

**REPORT OF THE 4TH AFRICAN SCIENTIFIC COFFEE
CONFERENCE**

**VIRTUAL CONFERENCE (ZOOM TELECONFERENCING), ACCRA,
GHANA**

Inter-African Coffee Organisation (IACO),
Ghana Cocoa Board
Cocoa Research Institute of Ghana (CRIG)

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1. Executive Summary

The 4th African Scientific Coffee Conference, was themed “Enhanced research for a resilient coffee value chain in Africa”. The conference was held on the 16th November 2020 via zoom teleconferencing and was split into two sessions according to the topics presented by the scientists: Crop Protection and Breeding (Session I), and Agronomy, Agro-Economy and Quality (Session II). There were twelve topics, from seven scientist in the different African coffee producing countries. The opening remarks highlighted the need to sustain coffee research, share findings and strengthen partnership aimed at enhancing current research. The presentations embraced diverse aspects of coffee research from the impact of climate change on disease, exploring mycoparasites as biocontrol agents, molecular approaches in breeding, sustainable crop production, post-disease recovery approaches, farmer income stabilization via crop diversification, investment and production costs, organoleptic properties of varieties, and a predictive model for production and establishing linkages to support research in Africa. The presentations stimulated discussions pertaining to enhancing research collaboration among African coffee scientists, increasing research funding, employing the use of molecular techniques in coffee research including pest and disease epidemiology and management, and marker-assisted breeding with the view to increase production, encourage investment in the coffee value chain and enhance the livelihood of farmers.

2. Background

Coffee industry is the main source of income for over 12 million households in Africa, and a key pillar in the fight against rural poverty. It constitutes a source of income, food and nutritional security, as well as for job creation in rural and urban areas. This is in addition to being a major source of tax and foreign exchange earnings for governments of coffee producing countries. However, the potential for Africa’s role in the global coffee value chain has been a source of concern for industry players for several years. Challenges faced by the development of the sector are amplified by poor agricultural practices, lack of new high yielding varieties, pests and disease pressure, and climate change effects, that lead to declines in both quality and productivity in the African coffee producing countries.

The African Coffee Research Network (ACRN) under the Inter-African Coffee Organization (IACO) was established in order to facilitate and enhance the capacity to research institutions, improve on resource manpower and effectively disseminate appropriate technologies or information to the coffee stakeholders, in response to these challenges faced by the sector. ACRN organizes biannual Scientific Coffee Conference as one of its tools to facilitate exchange and dissemination of scientific information on coffee between the member countries.

The 4rd ACRN Scientific Coffee Conference was held virtually on the 16th November 2020 under the theme “*Enhanced research for a resilient coffee value chain in Africa*”.

There were twelve presentations made by seven coffee researchers from different research organisations in IACO member states including, Cote d’Ivoire, DR Congo, Ethiopia, Ghana, Kenya, Rwanda, and Togo. Topics discussed were in the area of coffee Agronomy, breeding, pests and diseases management, Agro-economy, climate change effects, and quality improvement. It was recommended from the discussions:

- To enhance the collaboration and information sharing between coffee scientists in IACO member states,
- To enhance coffee research and innovation in the African IACO member countries
- Research should be oriented in a way to solve challenges faced by the coffee farmers
- To strengthen the linkage between research and extension so as to facilitate the dissemination of research findings to farmers

3. Conference activities

3.1 Opening remarks

The opening remarks were provided by:

Dr. Francis Padi, Deputy Executive Director, Cocoa Research Institute of Ghana (CRIG)

Dr. Celestin Gatarayiha, Coordinator, African Coffee Research Network (ACRN)

Dr. Frederick Kawuma, Secretary General, Inter-African Coffee Organisation (IACO)

Dr. Owusu Afriyie Akoto, Minister, Ministry of Food and Agriculture (MoFA), Ghana

Speakers in the opening remarks provided a welcome messages and wished fruitful discussion to all participants of the conference. They highlighted the opportunity to foster collaboration, create synergies to strengthen the coffee value chain and formulate proposals to attract funding for coffee.

It was raised that the African coffee industry is facing several challenges and paramount among these are (i) Inadequate agronomic practices, (ii) Pest and diseases and (iii) Climate change effects, and that the hope of streamlining these challenges remains in the hands of the researchers.,,

The issue of coffee price was also mentioned and affects farmers’ livelihood, therefore there is a need for the development of a strong internal market for coffee including stimulating the local market to enhance growth of the coffee industry. The official opening of the conference was

done by the Honorable Minister of Food and Agriculture (MoFA) of the Republic of Ghana, Dr. Owusu Afriyie Akoto, who is also the Chairman of IACO.

3.2 Presentations

Session 1: Crop Protection and Breeding

The session was moderated by Dr. Joseph Kimemia, from Kenya Agriculture and Livestock Research Organization [KALRO]). Six presentations were carried out by four participants from four African countries: Ethiopia, Kenya, Ghana and Rwanda.

a) *Two presentations by Mr. Kifle Belachew Bekele, Associate Researcher, Ethiopian Institute of Agricultural Research (EIAR)*

In the first presentation ‘**Climate change affect coffee leaf rust (*Hemileia vastatrix* Be & Br.) epidemics in Ethiopia**, the presenter gave a background on coffee production globally and its production in Ethiopia, indicating that Ethiopia is the 5th top producer of coffee in the world. However, the country is being affected by various coffee diseases where an incidence and severity of 35.3% and 22.5% respectively are reported, and this could be probably due to Climate change. Climate change factors such as warm and humid conditions, promote the incidence and severity of the coffee leaf rust. The major control measures are by various means such as the use of fungicides (chemical control) and resistant varieties. However, the emergence of new races of disease breaks down the resistance of plant varieties which poses a major challenge in obtaining resistant varieties. Other methods such as cultural (shade management and pruning) and soil nutrient management practices are also employed in managing the disease.

In the second presentation (**Screening of indigenous mycoparasites associated to coffee leaf rust *Hemileia vastatrix* for their biocontrol potential on the disease**), the presenter discussed the results of the study on biological control agents for coffee leaf rust (CLR). In the study, biological control agents were collected from various coffee-growing areas in Ethiopia. These were subsequently identified and characterized. Susceptibility test was also performed. The study identified 110 different parasites associated with CLR. Fifteen (15) of the isolates reduced the disease severity and these mainly belonged to the following genera: *Digitopodium* spp., *Fusarium* sp. and *Lecanicillium* spp.

Discussion and Comments on the presentations

In responding to how shade can be utilized in the management of the disease, Mr. Bekele stated that shade can reduce CLR and recommended that shade should be integrated with other methods for disease management. Adding to Mr. Bekele’s response, the Secretary-General of

IACO, talked about the impact of funding on research and what the African Coffee Facility can do to aid research.

A discussant wanted to know if there are any varieties resistant to the CLR. Mr. Bekele indicated that none is currently registered; however, twenty-three (23) coffee berry disease-resistant varieties are available and registered in the country. In responding to a question on whether mass production of the best performing bioagents has been done and their use on integrated control with fungicides, the presenter stated that a mass production method has not been developed. Furthermore, he stressed that the bioagents are not compatible with fungicide application.

b) Presentation by Dr. James Gimase, Research Scientist, Kenya Agricultural and Livestock Research Organization, Nairobi, Kenya

Dr. Gimase presented on **Characterization of the putative genome-wide SNP loci associated with resistance to *Colletotrichum kahawae* (Waller & Bridge) in the variety Hibrido de Timor using GWAS and QTL mapping**. He provided background information on the coffee berry disease and studies done on genetic finger printing of the disease. His study aimed at characterizing the putative SNP marker for the T gene using GWAS and QTL mapping. He explained the methodologies involved in conducting the study and indicated that the research was able to identify SNP marker and recommended it for validation.

Discussion and Comments

A participant wanted clarification on the significance of the research work to coffee breeding. Dr. Gimase indicated that it reduces the time taken in developing new varieties. On the relationship of cup quality and resistance to coffee berry disease, he indicated that there is the potential for that relationship to be established, though was not studied in the paper presented.

c) Two presentations by Dr. Abraham Akperterey, Research Scientist (Plant Breeding), Cocoa Research Institute of Ghana (CRIG)

In presenting the findings of his study (**SNP marker-assisted detection of mislabeling and pollen contamination in a Robusta coffee breeding programme**), Dr. Akperterey introduced the two main strategies in crop maintenance, *ex situ* and *in situ* and the need for Robusta coffee to be preserved in the field due to recalcitrant seeds. He also indicated that there are mislabeling (synonymous and homonymous) problems with *ex situ* storage and explained how these arise. He highlighted the advantages of molecular characterization over morphological characterization and identified 18.6% mislabeling (synonymous type) in his study. Mislabeling had a significant effect on growth and yield of Robusta coffee where intended crosses were more vigorous at the juvenile growth phase and outperformed unintended crosses (due to pollen

contamination or mislabeling) with a yield advantage of more than 2 kg wet cherry per tree. On the genetic structure of the germplasm collection at CRIG, Dr Akperterey noted that two main sub-populations were identified using 120 SNP loci.

In his second paper, Dr Akperterey presented on **Determination of field establishment and early bearing potential of half-sib Robusta coffee families in Ghana**. The presenter explained the effect of early field establishment and its effect on early bearing for varietal development. He also pinpointed the impact of weather variations (climate change) on crop establishment. He explained the methodology involved in carrying out the study and indicated a significant variation among Robusta coffee genotypes at CRIG for successful field establishment. He further indicated that four (4) promising families have been identified that would be useful in coffee field establishment, and research for productivity in Ghana.

Discussion and Comments

Responding to a question on how the genetic subpopulations identified in his first presentation could relate to any of the well-known genetic groups, Dr. Akperterey stated that they made attempts to get some of the well-known genetic materials (as reference in the characterization) but they were unsuccessful, hence standard genotypes were not included in this study. Mr. Hyacinthe Legnate of CRNA, Cote D'Ivoire volunteered to assist in acquiring these reference genotypes for future work.

d) Presentation by Dr. Simon Martin Mvuyekure, Coffee Research Leader, Rwanda Agriculture and Animal Resources Development Board (RAB)

Dr. Simon Martin Mvuyekure on the topic, **East African Coffee Breeding Hub: Coordinating a regional strategy to accelerate the creation of 21st century varieties**. The presenter stated that the coffee sector is facing issues of low productivity due to varieties which are not fit for current/modern times. In addition, factors such as changing weather patterns, increased temperature, biotic and abiotic stresses contribute to low productivity. This can be solved by building the next generation of coffee varieties and sustaining the industry's genetic resources and breeding potential. The creation of a network of regional breeding hubs that countries, research institutes and private sector partners can utilize to accelerate the pace of coffee genetic improvement is very important. The East African Coffee Breeding Hub is a sub-regional breeding hub which has been operational since 2018 and it is hosted by the Rwanda Agriculture Board (RAB) under the auspices of the World Coffee Research (WCR). The establishment of the hub is aimed at addressing the challenges highlighted by the presenter and also information exchange by the various stakeholders including the research community, policy makers and private sector partners.

Discussion and Comments

A participant wanted to find out how member countries could access materials from the organization. The presenter responded that the essence of the organization is to ensure the sustainable nature of germplasm. A participant commented that there is the need to find out how to promote African coffee. Answering a question on how to acquire land to expand on existing plantations if new varieties were developed, the presenter stated that they will engage farmers to make them available. In responding to a question regarding the kind of support that member countries such as Democratic Republic of Congo and Uganda will be provided in terms of disease control, he stated that they will be provided with measures to curb the disease.

Session 2: Agronomy, Agro-Economy and Quality

This session was moderated by Dr. Christophe Montagnon, Coffee Variety and Coffee Agronomic Practices Expert, RD2 Vision. It consisted of six presentations by researchers from five African countries namely Ethiopia, Democratic Republic of Congo, Rwanda, Togo, and Cote d'Ivoire.

a) Presentation by Mr. Kifle Belachew Bekele, Associate Researcher, Ethiopian Institute of Agricultural Research (EIAR)

The presentation was on '**Sustainable coffee production challenges in developing countries, the case of Ethiopian coffee production**'. The paper highlighted the importance of coffee to Ethiopia and its traditional role in the country including the local consumption of half of its production. It also indicated that most of the farms in Ethiopia are riddled with diseases, among the various challenges to coffee production in the country. This is compounded by the inaccessibility of farmers to chemicals. Sustainable production of coffee is also threatened by the volatility of coffee prices which affect farmers.

Discussion and Comments

A participant expressed worry based on the information provided during the presentation, the FOB price given to farmers has dwindled from about 40% in the 1980s to 10% currently. He therefore enquired on steps being taken to address the price fall. The presenter indicated that in Ethiopia, it is getting worrying since farmers are abandoning farms for other crops and measures need to be taken to reverse this. In a follow up, a participant wanted to know the motivation for farmers to produce more coffee even in the face of low market prices. In answering this, the presenter stated that because coffee is consumed a lot in the country, it has become a culture and therefore people still continue to produce the crop although it may not be economically viable.

b) Presentation by Daniel Dibue Munkamba, Director of Monitoring and Evaluation, Institut National Pour l'Etude et la Recherche Agronomiques (INERA), Democratic Republic of the Congo

The presentation was entitled ‘**Differentiation en racines et tiges feuillées a partir de feuilles cotylédonaire du caféier Robusta. Possibilité de reproduction des plants de caféier atteints par la Rihizoctoniose (fonte de semis) [Differentiation into roots and leaf stems from cotyledonary leaves of the Robusta coffee tree. Possibility of production of coffee plants affected by Rihizoctoniose (damping-off)]**’ The introductory part focused on the economic gains of the crop and how it is propagated. He indicated how the disease adversely affects cultivation and hence aimed his study at recovering such affected plants. He detailed the methodological approach used in the study. He observed significant shade treatment effect in leaf re-development and root development and that light had a significant effect on plant regeneration. Also, diseased plants could be regenerated from unaffected parts of the plant. This provides a cheaper alternative than acquiring new planting materials for resource-poor farmers.

Discussion and Comments

When asked about the effect of the disease on plant vigor after regeneration, he stated that the disease does not affect the plant vigor after regeneration. Answering a question on the yield difference between regenerated plants and unaffected plants, the presenter stated that data on yield was not available. On the cost-effectiveness of recovery of the plant from damping-off, the presenter indicated that it is cost-effective although time consuming and requires some level of technical knowledge.

c) Presentation by Dr. Simon Martin Mvuyekure, Coffee Research Leader, Rwanda Agriculture and Animal Resources Development Board (RAB), Rwanda

The presenter discussed the effect of price volatility, climate change and intercropping systems to stabilize farmers’ income in his presentation “**Stabilizing income in small scale coffee farming systems through crop diversification. The case of coffee banana intercropping practice**”. He explained the use of banana to provide shade and a source of additional income. Different plant densities for coffee and banana were evaluated and the findings indicated that the effect of plant densities was not consistent for the various study years. Planting coffee and banana together did not have a significant effect on coffee yields. However, when banana was added to existing coffee plantation, there was a significant depressive effect on coffee yield. Intercropping did not affect coffee cup quality, and coffee in the intercrop had less rust disease compared to the monocrop.

Discussion and Comments

A participant enquired if any fertilizer was added and if it had any effect. The presenter answered that fertilizer was applied at the recommended rate to the respective treatments and the effect of fertilizer was not studied.

d) Presentation by Dr. Adabe Kokou Edoh, Agroeconomist specialising in Agrobusiness and Researcher, Centre de Recherche Agronomique Zone Forestiere (CRAF), Togo

Presenting his study titled “**Investissement de base et cout de production du café vert robusta au Togo [Basic investment and cost of production of robusta green coffee in Togo]**”, the presenter provided a background information on coffee in Togo and its importance to the country’s agriculture, specifically information on the production of green coffee and the investment in this regard. Total investment in robusta green coffee for the 4-year study was CFA 771,000 per hectare with 65% spent on farm establishment while the remainder (35%) expended on farm management. The findings of the study also indicated that harvest required a lot of labour and 65% of labour was taken up by family members with 35% being hired labour.

Discussion and Comments

Discussants wanted to know if technical (extension) support was provided for production but the presenter indicated that although technical support was taken into account, the study focused on investment. It was suggested that data on youth involvement should be included. It was recommended to carry out the study on a long period in order to assessment the breakeven time for the investment as in the first 4 years of a establishment of a coffee plantation the farmer cannot expect to make the profit.

e) Presentation by Mr. Hyacinthe Legnate, CNRA, Cote D’Ivoire

In his presentation “**Qualites sensorielles de cafes de nouveaux hybrides Robusta pour une utilisation optimisee par l’industrie [Sensory qualities of coffee from new Robusta hybrids for optimized use by industry]**”, Dr Legnate provided a background information on coffee improvement in Cote d’Ivoire. He indicated the importance of cup quality of varieties in different locations, although the focus of the presentation was on the varieties and not the effect of locations on cup quality. Using a sensory panel of 12 assessors, he observed significant differences in cup quality for the different varieties. Based on their sensory profiles, the varieties were grouped into four types. The presenter also indicated that coffee without fermentation was preferred. Strong positive correlation between acidity and aroma was observed among the samples studied.

Discussion and Comments

The presenter indicated that data provided focused on variety and not effect of location. In answering a question on the effect of year of harvest on cup quality, he indicated that the data was pooled for the 3 years over which the study was conducted hence the yearly data was not presented. In clarifying the source of the panel for the sensory analysis, he stated that the sensory panel was not a panel of experts.

f) Presentation by Dr. Okoma Michelle Pamelas, Research Associate, Genetics and Plant Breeding, CNRA, Cote D'Ivoire

Dr. Okoma described a model for use in the coffee sector with the potential to forecast the function and production of the crop in “**Une nouvelle méthode pour prédire le fonctionnement et la production du caféier: le modèle GreenLab [A new method for predicting the function and production of coffee: the GreenLab model]**”. The model could simulate the development and growth of coffee tree. Based on the model, the height of plants and flower activity could be used to predict tree performance. The model enables the prediction of the chronological age of trees. Evaluating the model on 6 coffee species in both dry and wet areas, significant variation in tree growth parameters for the different locations (wet and dry) were identified. The model enables identification of parameters that determine growth in coffee trees by predicting biomass accumulation. This can have an application in developing varieties under a climate change scenario.

3.3 Conclusion

- The sessions of the presentations were engaging and the various speakers provided new insights into areas of coffee research including molecular approaches in breeding, pest and disease control and sustainable production.
- Participants agreed that information sharing among scientists in the coffee sector in Africa is limiting and should be improved.
- Collaborative efforts at sourcing funds for coffee research in Africa should be promoted.
- It is important to enhance coffee research and innovation in the African IACO member countries
- Research should be oriented in a way to solve challenges faced by the coffee farmers
- It is required to strengthen the linkage between research and extension so as to facilitate the dissemination of research findings to farmers