increase production as well as the physical the quality of cocoa pods and beans.

In the second presentation, **Mr. David Malard** from Louis Dreyfus Commodities (LDC) indicated that their business focused on fertilisers with a blend of different raw materials like the DAP, UREA, TSP, KCL, PCa3, and SA. The blends are adapted according to needs and each type of soil. LDC formulations are offered currently in Côte d'Ivoire and Cameroon. In 2013 the blended formulation NPK6.15-28+7S+3MGO+Cao was introduced into Cameroon. LDC intends to acquire blending plants in Côte d'Ivoire and Ghana to develop improved formulas.

In **Dr. Joel Joffre's** presentation, he cautioned against over regulation of fertilizer sector, which could lead to a stifling of innovation on the part of fertilizer manufacturers. Fertilizers are food for the plant which should be easy to procure and to identify. For instance, as it is much easier to make counterfeits of fertilizer in the powdered form it would be better if the fertilizer is granular to reduce the incidence of counterfeiting. Joffre advised that more emphasis should be put on monitoring to ensure that farmers receive exactly what they are paying for.

Agro-forestry systems and soil fertilisation

Dr. Lucien Diby of ICRAF presented the soil health monitoring system developed under the V4C project. The methodology of this system is based on the randomised choice of a "sentinel" site, where the spectral signature measured by a spectrometer is analyzed and aggregated to the data of the satellite map in order to find out information on the plot. This tool has the advantage of targeting the interventions, creating a wealth of experience and monitoring the changes in the soil and the vegetation.

Dr. Ranjana Bhattacharjee of IITA presentation was on Soil Fertility Constraints in Cocoa Systems of Cameroon and Nigeria. The purpose of the study is to develop knowledge and tools to assess trade-offs and synergies in climate change adaptation and mitigation in coffee and cocoa systems.

The main findings of the study include the following:

- Productivity is important factor for selection of cocoa varieties.
- Cocoa production requires shading, but degrees of shading vary strongly.
- Low level of input usage except for pesticides and fungicides.
- There are nutrient imbalances in all sites under the study and there is the need for adoption of ISFM.
- Smaller proportion of farmers not satisfied with yield level except for Mbam in Cameroon.
- A large percentage of cocoa plots were derived from forest except for SW-DS (fallow) in Nigeria.
- IITA developed diagnostic tools such as CND to discover nutrient deficiencies quickly, a basis for developing targeted fertilizer recommendations.
- Fertilizer use is seen only in areas where forests have been depleted. There is the need for intensification of production when plots are older and insufficient forest for clearing.

Farmers' Fertilizer Use

Michiel Hendriksz of ADM set the stage for discussion by drawing participants' attention to how to sustain the cocoa economy. The current situation is that there is less and less suitable soil or land available for cocoa cultivation while demand for planting alternative crops by small holder farmers is growing. Cocoa farmers receive insufficient (business) training and inputs. In addition, health, social and demographic issues are major concerns.

However, predictions from climatological point of view indicate that area suitable for cocoa production will reduce severely by 2030. Cocoa supply/demand & pricing projections (1978 – 2020) indicates that consumption is increasing at 3% per annum but there is no appreciable increase in net crop until 2013 and this situation will remain constant till 2020. The real cocoa price trend has been on the downward trend between 1950 and 2010.

A study by Ruf (Cirad, 2008) in Subré, Cote d'Ivoire shows a correlation between cocoa price and fertilizer adoption. The number of bags of fertilizer purchased by cocoa farmers increases in the years in areas where the farm gate price increased. Also a study of the purchasing power of cocoa farmers expressed in kilos of cocoa beans is higher in Indonesia followed by Ghana and then Cote d'Ivoire which closely follows the intensity of fertilizer use.

Dr. Solomon Acquaye of Ghana Cocobod's presentation was on Fertilizer Use on Cocoa by Farmers in Ghana. The Government of Ghana as part of measures to increase cocoa production introduced the Cocoa Hi-Tech Program to encourage farmers to apply fertilizer on cocoa farms. A pilot started during the 2002/2003 crop season with full national implementation begun in 2004/2005 season. The Cocoa Hi-Tech program aims to increase cocoa yield through improved soil fertility management and reduce deforestation through intensive cultivation.

Only fertilizers certified by Cocoa Research Institute of Ghana and recommended by COCOBOD are used on cocoa farms in Ghana. The approved fertilizers are mainly inorganic with limited use of organic fertilizers (poultry manure) for organic cocoa production. The inorganic fertilizers are as follows:

Granular-- Asaasewura (NPK 0-22-18+9CaO+7S+6MgO); Cocofeed (NPK – 0-30-20); Cocoa Master (NPK 1-21-19+9CaO+6S+6MgO+1B) and Nitrabor (N, Ca, B)

Liquid/foliar: Sidalco (NPK 10:10:10, 20:2:4, 6:0:20 + TE)

Since 2006/2007 crop season, government has provided on average about 100,000 metric tons of subsidized cocoa fertilizer annually to farmers. This only covers about 16% of the total area under cocoa production which is estimated at 1,500,000 ha. The introduction of fertilizers together with mass spraying of cocoa farms to control black pod and mirids led to an increase of cocoa production from 496,846 MT in 2002/2003 season to 896,348 in 2011/2012 season.

However, cocoa farmers are faced with a number of challenges which prevent them from the use of fertilizer. These may include: High price of fertilizer coupled with lack of purchasing power; lack of access to fertilizer and lack of information on fertilizer use.

In conclusion, it has to be recognized that fertilizer use by cocoa farmers is indispensable in increasing yields and hence household and national incomes. However there are challenges to fertilizer use by farmers and government and key stakeholders must address these challenges.

Some of the means of mitigating the challenges of fertilizer use by farmers include: making fertilizers available when and where needed at affordable prices and providing extension services to disseminate information about the benefits of the use of fertilizers.

Organic Amendments

Managing Root-knot Nematode on Cocoa with Poultry Litter Compost in Nigeria - **Dr. Samuel Orisajo** of CRIN

Root-knot nematodes (*Meloidogyne incognita*) have been found to retard the growth of cocoa seedlings leading to sudden death and establishment failure. However, poultry litter compost has been found to suppress nematode populations thereby increasing soil health and fertility and hence enhancing plant vigor.

The matured poultry litter compost was produced in 3.8-cu m static aerated pile from 3-week old poultry litter. The compost pile was self-heated to temperatures >55^{0}C in the core for 4 weeks, which gradually declined. The compost was turned at week 9 to ensure the exterior material go into the core of compost and vice versa. The compost was cured at 16 weeks, air dried, analyzed and stored for use.

The results indicated that poultry litter compost was found to inhibited *M. incognita* egg hatch and infective second stage juveniles. It also suppressed *M. incognita* populations on cacao and enhanced plant vigor. Poultry litter compost also has the potential to improve soil health and fertility.

Potential of improving soil fertility while reducing *Phytophthora* attack by composting Cocoa Pod Husk - **Dr. Jetro Nkengafac Njukeng** of IRAD

Phytophthora (P. *megakarya*) is found to cause black pod disease resulting in yield losses of 20-30% in cocoa. The control of this disease is found to be costly with the use of environmentally unfriendly agro-inputs for treatment. However, cocoa pod husk which are heaped up on farms as waste could be used to serve as a source of plant nutrient as well as inoculum for Phytophthora pod rot. The study has as its objectives to 1. determine the temperature/time at which P. Mergakarya can be eliminated and 2. evaluate the effect of cocoa pod husk amendment on soil properties.

The results indicate Phytophthora survived at 25 °C no matter the incubation time and at 35 °C for less than 2 days. However, Phytophthora did not survive after 2 days at 35 °C, 45 °C and 55 °C no matter the incubation period. Under the organic amendment studies, the amendments (made of cocoa pod husks, dried, composted, or as biochar, sunhemp leaves, or poultry litter) was applied at 20 t/ha (10 g/kg). The parameters studied are: pH: pH meter (1:5 w/V soil water); Electrical Conductivity: Conductivity meter (1:5 w/V soil water); Organic Carbon: loss on ignition; and C:N ratio: Leco analyser.

The conclusions from this study are: Phytophthora dies off at temperatures above 35 °C. Organic amendments improve soil properties and also the amendments were not toxic to tropical seeds. The implication is that cocoa pod husk when properly composted will reduce phytophthora spp. while improving the soil quality.

Integrated soil fertility management (ISFM) to improve cacao establishment and productivity in Côte d'Ivoire - **Dr. KOKO Louis** from CNRA

Dr. Koko presented results of his study, which demonstrated that in highly acidic P-absorbing soils of Côte d'Ivoire, Phosphorous (P) is among the nutrients that most limit plant production. For the success of cocoa (*Theobroma cacao* L.) replanting, application of P to soils is one solution to ensure cocoa growth and productivity.

To assess the effect of different P applications on cocoa production, two research projects have been initiated in Côte d'Ivoire since 2009. The first one, which is supported by IFS (International Foundation for Science) is focused on a field trial at the cocoa research station at Divo. The second project was carried out at USDA-Beltsville with the support of the Norman E. Borlaug International Agricultural Science & Technology Fellowship Program – Global Cocoa Initiative. The objectives of this research were to analyze available soil

phosphorus (P) and soil-cocoa seedlings P balances and to determine P value of compost made from cocoa pod husks (CPH), leaves and other organic materials.

The main results showed that all compost + SP (Superphosphate) treatments increased significantly yields in relation with the amount of SP. These results were related to the improvement of the soil P status mainly of the 0-5 cm layer but also for deeper layers. All indicators (C_P, P-Olsen-Dabin and total P) shown similar trends. Finally, the greatest increase in growth and yield is observed when 8 t/ha compost + 184 kg/ha P_2O_5 (or 6 kg of compost/cacao + 300 g of SP) was applied. It is likely due to the positive and synergistic effect of mixing organic and phosphate fertilizer to reduce P absorption capacity in cacao soils. Further works, started at USDA on July 2012, are required to distinguish the respective effect of each factor.

Day 23 – February 28, 2013

Soil Testing and Soil Mapping

Dr. Moses O. Ogunlade of CRIN presented an overview of conventional soil testing methods and constraints; and the possibilities for less expensive methods in soil fertility management of small holders cocoa plantations. Low soil fertility is one of the major causes of decline in yield of cocoa in Nigeria (250-400kg dry bean/ha/year). P & K have been reported low in soils and below critical values required across cocoa plantations (Ogunlade & Aikpokpodion 2006, 2010). Nutrients are being removed (mining) through pod harvest without replenishment. 1000kg dry beans removed 20kg N, 4kg P and 10kg K from the soil (Omotoso, 1975), K removed increased fivefold where cocoa pod husk (CPH) are removed from the farm. There is non-usage of fertilizer by about 85% of cocoa farmers in Nigeria (Ogunlade et. al. 2009). To increase cocoa bean yield in the existing plantations of small holder farms requires guided and judicious use of fertilizer. This calls for soil testing before fertilizer application.

The study explored the adaptability of affordable, handy and quick soil test kits for soil analysis. It analyzed soil chemically using conventional analytical methods and compare and correlate the analytical results obtained with results from the above unconventional methods. It subsequently determined the soil test kit(s) that significantly correlate(s) with conventional method in order to introduce it to small holder cocoa farmers in Nigeria. The soil test kits used for soil fertility evaluation of smallholder cocoa farms were: La Motte, Rapitest and Hanna. The kits were used to determine pH, N, P and K.

The results indicates that there was significant correlation between LaMotte and conventional analytical methods for pH, N, P and K. La Motte was accurate for analysis of soils with wide pH range and could be used for soil analysis for soil fertility management in cocoa plantations. However, it calls for proper training of farmers on the collection of representative soil samples.

In conclusion, cocoa soils should not be allowed to be degraded further by polluting it with blanket application of inappropriate mineral fertilizers. This is very important as cocoa farmers are being sensitized to use fertilizers on cocoa in Nigeria. Soil fertilization based on soil testing which takes care of the soil and the crop is sustainable.

Overview of World Cocoa Foundation Activities on Soil Fertility

Jonas Mva Mva of IDH presentation was on Cocoa Fertilizer Initiative: 'Bringing back soil fertility to the cocoa farms'. He provided an insight to the mining of soil nutrients as a result of export of cocoa beans. For example, every 10,000 metric tons of cocoa beans exported nutrient loss is equivalent to the following:

- N : 210 MT

- P_2O_5 : 86 MT
- K_2O : 111 MT
- MgO : 40 MT
- CaO : 11 MT

This will require fertilizer equivalent of 1, 125 MT to replace these lost nutrients. Based on the calculations it would mean that for every 9 ships leaving with cocoa it needs to be replaced by one ship of fertilizer. However, if you consider the nutrient needs of the cocoa tree for sustainable production will require taking into account how to balance the export of nutrients, maintain the soil quality, balance the soil leakages and side consumption from other plants in the farms and replace all nutrients from husk. All these put together will require more than one vessel of fertilizer for replacement. The estimate is different and hence for every 3 ships of cocoa leaving a producing country they need to be replaced by one single vessel of fertilizer.

There are major challenges hindering fertilizer use by cocoa farmers. African soils are different and variable which requires adapted fertilizer formulas, however the development of adapted formulas is highly costly for the limited market. Also the financing of fertilizer in a context of limited income and limited assets of the smallholder cocoa farmers are not encouraging to the financial institutions to take risk on smallholders. Without financial support, farmers themselves have limited direct investments capacities, and in most of the cases the lack of transparency in the setting of prices is not motivating enough for farmers to risk investing in production. There is also logistical challenge for the distribution of fertilizer to the farm gate. The cocoa producing areas are remote and away from the harbors, agro dealers can be used as local collective points, delivery for the last mile is also a challenge as most of the fertilizer bags will have to reach the plantations on bicycles. Often a hurdle when a farmer needs to carry up to ten 50kgs bags for one application. Cocoa always finds its way to the market but fertilizer has troubles finding its way to the fields.

It is in the light of these that IDH is implementing the Fertilizer Initiative for Cocoa in W.A. The program seeks to facilitate farmers' access to cocoa fertilizer to boost productivity. Between 2013 and 2015, 110,000 metric tons of Teractiv fertilizer (Rock Phosphate) would be shipped to Cote d'Ivoire (90,000MT) and Nigeria (20,000MT).

The program is adopting 3 basic models to leverage the cocoa supply chain in delivering fertilizers to the farmers. In a range from complex to simple, the models are:

1. **Farm finance:** The farmer group takes a bank loan for fertilizer for its members, with risk-sharing from the other supply chain
2. **Fertilizers-for-beans:** The cocoa supplier is partially paid in fertilizer upon delivery of beans to the trader
3. **Cash-and-carry:** Building on the supply chain infrastructure, fertilizer is made available at selling points close to farmers to buy in cash

Currently 16 partners have sign on to support this program and the shipment of Teractiv expected in Abidjan in March 2013.

Dr. Mbalo Ndiaye of Cocoa Livelihoods Program (CLP) presented the Footprint of CLP in the sub-region.

The program was launched in 2009 with the objective of doubling the incomes over 10 years through improved productivity of 200,000 smallholder cocoa-farming households in Cameroon, Cote d'Ivoire, Ghana, Nigeria and Liberia. The key programmatic areas are:

1. Improving marketing efficiency – professionalization of farmer organizations and cooperatives in best management practices

2. Improving productivity – Training of farmers in Good Agricultural Practices with increased provision of inputs (e.g. ,crop protection, fertilizer, improved seedlings)
3. Diversification of incomes – Farmer Business School; and establishment of Business Service Centers close to farmers

CLP is providing direct and indirect interventions in the area of GAP training, Farmer Business Schools, Business Service Centers, Access to credit & inputs, Cocoalink with ACI & ECHOES and the Borlaug fellows program.

Policy Constraints & Opportunities

Sona Ebai of ACI set the stage for the panel discussion of the policy constraints hindering the fertilizer industry and opportunities to be exploited, with a presentation on the policy areas for ACI Work. The focus of the presentation was on the Promotion of Agroforestry in Cocoa Cultivation with particular emphasis on:

- Mainstream agroforestry in cocoa research to enhance the planting and utilization of trees and other tree crops in cocoa fields.
- Bring together forestry and cocoa experts to propose, analyze and modify the legal framework to enable cocoa farmers benefit from agroforestry.
- Create farmer awareness on existing laws on farm tree ownership
- Incorporate agroforestry in training of extension service personnel at the agriculture and forestry faculties in the Universities.
- Compile and evaluate agroforestry experience and recommend a list of key species to be promoted in cocoa cultivation in West and Central Africa.
- Support farmers with production of agroforestry tree planting materials.

Proposed strategies and policies for the fertilizer industry which include:

- Formulate and enforce legislation on local production, importation and use of fertilizers.
- Ensure quality assurance and quality control for fertilizers.
- Develop and revise the right fertilizer formulations for identified benchmark soils periodically.
- Identify/establish reliable soil testing laboratory for farmers in each country.
- Identify and map out major cocoa producing soils in the various agro-ecological zones in each country.
- Ensure good marketing infrastructure to make fertilizers available to farmers
- Make fertilizers affordable to farmers by providing credit facilities with requisite arrangements for loan recovery.