



PROCEEDINGS

77TH PLENARY MEETING OF THE ICAC

2-6 December 2018



COTTON CHALLENGES: SMART AND SUSTAINABLE SOLUTIONS

PROCEEDINGS OF THE 77TH PLENARY MEETING

***“Cotton Challenges:
Smart and Sustainable Solutions”***



ICAC
Washington DC USA

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FOREWORD

On invitation from the Government of the Côte d'Ivoire, the 77th Plenary Meeting of the International Cotton Advisory Committee (ICAC) took place from 2-6 December 2018 in Abidjan.

The International Cotton Advisory Committee is an association of governments having an interest in the production, export, import and consumption of cotton. It is an organization designed to promote cooperation in the solution of cotton problems, particularly those of international scope and significance.

The functions of the International Cotton Advisory Committee, as defined in the Rules and Regulations, are:

- To observe and keep in close touch with developments affecting the world cotton situation.
- To collect and disseminate complete, authentic, and timely statistics on world cotton production, trade, consumption, stocks and prices.
- To suggest, as and when advisable, to the governments represented, any measures the Advisory Committee considers suitable and practicable for the furtherance of international collaboration directed towards developing and maintaining a sound world cotton economy.
- To be the forum of international discussions on matters related to cotton prices.

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Statements of the Meeting, which are an integral part of the full record of the meeting, are placed on www.icac.org/events/plenarymeetings

STATEMENT OF THE 77th PLENARY MEETING

“Cotton Challenges: Smart and Sustainable Solutions”

1. The International Cotton Advisory Committee (ICAC) met in Abidjan, Côte d’Ivoire from 2 through 6 December 2018 for its 77th Plenary Meeting since the establishment of the committee in 1939. The meeting was attended by 385 persons including 22 Member governments, 6 International Organisations and 15 Non-Member governments.

2. Production: The Secretariat is projecting world cotton production for 2018/19 season at 26.12 million tonnes, down from 26.75 million tonnes in the previous season, due to a reduction in planting area, water availability, and limited improvements in yields. Consumption growth has slowed during the period but at 26.8 million tonnes is currently projected to exceed production. Global stocks are expected to decrease overall, leading to a projected stable or a slight increase in cotton prices over the course of the season. Though stock levels in China are reduced, stock levels elsewhere in the world are expected to increase, thereby presenting a total of 18.2 million tonnes against 18.8 million tonnes at the end of the previous season.

3. Future Demand: The Secretariat forecasts that total fibre demand will increase to 121 million tonnes by 2025, implying 25.5 million tonnes of additional demand between 2017 and 2025, which represents an important opportunity for the cotton sector. The Secretariat projected that by increasing the average world cotton consumption per capita to 4 kilograms (the level observed in 2007), the cotton industry would be able to satisfy 28% of the additional projected demand for fibres. If cotton yields in India and sub-Saharan Africa were as high as the world average, cotton production would increase by 5.3 million tonnes.

4. Government Support to the Cotton Sector Increased in 2017/18: The Secretariat reported that even though market prices rose and minimum support price programs were not triggered in a number of countries, ICAC’s annual report on government measures for cotton shows that an estimated value of the support, including border protection, direct subsidies and crop insurance aid, increased by 33% in 2017/18 to US\$5.9 billion from US\$4.4 billion in 2016/17, principally due to increased production.

5. Combating the Effects of Climate Change on Cotton: The Intergovernmental Panel on Climate Change (IPCC) projected that climate change will result in a substantial loss in agricultural productivity. About 56% of the global cotton area is dependent on rain, and water stress can lead to significant reduction in yields. Climate change may introduce heat waves, increasing risks of enhanced insect pest problems, also bolls with reduced weight and poor boll retention, thereby leading to yield losses and deterioration in fibre quality. The Committee was informed that increased levels of atmospheric CO₂ may lead to higher yields. The Committee urged governments to encourage the development of climate-resilient cultivars with high water-use-efficiency, high nutrient-use-efficiency and with potential to adapt and withstand unpredictable drought, changes in heat, waterlogging, increased insect pests and diseases.

6. Mechanisation, Drones and Robotics for Small-Scale Farms: Cotton is a labour-intensive crop in developing and least-developed countries. Labour shortages and higher wages in nations where cotton is currently manually harvested may result in delayed harvesting, thus leading to quality deterioration. Even for small farms, mechanisation could enhance efficiency and reduce costs. The costs of manual picking in some countries are about US\$100 to US\$120 per tonne, and an economical mechanical cotton picker could increase efficiency by 5 to 10 times compared to manual picking. The Committee was informed that recent advances in drones and robotics open new avenues and opportunities for their deployment for small-scale cotton production systems, for multiple activities relating to the management of the crop.

7. Technical Seminar: Combating Pest Resistance to Biotech Cotton and Pesticides: Insect resistance to Bt-cotton and weed resistance to herbicides have emerged as challenges to the efficacy of biotech cotton across the world. The phenomenon of resistance is currently being countered by adding more and more new genes to develop new biotech varieties. However, the addition of new genes takes time and indirectly increases production costs. As such, the emergence of Bt-resistant bollworms poses a new challenge to cotton crop production systems, whilst the recent instances of pink bollworm resistance to Cry1Ac and Cry2Ab proteins will have serious consequences. Insecticide-

resistant whiteflies not only cause severe crop damage, but also transmit the cotton leaf curl virus. Bollworms, whiteflies and cotton leaf curl virus can cause debilitating effects on cotton production. The Committee noted the presentations and their recommendations to endorse a rigorous pest resistance management strategy together with growers and the industry.

8. Inter-Governmental Policies on Seed-Exchange: The Committee was informed that the exchange of seeds (germplasm) between countries can facilitate progress in agriculture. The narrow genetic base available for cotton improvement in major cotton-producing countries — and the ever-changing market demands for specific fibre qualities, along with the need to improve yields — make seed exchange important across countries. Access to new germplasm holds the key to genetic improvement, enhancement of genetic diversity, and expanding genetic variability for useful traits. The speakers recommended that governments develop a roadmap to create a global platform that operates as a smooth and trustworthy channel of seed exchanges amongst countries across borders. They were also urged to create an International Cotton Research Institute under the CGIAR system, which could act as a research and educational institute and a global repository of germplasm sources that could be freely shared.

9. Biotechnology: The Committee was informed that new biotechnology tools (NBTs) are being used to enhance the performance of commercial cotton varieties. Scientists in Latin America are using these new tools in the form of Cry10Aa to protect cotton from the boll weevil, thereby promising a dramatic reduction in insecticide use.

10. #TruthAboutCotton: The Secretariat informed participants in the Plenary Meeting that the #TruthAboutCotton campaign uses statistics, research and verifiable facts to counter misleading claims told about the cotton industry. The campaign aims to empower the global cotton value chain to support the hundreds of millions of people around the world who depend upon cotton for their livelihoods.

11. Cotton By-products: New uses for the by-products of cotton production, such as stalks and material remaining after ginning, are being developed in order to enhance the income of farmers. Products produced include 100% biodegradable packaging material as well as composites used in construction and other products.

12. World Café: The ICAC conducted a World Café conversation on organic cotton. Topics discussed were farm economics, ecology and environment, innovation and R&D, organic seed production, processing, diversification and policies. Yield improvement in organic cotton production is still an area where more research is needed. One suggestion was to have dedicated zones for organic cottonseed production and ginning to facilitate the production and marketing of organic cotton. Market intelligence for organic cotton should be strengthened. Some participants suggested that there is a need to develop policies for organic cotton production on national and regional levels.

13. Topic of 2019 Technical Seminar: The Committee decided to hold the 2019 Technical Seminar on the topic of ‘Cotton Traceability Technologies’.

14. Strategic Plan: Following their recommendation at the last Plenary Meeting in Tashkent, Uzbekistan, to conduct a Strategic Review, the Committee was updated with the results of that review and presented with the proposed ICAC Strategic Plan 2019-2021. The Plan was formed as a result of 12 months consultation with stakeholders at different levels, and its seven core objectives form a strong starting point to ensure the organisation is fit for purpose for the future. Following a unanimous recommendation from the Standing Committee, the Strategic Plan was approved.

15. Future Plenary Meeting: The Committee has accepted an invitation from the government of Australia to host the 78th Plenary Meeting from 1 through 5 December 2019 in the city of Brisbane.

16. Appreciation to the Host Country: The Committee thanks the people, the Organising Committee and the government of Côte d’Ivoire for hosting the 77th Plenary Meeting. Delegates commented very favourably on the quality of the venue, the efficiency of the preparations, and the warmth of the traditional Ivorian welcome.


**INTERNATIONAL COTTON
ADVISORY COMMITTEE**
December 5, 2018
Supply and Distribution of Cotton
Seasons begin on August 1

	2013/14	2014/15	2015/16	2016/17	2017/18 Est.	2018/19 Proj.
million metric tonnes						
Beginning stocks						
World Total	19.43	21.33	22.97	20.33	18.81	18.76
China	10.81	13.28	14.12	12.65	10.63	8.57
USA	0.83	0.51	0.79	0.83	0.60	0.94
Production						
World Total	26.22	26.23	21.48	23.08	26.75	26.12
India	6.77	6.56	5.75	5.87	6.35	6.05
China	7.00	6.60	5.20	4.90	5.89	5.94
USA	2.81	3.55	2.81	3.74	4.56	4.01
Pakistan	2.08	2.31	1.54	1.66	1.80	1.75
Brazil	1.73	1.56	1.29	1.53	2.01	2.31
Uzbekistan	0.91	0.89	0.83	0.79	0.80	0.80
Others	4.93	4.77	4.07	4.59	5.36	5.27
Consumption						
World Total	24.10	24.59	24.14	24.50	26.81	26.72
China	7.60	7.55	7.60	8.00	9.20	8.45
India	5.09	5.38	5.30	5.15	5.20	5.25
Pakistan	2.47	2.47	2.15	2.15	2.35	2.35
Europe and Turkey	1.61	1.69	1.69	1.61	1.63	1.85
Bangladesh	1.13	1.20	1.32	1.41	1.66	1.81
Vietnam	0.67	0.88	1.01	1.17	1.53	1.61
USA	0.77	0.78	0.75	0.71	0.77	0.74
Brazil	0.86	0.80	0.66	0.69	0.72	0.76
Others	3.90	3.85	3.67	3.62	3.75	3.90
Exports						
World Total	9.02	7.76	7.52	8.18	9.00	9.42
USA	2.29	2.45	1.99	3.25	3.45	3.27
India	2.02	0.91	1.26	0.99	1.13	0.96
CFA Zone	0.97	0.97	0.96	0.97	1.05	1.28
Brazil	0.49	0.85	0.94	0.61	0.91	1.38
Uzbekistan	0.62	0.55	0.50	0.40	0.30	0.34
Australia	1.06	0.53	0.62	0.81	0.85	0.76
Imports						
World Total	8.86	7.80	7.58	8.09	9.00	9.42
Bangladesh	1.11	1.18	1.38	1.41	1.67	1.80
Vietnam	0.69	0.93	1.00	1.20	1.57	1.65
China	3.07	1.80	0.96	1.10	1.27	1.62
Turkey	0.92	0.80	0.92	0.80	0.88	0.79
Indonesia	0.65	0.73	0.64	0.74	0.79	0.83
Trade Imbalance 1/	-0.16	0.04	0.06	-0.09	0.00	0.00
Stocks Adjustment 2/	-0.06	-0.05	-0.03	-0.01	0.00	0.00
Ending Stocks						
World Total	21.33	22.97	20.33	18.81	18.76	18.16
China	13.28	14.12	12.65	10.63	8.57	7.66
USA	0.51	0.79	0.83	0.60	0.94	0.94
Ending Stocks/Mill Use (%)						
World less China 3/	49	52	46	50	58	57
China 4/	175	187	166	133	93	91
Cotlook Index A 5/	90.53	70.78	70.39	82.77	87.98	

1/ The inclusion of linters and waste, changes in weight during transit, differences in reporting periods and measurement error account for differences between world imports and exports.

2/ Difference between calculated stocks and actual; amounts for forward seasons are anticipated.

3/ World-less-China's ending stocks divided by world-less-China's mill use, multiplied by 100.

4/ China's ending stocks divided by China's mill use, multiplied by 100.

5/ US cents per pound.

Заключительное заявление 77-го Пленарного заседания

«Проблемы хлопка: Умные и рациональные решения»

1. Международный Консультативный Комитет по хлопку (ICAC) собрался в г. Абиджан, Кот-д'Ивуар со 2-е по 6-е декабря 2018 года на свое 77-е со дня создания Комитета в 1939 году Пленарное заседание. На заседании присутствовало 385 человек, в том числе представители 22 правительств-членов, 6 международных организаций и 15 стран, не являющихся членами.

2. Производство: По прогнозу Секретариата в сезоне 2018/19 года объем мирового производства хлопка составит 26,12 млн. тонн, т.е. снизится относительно объема в 26,75 млн. тонн в предыдущем сезоне из-за сокращения посевных площадей, водообеспеченности и ограниченного роста урожайности. За этот период прирост потребления хлопка замедлился, однако поскольку потребление хлопка составляет 26,8 млн. тонн, то согласно текущему прогнозу потребление превысит объем производства. Ожидается, что объем мировых запасов в целом сократится, и это приведет к прогнозируемому стабильному или незначительному росту цен на хлопок в течение сезона. Несмотря на то, что объем запасов в Китае сократился, ожидается, что запасы в других странах мира увеличатся, и, таким образом составят 18,2 млн. тонн по сравнению с 18,8 млн. тонн на конец предыдущего сезона.

3. Будущий спрос: Секретариат прогнозирует, что к 2025 году совокупный спрос на волокно увеличится до 121 млн. тонн, что предполагает образование дополнительного спроса в объеме 25,5 млн. тонн в период с 2017 по 2025 год, и это создает важную перспективу для хлопкового сектора. Секретариат спрогнозировал, что, если среднее потребление хлопка на душу населения в мире увеличится до 4 килограммов (уровень, отмеченный в 2007 году), то хлопковая отрасль сможет удовлетворить прогнозируемый дополнительный спрос на волокно на 28%. Если бы урожайность хлопка в Индии и в странах Африки к югу от Сахары находилась на уровне среднего мирового показателя, то производство хлопка увеличилось бы на 5,3 млн. тонн.

4. В 2017/18 г. поддержка хлопкового сектора со стороны правительств выросла: Секретариат сообщил, что даже несмотря на то, что рыночные цены выросли, и что в ряде стран программы поддержки при минимальных ценах не

были запущены, ежегодный отчет ICAC о мерах правительств по хлопку показывает, что оценочная стоимость поддержки, включая охрану границ, прямые субсидии и помощь по страхованию урожая возросла с 4,4 млрд. долл. США в 2016/17 г. на 33% в 2017/18 г. и составила 5,9 млрд. долл. США главным образом благодаря росту производства.

5. Борьба с последствиями изменения климата для хлопка:

Межправительственная группа экспертов по изменению климата (МГЭИК) спрогнозировала, что изменение климата приведет к существенному снижению производительности сельского хозяйства. Около 56% площадей, занятых в мире под хлопок, зависят от дождей, и нехватка воды может привести к значительному снижению урожайности. Изменение климата может приводить к периодам сильной жары, повышению риска обострения проблем с насекомыми-вредителями, а также к появлению коробочек с уменьшенным весом и ухудшению их удерживания, что тем самым приводит к сокращению урожайности и ухудшению качества волокна. Комитет был информирован о том, что увеличение уровня содержания CO₂ в атмосфере может приводить к повышению урожайности. Комитет призвал правительства поощрять разработку устойчивых к изменению климата сортов с высокой эффективностью водопользования, высокой эффективностью усвоения питательных веществ и с потенциалом к адаптации и противостоянию против непредсказуемой засухи, изменений температур, заболачивания, роста числа насекомых-вредителей и болезней.

6. Механизация, беспилотные летательные аппараты и робототехника для небольших хозяйств:

В развивающихся и наименее развитых странах хлопок является трудоемкой культурой. Нехватка рабочей силы и более высокая заработная плата в странах, где хлопок в настоящее время собирают вручную, могут приводить к задержке сбора урожая, что приводит к снижению качества. Даже в небольших хозяйствах механизация может повышать эффективность и снижать себестоимость. В некоторых странах стоимость ручного сбора составляет около 100-120 долл. США за тонну, а бюджетный механический хлопкоуборочный комбайн может повышать эффективность в 5-10 раз по сравнению с ручным сбором. Комитет был проинформирован о том, что последние разработки беспилотных летательных аппаратов и робототехники открывают новые горизонты и возможности для их внедрения в небольшие системы по производству хлопка, а также для их включения в многочисленные виды деятельности, связанной с управлением урожаем.

7. Технический семинар: Борьба с устойчивостью вредителей к

биотехнологическому хлопку и пестицидам: Устойчивость насекомых к Bt-хлопку и устойчивость сорняков к гербицидам бросает вызов эффективности биотехнологического хлопка во всем мире. В настоящее время с этим проявлением устойчивости ведется борьба путем добавления все большего и большего количества новых генов для создания новых биотехнологических сортов. Однако добавление новых генов занимает много времени и косвенно

увеличивает производственные затраты. Таким образом, появление резистентных к *Bt*-хлопку коробочных червей бросает новые вызовы системам выращивания хлопка на фоне того, что недавние случаи устойчивости розового коробочного червя к белкам Cry1Ac и Cry2Ab будут иметь серьезные последствия. Устойчивые к инсектицидам белокрылки не только наносят серьезный ущерб урожаю, но также передают вирус курчавости листьев хлопка. Коробчатые черви, белокрылки и вирус курчавости листьев хлопка могут оказывать истощающее воздействие на производство хлопка. Комитет принял к сведению презентации и содержащиеся в них рекомендации относительно одобрения радикальной стратегии борьбы с вредителями вместе с производителями и отраслью.

8. Межправительственная политика в области обмена семенами: Комитет был информирован о том, что обмен семенами (зародышевой плазмой) между странами может способствовать развитию сельского хозяйства. Узкая генетическая база, доступная для улучшения хлопка в основных странах-производителях хлопка, и постоянно меняющийся рыночный спрос на конкретные качества волокна, а также необходимость повышения урожайности обуславливают важность обмена семенами между странами. Доступ к новой зародышевой плазме является ключом к генетическому улучшению, расширению генетического разнообразия и расширению генетической изменчивости для полезных признаков. Выступавшие рекомендовали, что правительствам необходимо разработать дорожную карту для создания глобальной платформы, которая действует как бесперебойный и надежный канал трансграничного обмена семенами между странами. Правительства также призвали создать Международный исследовательский институт хлопка в рамках системы Консультативной группы по международным сельскохозяйственным исследованиям (CGIAR), который мог бы действовать в качестве исследовательского и учебного института, а также глобального хранилища источников зародышевой плазмы, которыми можно свободно обмениваться.

9. Биотехнология: Комитет был информирован о том, что для повышения эффективности коммерческих сортов хлопка используются новые инструменты биотехнологии (НИБ). Ученые в Латинской Америке используют эти новые инструменты в форме Cry10Aa для защиты хлопка от американского долгоносика, что создает перспективу значительного сокращения применения инсектицидов.

10. #TruthAboutCotton:- Секретариат проинформировал участников Пленарного заседания о том, что в рамках кампании #TruthAboutCotton (Истина о хлопке) используются статистические данные, результаты исследований и поддающиеся проверке факты для противодействия дезориентирующим заявлениям относительно хлопковой отрасли. Данная кампания направлена на развитие глобальной цепочки добавления стоимости хлопка для поддержки сотен

миллионов людей во всем мире, которые зависят от хлопка как источника средств к существованию.

11. Побочные продукты хлопка: В целях повышения доходов фермеров разрабатываются новые виды использования побочных продуктов производства хлопка, таких как стебли и материал, остающийся после очистки хлопка-сырца. Производимые продукты включают 100% биоразлагаемый упаковочный материал, а также композиты, используемые в строительстве, и другие продукты.

12. Всемирное кафе: В рамках Всемирного кафе ICAC провел обсуждение органического хлопка. Обсуждались такие темы, как экономика сельского хозяйства, экология и окружающая среда, инновации и НИОКР, производство, переработка и диверсификация семян, а также политика в области их производства. Повышение урожайности при производстве органического хлопка все еще является областью, где необходимы дополнительные исследования. Одним из предложений была организация специальных зон для производства семян органического хлопка и очистки хлопка-сырца для содействия производству и сбыту органического хлопка. Следует активизировать маркетинг органического хлопка. Некоторые участники высказали мнение о необходимости разработки политики на национальном и региональном уровнях в области производства органического хлопка.

13. Тема технического семинара в 2019 году: Комитет принял решение провести в 2019 году Технический семинар 2019 года на тему «Технологии отслеживания хлопка».

14. Стратегический план: В соответствии с рекомендацией, принятой на последнем Пленарном заседании в Ташкенте, Узбекистан, о проведении Стратегического обзора, Комитет получил результаты этого обзора, и ему был представлен проект Стратегического плана ICAC на 2019–2021 годы. Этот План был составлен на основе 12-месячных консультаций на различных уровнях с заинтересованными сторонами, и его семь основных целей образуют надежную отправную точку для обеспечения того, чтобы организация соответствовала своим целям в будущем. В соответствии с единогласно принятой рекомендацией Постоянного комитета Стратегический план был утвержден.

15. Будущее пленарное заседание: Комитет принял приглашение правительства Австралии провести 78-е Пленарное заседание в течение со 1 по 5 декабря 2019 года в городе Брисбен.

16. Благодарность принимающей стране: Комитет благодарит народ, Организационный комитет и правительство Кот-д'Ивуара за проведение 77-го Пленарного заседания. Делегаты очень положительно отзывались о качестве места проведения, эффективности подготовки, а также о традиционном теплом гостеприимстве Кот-д'Ивуара.

10. **#TruthAboutCotton** : أبلغت الأمانة المشاركون في الجلسة العمومية أن حملة #TruthAboutCotton تستخدم الإحصائيات والبحوث والحقائق التي يمكن التحقق منها لمواجهة المطالبات المضللة التي يتم تناقلها بخصوص صناعة القطن. و تهدف الحملة إلى تمكين سلسلة القيمة العالمية للقطن لدعم مئات الملايين من الناس في جميع أنحاء العالم ممن يعتمدون على القطن في معيشتهم.

11. **المنتجات الثانوية للقطن**: يجري تطوير استخدامات جديدة للمنتجات الثانوية لإنتاج القطن ، فعلى سبيل المثال يتم تطوير السيقان والمواد المتبقية بعد الحلق من أجل تعزيز دخل المزارعين. و تشمل هذه المنتجات مواد التعبئة القابلة للتحلل بنسبة 100 % بالإضافة إلى المواد المركبة المستخدمة في الإنشاءات والمنتجات الأخرى.

12. **المقهي العالمي**: أجرت اللجنة الاستشارية الدولية للقطن (ICAC) نقاشاً في إطار مقهى عالمي حول القطن العضوي. و قد شملت الموضوعات التي نوقشت اقتصاديات المزارع و الإيكولوجيا و البيئة، و الابتكار و الأبحاث و التطوير، و إنتاج البذور العضوية، و المعالجة، و التنوع و السياسات. و لا يزال التحسن في إنتاج القطن العضوي مجاًلاً يحتاج إلى المزيد من الأبحاث. و أشارت إحدى المقترحات إلى تخصيص مناطق تُحدّد لإنتاج وحلج القطن الزهر العضوي لتسهيل إنتاج وتسويق القطن العضوي. و ينبغي تعزيز استعلامات السوق للقطن العضوي. هذا و قد اقترح بعض المشاركون أن هناك حاجة لوضع سياسات لإنتاج القطن العضوي على المستويين الوطني والإقليمي.

13. **موضوع الندوة التقنية لعام 2019** : قررت اللجنة عقد الندوة التقنية لعام 2019 حول موضوع "تقنيات تتبع القطن".

14. **الخطة الاستراتيجية**: متابعة للتوصية التي اتخذت في الجلسة العمومية الأخيرة التي عقدت في طشقند بأوزبكستان لإجراء مراجعة استراتيجية، تم موافاة اللجنة بنتائج مستكملة لهذه المراجعة و تم عرضها مع خطة اللجنة الاستشارية الدولية للقطن (ICAC) الاستراتيجية المقترحة لفترة 2019 – 2021. و قد تم وضع الخطة بعد مشاور على مدى 12 شهراً مع أصحاب المصلحة على مستويات مختلفة و تشكل أهدافها السبعة الأساسية نقطة انطلاق قوية لضمان أن المنظمة صالحة للغرض في المستقبل. و بعد التوصية بالإجماع من طرف اللجنة الدائمة ، تمت الموافقة على الخطة الاستراتيجية.

15. **الجلسة العامة المقبلة**: قبلت اللجنة دعوة من حكومة أستراليا لاستضافة الجلسة العمومية الثامنة و السبعين و ذلك من 1 إلى 5 من شهر ديسمبر 2019 في مدينة بريسبين.

16. **التقدير إلى البلد المضيف**: تشكر اللجنة الشعب واللجنة التنظيمية وحكومة كوت ديفوار على استضافة الجلسة العمومية السابعة و السبعين. و علّق المندوبون بنحو إيجابي للغاية على جودة المكان و فعالية التحضيرات و دفء الترحيب الإيفواري التقليدي.

مستويات ثاني أكسيد الكربون في الغلاف الجوي قد يؤدي إلى زيادة الغلال. هذا وقد حثت اللجنة الحكومات على تشجيع تطوير أصناف تتكيف مع المناخ و تتسم بكفاءة عالية في استخدام المياه، وكفاءة عالية في استخدام المغذيات إلى جانب القدرة على التكيف مع الجفاف الذي لا يمكن التنبؤ به و تحمله، و التغيرات في درجات الحرارة، و التغدق، و زيادة آفات الحشرات و الأمراض.

6. **الميكنة ، الطائرات بدون طيار، و الروبوتات للمزارع صغيرة الحجم:** يعتبر القطن محصولاً كثيف العمالة في البلدان النامية و البلدان الأقل نمواً. و قد ينتج عن النقص في اليد العاملة و ارتفاع الأجور في الدول التي يتم فيها جني القطن يدوياً في الوقت الحاضر تأخير الحصاد ، مما يؤدي إلى تدهور الجودة. و حتى بالنسبة للمزارع الصغيرة، فيمكن للميكنة أن تعزز الفعالية و أن تخفض من التكاليف. و تبلغ تكاليف الجني اليدوي في بعض البلدان حوالي 100 دولار - 120 دولاراً أمريكياً للطن الواحد ، و يمكن أن تزيد آلة جني القطن الميكانيكية الاقتصادية من الفعالية بنسبة 5-10 مرات مقارنة بالجني اليدوي. و قد تم إبلاغ اللجنة بأن التطورات الحديثة في الطائرات بدون طيار و الروبوتات تفتح آفاقاً و فرصاً جديدة لنشرها في نظم إنتاج القطن الصغيرة النطاق ، و ذلك بهدف إدراجها في أنشطة متعددة ذات صلة بإدارة المحاصيل.

7. **الندوة الفنية: مكافحة مقاومة الآفات للقطن البيوتك (المعدل وراثياً) و لمبيدات الحشرات:** برزت مقاومة الحشرات للقطن Bt (البيوتك - المعدل وراثياً) و مقاومة الحشائش لمبيدات الأعشاب كتحدٍ لفعالية القطن البيوتك في جميع أنحاء العالم. و يجري حالياً التصدي لظاهرة المقاومة من خلال إضافة المزيد و المزيد من الجينات الجديدة لتطوير أنواع جديدة من التكنولوجيا الحيوية. و مع ذلك ، فإن إضافة جينات جديدة تستغرق وقتاً طويلاً و تزيد بشكل غير مباشر تكاليف الإنتاج. و هكذا، فإن ظهور دودة لوزة القطن المقاومة للتكنولوجيا البيولوجية يشكل تحديات جديدة لنظم إنتاج محصول القطن، في حين أن الحالات الحديثة لمقاومة دودة لوزة القطن القرنفلية للبروتينات Cry1Ac و Cry2Ab سيكون لها عواقب وخيمة. و الذبابة البيضاء المقاومة لمبيدات الحشرات لا تسبب ضرراً شديداً بالمحاصيل فحسب ، بل أنها تنقل أيضاً فيروس تجعد ورق القطن. هذا و يمكن أن يكون لدودة لوزة القطن القرنفلية، و الذباب الأبيض، و فيروس تجعد ورق القطن الآثار الضارة على إنتاج القطن. و قد لاحظت اللجنة العروض و توصياتها الهادفة إلى تأييد استراتيجية صارمة لإدارة مقاومة الآفات بالاشتراك مع المزارعين و القطاع الصناعي.

8. **السياسات المشتركة بين الحكومات بشأن تبادل البذور:** تم إبلاغ اللجنة بأنه يمكن لتبادل البذور (الجرمبلازم germplasm) بين البلدان أن يكون له الدور في تيسير إحراز تقدم في الزراعة. إن القاعدة الوراثية الضيقة المتاحة لتحسين القطن في البلدان الرئيسية المنتجة للقطن، و متطلبات السوق دائمة التغير لألياف ذات سمات محددة، إلى جانب الحاجة إلى تحسين المحاصيل، تجعل تبادل البذور مهماً في جميع البلدان. إن الحصول على البذور (الجرمبلازم) الجديدة يحمل مفتاح التحسين الوراثي ، وتعزيز التنوع الجيني ، و توسيع التباين الوراثي للصفات المفيدة. و قد أوصى المتحدثون بالحكومات بضرورة وضع خارطة طريق لإنشاء منصة عالمية تعمل كقناة سلسلة و جديرة بالثقة لتبادل البذور بين البلدان و عبر الحدود. كما تم حثهم على إنشاء معهد دولي لبحوث القطن في إطار نظام CGIAR ، والذي يمكن له أن يكون بمثابة معهد بحثي و تعليمي ومستودع عالمي لمصادر الجرمبلازم التي يمكن المشاركة بها بحرية.

9. **التكنولوجيا البيولوجية:** تم إبلاغ اللجنة أنه يجري استخدام أدوات التكنولوجيا البيولوجية الجديدة (NBTs) لتحسين أداء الأصناف التجارية من القطن. يستخدم العلماء في أمريكا اللاتينية هذه الأدوات الجديدة في شكل Cry10Aa لحماية القطن من سوسة لوزة القطن، مما يعد بحدوث انخفاض هام للغاية في استخدام مبيدات الحشرات.

البيان الختامي للجلسة العمومية السابعة والسبعين

" تحديات القطن: حلول ذكية و مستدامة "

1. اجتمعت اللجنة الاستشارية الدولية للقطن (ICAC) في مدينة أبيدجان في الكوت ديفوار في الفترة بين الثاني و السادس من شهر ديسمبر/ كانون الأول 2018 في جلستها العمومية السابعة و السبعين منذ إنشاء اللجنة في عام 1939. و قد حضر الاجتماع 385 شخصاً من بينهم ممثلون عن 22 دولة عضو ، و 6 منظمات دولية و 15 حكومة ليست أعضاء.
2. **الإنتاج:** تتوقع الأمانة العامة أن يصل إنتاج القطن العالمي في موسم 2018/ 2019 إلى حوالي 26.12 مليون طن، بما يمثل انخفاضاً من 26.75 مليون طن في الموسم السابق و ذلك بسبب تقلص مساحة الزراعة، و توافر المياه ، و التحسينات المحدودة للإنتاج. هذا و قد تباطأ نمو الاستهلاك خلال هذه الفترة ، و لكن من المتوقع في الوقت الحالي أن يتجاوز مستواه الذي وصل إلى نحو 26.8 مليون طن الإنتاج. و من المتوقع أن تنخفض المخزونات العالمية عموماً، مما سيؤدي إلى استقرار متوقع أو زيادة طفيفة في أسعار القطن على مدار الموسم. و على الرغم من انخفاض مستويات المخزون في الصين ، فمن المتوقع أن ترتفع مستويات المخزون في أماكن أخرى من العالم ، بما يمثل مجموعاً يبلغ نحو 18.2 مليون طن مقابل حوالي 18.8 مليون طن في نهاية الموسم السابق.
3. **الطلب المستقبلي:** تشير توقعات الأمانة العامة إلى أن الطلب على كافة الألياف سوف يزداد ليصل إلى حوالي 121 مليون طن بحلول عام 2025 ، و يعني ذلك حوالي 25.5 مليون طن من الطلب الإضافي بين عامي 2017 و 2025 ، و يمثل ذلك فرصة مهمة لقطاع القطن. و قدّرت الأمانة العامة أنه بزيادة متوسط نصيب الفرد من استهلاك القطن في العالم إلى 4 كيلو غرامات (المستوى المرصود في عام 2007) ، تصبح صناعة القطن قادرة على تلبية 28 % من الطلب الإضافي المتوقع على الألياف. و إذا كان مستوى غلال القطن في الهند و أفريقيا جنوب الصحراء الكبرى عالياً بنفس مستوى المتوسط العالمي ، فسوف يزداد عندئذ إنتاج القطن بحوالي 5.3 مليون طن.
4. **زيادة دعم الحكومة لقطاع القطن في الفترة 2017/ 2018:** أبلغت الأمانة العامة أنه على الرغم من أن أسعار السوق ارتفعت وأنه لم يتم إطلاق الحد الأدنى لأسعار الدعم في عدد من البلدان ، فإن التقرير السنوي للجنة الاستشارية الدولية للقطن (ICAC) بشأن التدابير الحكومية للقطن يبين أن القيمة التقديرية للدعم ، بما يشمل الحماية الحدودية، و الدعم المباشر، و المعونة لتأمين المحاصيل قد ارتفعت بنسبة 33 % في 2017/ 2018 لتصل إلى 5.9 مليار دولار أمريكي مقارنة بمبلغ 4.4 مليار دولار أمريكي في 2016/ 2017 و يرجع ذلك بشكل أساسي إلى زيادة الإنتاج.
5. **مكافحة آثار تغير المناخ على القطن:** أشارت توقعات الفريق الحكومي الدولي المعني بتغير المناخ (IPCC) إلى أن تغير المناخ سوف يؤدي إلى خسارة كبيرة في الإنتاجية الزراعية. تعتمد حوالي 56 % من مساحة القطن العالمية على الأمطار، و يمكن أن يؤدي الإجهاد المائي إلى انخفاض كبير في المحاصيل. و قد يؤدي تغير المناخ إلى موجات حرارة ، و الزيادة من مخاطر تعزيز مشاكل الآفات الحشرية ، و كذلك اللوزات ذات الوزن المنخفض، و الضعف في الاحتفاظ باللوزة، مما يؤدي إلى خسائر في المحصول وتدهور في جودة الألياف. و قد تم إبلاغ اللجنة أن زيادة

Inaugural Session

9:00 hrs. Monday, 3 December 2018

Chair: Mr. Mamadou Sangafoa Coulibaly, Minister of Agriculture and Rural Development of Côte d'Ivoire

Dr. Adama Coulibaly, the President of the Organising Committee and Director General of Cotton and Cashew Council of Côte d'Ivoire, presented welcoming remarks thanking all delegates for attending this Plenary Meeting of the ICAC, organisation founded in 1939 and playing a very important role in cotton value chain. He thanked the Minister of Agriculture and the Minister of Culture for accepting an invitation to attend and address this meeting as a very important forum for cotton sector in Côte d'Ivoire. He expressed his gratitude to the ministries for all of their efforts in organising this meeting. He also thanked the Secretary General Mr. Kai Hughes and the Secretariat of the ICAC for their efforts in organising this meeting in collaboration with the organising committee. He noted that ICAC is an important platform where 29 members have a very meaningful discussion on issues affecting the cotton value chain, providing statistics and information to members and helping to mobilize efforts to assist stakeholders for improvements in the sector. The theme of the meeting: "Cotton Challenges: Smart and Sustainable Solutions" and all the topics of the sessions will provide a great opportunity to address major challenges faced by the cotton sector and to find solutions. He wished the participants a great stay in Abidjan and in the country, noting that the elephant is a symbol of Côte d'Ivoire.

Mr. Tokhir Kuliev, the delegate of Uzbekistan presented welcoming remarks on behalf of the government of Uzbekistan. He thanked the staff of the ICAC and the government of the Republic of Côte d'Ivoire for organising this Plenary Meeting. He noted that Uzbekistan is one of the major producers and exporters of cotton. Annually, Uzbekistan grows 2.3 million tons of seed cotton on 1.1 million hectares, or an equivalent of about 600-650 thousand tons of cotton fibre and 900-950 thousand tons of seeds. In October 2017 Tashkent hosted the 76th Plenary Meeting of the ICAC, attended by 345 delegates from 16 member countries, 4 international organisations and 9 non-member countries. The Plenary Meeting gave a powerful incentive to further develop the cotton industry in Uzbekistan. The theme of that meeting "Cotton in the era of globalization and technological progress" reflected the need to modify and standardise the fibre classification methodology in Uzbekistan, review pricing policy, the development of new biotechnologies and the exchange of technologies and best practice between cotton producers.

Based on the recommendations of the Plenary Meeting, the President of the Republic of Uz-

bekistan issued a Decree "On measures for fundamental improvement of the management system in the cotton industry". This Decree includes requirements to ensure the implementation of a unified policy in the organisation and implementation of a complex works on the acceptance, storage and processing of raw cotton, treatment of cotton seeds and the creation of modern plants for the production of high-quality cotton products that meet international standards. An integrated organisation, named JSC "Uzpakhtasanoat" has been established in Uzbekistan to manage all 98 ginneries, more than 400 cotton procurement centres and over 20 cotton terminals.

Another Decree was issued by the President of the Republic of Uzbekistan "On measures to create modern forms of organisation of cotton and textile production". This document initiated large-scale work on the creation of cotton-textile clusters. Cultivation of cotton, its harvesting and processing, yarn manufacturing, as well as the production of finished goods within a single cluster shall bring greater economic benefits. Clusters will make independent decisions on investing, the volumes of raw cotton production, selecting cotton varieties, and more importantly, selling their products both on the domestic market and for export. To date, 15 clusters have already been formed; the creation of 44 clusters is planned for 2019.

Another step in reforming the cotton industry was the Decree by the President of the Republic of Uzbekistan "On measures to fundamentally improve the activities of JSC "Pakhtasanoat Ilmiy Markazi" (Cotton Industry Science Centre). The aim of the Decree is to increase the Centre's efficiency, conduct innovative upgrades and technical and technological modernisation. The Centre shall assist the cotton industry in raising production capacity, strengthening its competitiveness, creating new systems and introducing modern technologies.

Mr. Kuliev wished success to this Plenary Meeting and expressed his confidence that this Plenary Meeting will provide the opportunity to address important issues covered by the theme of the event - "Cotton Challenges: Intellectual and Sustainable Solutions" and will provide an opportunity to exchange information, establish new, mutually beneficial contacts and to exchange views and experiences. His welcoming remarks is a statement of the meeting.

The CHAIR introduced Mr. Kai Hughes and asked him to give his report as Secretary General.

The Secretary General reported that Côte d'Ivoire and Africa represented the future potential for cotton. Africa produces around 6% of the

world's cotton of which around 70% is exported abroad. He noted that if more of this exported cotton could be spun and made into finished products in Africa it would have the potential of earning billions of dollars in additional revenue annually as well as employing millions of extra people. With a projected growth in population of 1.15 billion by 2030 and an increasing number of middle class incomes cotton needs to produce more to satisfy this extra demand and that can only come about from either increased acreage or increased yields. This is where Africa can have a huge impact and where it has the biggest potential. It has the land mass and a huge amount of uncultivated land that could possibly be suitable for cotton cultivation. But the biggest potential for Africa to fill the projected shortfall in cotton demand was yields. He highlighted that if we take the top five producers of raw cotton in Africa; Burkina Faso, Mali, Benin, Côte d'Ivoire and Cameroon and their yields were increased to the global average this would equate to an increase of almost 1 million tonnes of cotton.

He reminded everyone that last year as the brand-new Secretary General of the ICAC he had suggested then that it was time to review the structure of ICAC, the way it was governed and funded, the functions it performed and the services it provided. The strategic plan that has been produced will not only make the ICAC fit for purpose for the future but will also produce a more dynamic, innovative and efficient ICAC. The ICAC serves a unique and important role within the world of cotton and textile industry and it is only right that its role should evolve and grow in response to current challenges to create a bigger, more effective ICAC that not only adds value first to its member governments, but also to the whole of the cotton and textile value chain.

He noted that the ICAC was a central point of information on cotton issues and how the organisation must improve its use of information technology and social media to reach more and more people, more effectively. To do this, it had launched the 'Truth about Cotton' campaign and along with the International Forum for Cotton Promotion (IFCP) the ICAC will be producing fact sheets that can be used either to brief journalists, ministers, academic institutions etc or simply for anyone to use in presentations.

He highlighted that membership retention and recruitment was top priority in the Strategic Plan as the greater the number of members the more impact the ICAC can have globally. He pointed to the need to develop cooperation with key strategic partners who can provide the support and resources, which the ICAC does not have. Today the ICAC is currently involved in, or negotiating involvement in, a total of 14 projects many of which will have a

fundamental impact on the cotton world. They range from projects on yield enhancement, seed development, producing sustainable supply chains, traceability and specialised training. He mentioned two important projects. The first was the Soil Health App, which is being developed by the Expert Panel on the Social Environmental and Economic Performance of Cotton (SEEP) and is being supported by Cotton Incorporated. This app will give any farmer, even an illiterate farmer, the ability to interact with the app and respond to a series of questions in order to know what inputs he or she should add to the soil. The second involves the use of technology to create a virtual reality laboratory to train cotton research scientists and a virtual reality-training programme aimed at increasing yields. He then announced that next the ICAC in collaboration with its key partners from the United Nations and the WTO will be launching World Cotton Day. By raising the profile of cotton with a joint global effort on just one day a year we can raise awareness of the benefits of this beautiful natural product and hopefully encourage demand for it.

Mr. Hughes acknowledged the work of the ICAC committees including PSAP, CSITC, SEEP IFCP and the Standing Committee. He thanked the members, chairs and officers of the committees. He thanked the government of Côte d'Ivoire for hosting this 77th Plenary Meeting and to its Organising Committee and for the immense amount of work that has been put in to produce this event. He recognised the leadership of Dr. Adama Coulibaly, the Director General of the Cotton and Cashew Nut Council and Head of the Organising Committee and the hard work and dedication of Mr. Simplicie Gue who had liaised with the ICAC to ensure that the finer details of this Plenary Meeting were correct. He also welcomed delegates from non-member countries who were participating as observers as well as members of international organisations. He urged non-member countries, especially those in Africa, to join the ICAC.

In conclusion, he highlighted the three themes that were critical to the future success of the ICAC and would be at the heart of everything the ICAC does; communication, partnerships and adding value. The ICAC is developing strong and long-lasting relationships with key partners which will stand it in good stead for the future and this will enable the ICAC to develop an even stronger leadership role within the cotton industry and most importantly, to add value to all its members. The report of the Executive Director is a statement of the meeting.

Mr. Mamadou Sangafowa Coulibaly, the Minister of Agriculture and Rural Development of Côte d'Ivoire presented the Opening Address. On behalf of the President, Prime Minister and the government of Côte d'Ivoire Mr. Coulibaly thanked and greeted all delegates and stakeholders and expressed his satisfaction with an opportunity to host the 77th Plenary Meeting of

the ICAC in Côte d'Ivoire for the first time. He referred to the report presented by the Secretary General addressing the future development of the ICAC and indicated that agriculture in Côte d'Ivoire is growing, providing jobs and revenues. The economy depends on agriculture and cotton is the 5th export product employing 120,000 people, with production of 430,000 tons of seed cotton in 2017/18, the fourth largest among African countries. Cotton is very important for the development in the North and Centre of the country. Reforms in the sector have been adopted recently aimed at improving technology, yields and flow of investments for sustainable production and better competitiveness of cotton. He wished the meeting participants a fruitful discussion of the challenges facing sustainable cotton production and to find solutions for the benefit of stakeholders and especially young people. He also invited participants to attend an annual agricultural exhibition in Côte d'Ivoire. He then declared the 77th Plenary Meeting open.

The CHAIR introduced Mr. James Johnson to present a report on behalf of the Chair *ad Interim* of the Standing Committee, Mr. Ali Tahir.

On behalf of the members of the Standing, Mr. Johnson expressed his sincere appreciation to the government of Côte d'Ivoire for hosting the 77th Plenary Meeting and for all the efforts to ensure that this meeting will not only be successful for the delegates but will also provide an opportunity to showcase this beautiful country. He congratulated the Organising Committee for producing such a magnificent event. He thanked the Chair of the Standing Committee, Mrs. Claudia Fontana Tobiassen for her service as an officer of the Standing Committee and her efforts in leading the ICAC over the past year and especially in this critical year where the organisation is undergoing some major changes. He also thanked the government of Switzerland for their support of the ICAC during that period.

He noted that in accordance with the Rules and Regulations of the ICAC, the Standing Committee at its 555th Meeting unanimously endorsed the nominations of himself to serve as Chair of the Standing Committee from the end of this 77th Plenary Meeting to the end of the 78th Plenary Meeting. The Standing Committee also endorsed the nominations of Ms. Maha Zakaria, Economic and Commercial officer, Embassy of Egypt to serve as first vice Chair, and Mr. Selman Kurt, Commercial Counsellor at the Embassy of Turkey, to serve as second vice Chair.

The past year has seen some major changes in the direction of the ICAC. A year ago, a new Executive Director was appointed who had worked hard on preparing a strategic plan to revitalize the organisation and serve the member countries in a better manner. Since the last Plenary Meeting we have seen the addition of one important and crucial member of staff, a Director of Communications, Mr. Mike McCue.

Since his appointment, we have seen a growing presence on social media especially on Twitter and LinkedIn. We have also seen the introduction of a monthly newsletter – 'Cotton Matters' – which has enabled all of us to keep track of the numerous events attended globally by the ICAC Secretariat on our behalf. New technology is also being used to ensure that the ICAC is at the forefront of digital innovation. A new ICAC website was launched in October and demonstrates a new, vibrant, forward-looking ICAC.

On his appointment, the Executive Director proposed a strategic review of the organisation, that review was agreed at the Plenary Meeting last year in Uzbekistan and has been on-going for nearly a year, with the organisation benchmarking itself against other international commodity bodies, questionnaires being sent out to stakeholders and finally, resulting in a Strategic Away Day for members of the Standing Committee in July. An independent consultant was hired to assist in the process, which resulted in a strategic plan for the next three years covering seven major areas. Retention as well as the recruitment of new members will form the thrust of the ICAC's efforts over the next year. It is important to note that the ICAC represents all countries in the cotton and textile value chain. Therefore, it is important that we also develop a value proposition for those countries who are also primarily consuming countries.

Key partnerships should be revived, and new ones developed. These partnerships should include United Nations bodies and international organisations such as FAO, ITC, UNCTAD, ILO and WTO, but should also include international organisations covering the private sector as well as national cotton and textile organisations. The role of the private sector in the ICAC is crucial. To enable this to happen we shall be consulting with other international commodity bodies and producing a suitable structure that gives them value and enables them to engage with the ICAC. The ICAC's promotion of research and its relationship with ICRA should be strengthened and made more effective so that all cotton researchers can benefit from this vast pool of experience and knowledge and a West African regional research network should be developed within the next couple of years. He noted that the Strategic Plan had involved many hours work and will be continually reviewed and built upon each year. It has been approved at the 557th Meeting of the Standing Committee and he strongly recommended it to the Steering Committee for ratification at this Plenary Meeting later this week.

He also noted that Côte d'Ivoire is the 4th largest producer of cotton in Africa, and that it was right that at a time when cotton production and consumption is increasing that we use this opportunity to put the spotlight on Africa and the potential of Africa. The theme of this Plenary Meeting was "Cotton Challenges: Smart and

Sustainable Solutions” and the agenda developed in conjunction with the Organising Committee look at those challenges that affect the African continent in particular challenges such as climate change, improving yields, developing revenue from cotton by products, how small farm holders can use drones and robotic technologies, combatting pest resistance to *Bt* cotton and pesticides, and how farmers can produce the quality of cotton that spinners desire. In addition, this year’s ‘World Café’ will explore the challenges in growing organic cotton and how that may affect policy perspectives. This year, the ICAC was also starting to put in effect changes to the way the Plenary Meeting is run so that the meetings can become even more productive and efficient.

He thanked the government of Côte d’Ivoire for their hospitality in their beautiful country and to all the many people that formed the Organising

Committee. He thanked his fellow Standing Committee members in Washington DC for their support of the ICAC over the last year, and especially Mr. James Johnson, the representative of the United States of America for Chairing the Sub Committee on Budget and Mr. Rado Wang, the delegate from Taiwan, who Chaired the Strategy Sub Committee. He also thanked the ICAC Secretariat for the excellent work over the past year. Finally, at its 553rd Meeting, the Standing Committee accepted an invitation from the government of Australia to host the 78th Plenary Meeting in 2019. On behalf of all of us at the ICAC, He conveyed to the government and people of Australia sincere appreciation and thanks for the invitation. The report of the Chair *ad Interim* is a statement of the meeting.

The Secretary General then recognised the ICAC Researcher of the Year This year, Dr. Baohong

Zhang, Professor of Biology at East Carolina University, Greenville, USA, had been selected to be the ICAC Cotton Researcher of the Year 2018. The ICAC started the award in 2009 and Dr. Zhang is the 10th winner. His pioneering research on micro RNAs, and CRISPR/Ca-9 provided new targets for cotton improvements, including fibre yield and quality, as well as tolerance to environmental biotic and abiotic stresses. Unfortunately, Dr. Zhang was unable to attend the Plenary Meeting so Mr. Patrick Packnett, the Head of Delegation of the USA received the award on his behalf.

The Secretary General informed delegates that the agenda of the meeting has been produced in cooperation with the Organising Committee and approved by the Standing Committee of the ICAC and he requested if there were any further amendments. There being none, the Agenda of the 77th Plenary Meeting was approved.

First Plenary Session

Statements

14:15 hrs. Monday, 3 December 2018

Chair: Mr. Adama Coulibaly, General Director, Cotton and Cashew Council of CI

Mr. Coulibaly opened the session by inviting statements from member countries wishing to make oral statements. Written statements received later will be placed directly on the Plenary website.

The delegate from ARGENTINA presented the national strategy of four pillars of public policies that are aligned with the aims of the ICAC plenary. These strategies stress sustainability: economic, environmental and social. The first pillar on health is aligned with pest management. The second pillar on genetics aligns with seed development and exchange. Through a germplasm bank, Argentina can manage and exchange seeds with other countries. The third pillar has supported the creation of an internal network of HVI lab testing, improving transparency, traceability and quality in the cotton market. The fourth pillar has supported the creation of formal markets for seeds and seeds for animal consumption products. Working on formal markets will add value. The policies currently being implemented in the cotton sector are well aligned with the innovation and sustainability themes of the ICAC. Argentina’s country report is a statement of the meeting

The delegate from AUSTRALIA highlighted that in addition to the importance of the cotton sector in Eastern Australia, expansion of new cotton area to Northern Australia has demonstrated the potential of innovations in technology. Expansion into new areas has been possible through innovations in plant varieties and genetic modification. The Australian Cotton Research and Development Corporation

(CRDC) funded through producers and matched by government demonstrates a public private partnership for advancing research and development activities. As a major cotton exporter, the current work of the CRDC has aimed to position the Australia cotton industry to meet global demand to produce fibres sustainably and responsibly, while creating higher value uses for cotton. Water use efficiency remains a priority. Sustainable production practices are supported through the involvement in the Better Cotton Initiative and the Cotton LEADS programmes. Australia’s country report is a statement of the meeting

The delegate from BRAZIL reported that cotton area in Brazil are expected to continue to increase with record crops expected for cotton lint and cotton seed. Innovations through technical and managerial improvements on the farm and processing have led to higher production and quality. Through innovation, the Matto Grosso region has employed production practices that have double cropped land with soybeans allowing the farmer to plant and reap from two export commodity crops. Price protection hedging system and a central HVI system have enabled stronger commercialisation of cotton. Brazil’s country report is a statement of the meeting

The delegate from BURKINA FASO underlined the importance and relevance of the Plenary’s themes on innovation and sustainability for the development of the country’s cotton sector. Burkina Faso’s cotton sector is facing challenges with a need for better performance, better training, better exchange of information to develop cotton production, processing and textile manufacturing. Innovation and technical assistance is needed for better production practices, pest managements, pesticide use.

Developing the cotton industry remains a goal for African countries to improve wealth from a developed the value chain, improve the standard of living and creating jobs for youth and women. The sector needs to develop through improved industrialisation of the sector, the creation of a stronger investment environment. In line with the theme of sustainable solutions, the need to better understand the effects of climate change on cotton production and yields was highlighted.

The delegate from COTE D’IVOIRE presented current structural changes and challenges of the cotton sector include mechanisation on the farm. Structural changes include the creation of development zones for processing that are expected to further increase processing capacity is increasing. Challenges to the sector include the need to optimise mechanisation, providing quality seeds to farmers, optimising fertiliser and insecticide use. Effects of climate change on the crop and the reduction of yields remain areas of concern for the sustainability of the sector.

The delegate from EGYPT underlined that as a founding member, it remains strongly invested in the mission of the ICAC as well as in the fellow member countries. In Egypt, where more than 5 million people depend on the cotton for their livelihoods, cotton is an important sector of the economy and society. While the sector receives strong government support, challenges remain including decreasing revenues, a crowding out by food crops and the creation of a stronger investment environment. Egypt works with BCI for sustainable production practices. Additional advances include seed improvements, the increasing of cultivated crop area and the governments support of smart and sustainable solutions. Egypt’s country report is a statement of the meeting

The delegate from the EU presented the unions position of cotton sector development as a strategy to support cotton value chains based on the promotion of good agricultural practices and the management of critical support functions. Within the Multi-Financial Framework, strategy proposals will include interventions to improve internal competitiveness with a focus on the quality of product and sustainable practices. The EU supports other cotton producing countries through the EU-African Partnership in Cotton, the BCI and Cotton Made in Africa programmes, supporting the value chain through sustainable production practices and social goals. The EU is involved along with the ICAC in the Clear Cotton Project on the elimination of forced child labour. The EU recognises consumer demand for better traceability and environmental impact and seeks to be with the ICAC at the forefront of sustainable development in textiles. The European Union's country report is a statement of the meeting

The delegate from INDIA presented an overview and aims of the sector. Though the country has the highest area under cultivation, due to low productivity, return from cotton farming remains poor. The government has been making efforts to enhance yields, improve quality and demonstrate best production practices for reducing the contamination of cotton and developing new varieties of cotton. Initiatives to improve technical aspects, development schemes to support the textile value chain and projects to obtain better real time data on crop conditions to assist farming are underway. India's country report is a statement of the meeting

The delegate from KENYA noted the launching of the Big Four agenda to increase GDP contribution from the manufacturing sector, achieve 100% food and nutrition security, ensure affordable housing and achieve 100% universal health coverage. Under the Big Four agenda, the government has already put in place plans to develop cotton production using hybrids and is investigating possibly of having BT cotton in the mix which is envisaged will result in higher production yield and better lint quality compared to the present conventional varieties. The domestic market for cotton is supplemented with regional imports. High yield breeds and BT cotton are being considered for higher yields and quality. In addition to a seed quality production system to reduce the cost of production, mitigation price risk occurs through contract farming. Capacity building of extension service providers is expanding, increasing lint production over the next 4 years, and increasing the number of jobs through cotton farming – farm to processing to textile manufacturing. The government recognizes that cotton industry is governed by the global trade initiatives under the WTO. The government notes and continues to advocate for a level playing field through fair cotton produc-

tion, trade and support systems in the domestic and in the international arena. It is only through fair practices that countries will achieve sustainable industrialization goals through measurable positive results from the Industry.

The delegate from MALI presented an evolution of the cotton sector in the country, noting advances in mechanisation and current sector reforms including those to the Malienne cotton development, agency. The current reforms are expected to strengthen cooperation and will be accompanied by a study to evaluate reforms.

The delegate from MOZAMBIQUE stated the importance of cotton as a cash crop. Despite diversification amongst crops, cotton remains an important export commodity responsible for 20% of agricultural GDP. Challenges to the sector include technical assistance, exchange rate risk, climate change, volatility of international markets. Production has decreased due to unfavourable conditions, market issues, price volatility and exchange rates that affected minimum seed prices. Mozambique is committed to be an active member of the ICAC and looks to the organisation for best practices and assistance in the development of sustainable production system. Mozambique looks to revive the cotton value chain and will require higher yields and production, better competitiveness, trade certification and traceability. The need for sustainability along the cotton value chain will sustain the crop for future generations. Mozambique's country report is a statement of the meeting

The delegate from PAKISTAN provide an overview of the future cotton policy which envisages several strategies including germplasm improvements, development of hybrid cotton, better farm and crop management, bringing additional area under cultivation and minimizing post-harvest losses. Necessary legislative and regulatory frameworks have been strengthened. Seed Act has been amended and rules are being formulated. Plant Breeder's Act has also been passed by the parliament of Pakistan. The national cotton research and development system is being streamlined with the involvement of all the key stakeholders to bring it at par with international standards. The Government is also encouraging multinational and national technology providers for introducing latest and effective insect protection technology. Pakistan's country report is a statement of the meeting

The delegate from SOUTH AFRICA provided an update on production prospects for the new planting season, with a favourable outlook as land and yield are expected to increase to record highs.

Imports from regions due to regional free trade agreements and a locally integrated supply chain help to support the manufacturing sector. Sustainable cotton clusters in place since 2014 have granted support which have stimulated the South

African cotton industry. South Africa's country report is a statement of the meeting

The delegate from SUDAN noted that cotton provides important jobs and is a motor to the economy. The sector currently relies on private sector. With aspirations to increase land and production, Sudan will require more technical assistance from international organisations as well as the support of international financing and loans which are not currently available to Sudan. Cotton is exported as processing and manufacturing is lacking and the country is unable to build up the value chain. Sudan's country report is a statement of the meeting

The delegate from TAIWAN noted that as a non-producing country, Taiwan relies on imports to supply an innovative textile manufacturing sector. In order enhance exchanges within the ICAC, Taiwan has co-organized six international seminars in cooperation with the ICAC Secretariat, in 2005, 2008, 2010, 2012, 2015 and 2017. The most recent seminar, whose theme was "Market Trends and Sustainability of Cotton & Textile Industry," focused on new business opportunities created by IoT, big data and other technological trends, as well as on how to expand creative applications to blend cotton and man-made fibres. Representatives of industry, government and academia from more than a dozen ICAC member states gave presentations and engaged in discussions during the gathering. The next seminar in Taipei will be held in 2019, and we invite all ICAC members to take part. Taiwan seeks to help link producing and manufacturing country goals and aims. Taiwan's country report is a statement of the meeting

The delegate from TURKEY highlighted regional relationships with Africa through investments and rural developments in Eastern Anatolia that now account for 60% of production. Both production and yield have increased due to irrigation. Innovation has led to production increases. Turkey's country report is a statement of the meeting

The delegate from UGANDA provided an overview of recent achievements and challenges.

Solutions include quality standards approved by the ICA as the official standard for Uganda for the next two years, a newly constructed pest laboratory with assistance from India and a seed processing plant allows for the domestic production of cotton seed. Uganda's country report is a statement of the meeting

The delegate from the USA provided a brief oral statement to update the written statement provided earlier to the Secretariat noting updated estimates since the time the written statement was drafted noting lowered production forecasts due to drought conditions. The United States' country report is a statement of the meeting

16:15 hrs, Monday, 3 December 2018

Chair: Mr Adama Coulibaly, Directeur General, Cotton and Cashew Council of CI

The CHAIR invited oral statements from International Organisations and Non-Member governments.

The delegate representing the Centre de coopération internationale en recherche agronomique pour le développement (CIRAD) reiterated the research organisations aims for agricultural development in tropical zones including cotton. The organisation engages in research with the south for a sustainable development amidst climate change. Amongst priorities, the organisation houses a gene bank of cotton which collects, protects, preserves and shares the genetic material, has helped reconstitute lost genetic material to several African countries and supported African researchers. The activities highlight the need for research support to developing countries fulfilling their mandate. CIRAD's report is a statement of the meeting

The delegate representing the African Cotton Association (ACA) noted the pan African involvement of the ACA through the annual conferences held throughout Africa over the course of the ICAC's history. Highlighting the potential of Africa as a good source of cotton production and the potential decline of Asia as the centre of manufacturing due to the costs of production and labour, Africa is poised to be the

next centre of manufacturing and must gear up to prepare. Challenges to be addressed include climate change and re-emerging pest issues. The ACA is an African forum that organizes and networks throughout the continent and Africans need to act to move beyond potential to exploiting the potential available through international cooperation including germplasm exchange and working closely with the ICAC in order to increase participation from more African countries into the organisation.

The delegate representing the World Trade Organisation (WTO) highlighted the recent addition of Cote d'Ivoire to the Cotton 4. Through the Cotton 4, cotton has become a key issue within the WTO's work toward a fair and market-oriented trading system. The ICAC has partnered with the WTO through Cotton Day's, where cotton trade and development issues are discussed in a holistic manner and the Cotton Portal, where the ICAC provides statistics.

The delegate from the Association Française Cotonnière (AFCOT) shared the mission of the organisation to represent and serve the interests of the private sector in the francophone cotton industry. Scientific research has benefitted each segment of the cotton sector from farming to processing.

The delegate from the International Textile Manufacturing Federation (ITMF) presented the position of the ITMF is to support the ICAC

through a historical relationship through committee membership.

The delegate representing the International Cotton Researchers Association (ICRA) shared that among its objectives, ICRA has ambitions to promote the interaction between cotton scientists in the world. While ICRA was able to modestly sponsor the participation of some speakers to this plenary, it may not be able to do so in the future. ICRA's report is a statement of the meeting

The delegate representing the International Cotton Association (ICA) spoke on the role of the ICA as an arbitrator in the global trade of cotton. Arbitration has been declining as a positive sign of parties in the global cotton trade upholding contracts. Contract issues are correlated with price volatility. Global demand slowing would indicated a slowing of global trade transactions.

The delegate representing the United Nations Committee on Trade and Development (UNCTAD) representing commodity analysis spoke of the three pillars of research, consultation and technical assistance. Through the UNCTAD, streams of works and projects are underway in Africa including cotton projects in Tanzania and Zimbabwe. Cotton is a key commodity for adding value to the textile chain, adding to farm income.

No non-member countries wished to make oral statements.

First Open Session

World Cotton Market

11:00 hrs. Monday, 3 December 2018

Chair: Mr. Siaka Minahaya Coulibaly, Director of Cabinet of the Minister of Agriculture and Rural Development of CI.

The CHAIR presented a welcome address and opening remarks and invited Ms. Lihan Wei, Statistician at the International Cotton Advisory Committee to deliver her presentation.

Ms. Wei, made a presentation on cotton area, production, stocks levels and consumption. She noted that over the past three decades a very strong historical correlation exists between prices prevailing during a given season and the planted area for the next season. In 2018/19, despite attractive prices for farmers during the second half of the season, world cotton area is expected to remain at 33 million hectares. Global average yields are forecast to decrease slightly by 2%, due to weather issues. Over the past decade, cotton production growth has come from area increases, instead of increasing in yields. In 2018/19, production is expected to grow in China by 0.8% to 9 million tonnes, Brazil by 15% to 2.3 million tonnes, West Africa by 6.5% to 1.3 million tonnes, Turkey by 18.7% to 940

thousand tonnes and Uzbekistan by 0.1% to 800 thousand tonnes. Ms. Wei, noted that India will continue to be the world's largest producer of cotton in 2018/19, with an estimated production of 6 million tonnes, accounting for nearly a quarter of global production. Cotton imports are expected to grow in 2018/19 by 5% to 9.4 million tonnes, mainly driven by increased spinning in non-cotton producing countries. Imports by China are projected to increase by 27.6% to 1.6 million tonnes. The United States will continue to lead global cotton exports with 3.3 million tonnes. As cotton consumption is projected to exceed production, global ending stocks are expected to decrease from 18.8 to 18.2 million tonnes. Stocks outside China are expected to grow for the fourth consecutive season to 10.5 million tonnes. Ms. Wei's presentation is a statement of the meeting.

The CHAIR invited Ms. Lorena Ruiz, Economist at the International Cotton Advisory Committee to deliver her presentation.

Ms. Ruiz, started her presentation by noting that cotton mill use is recovering and that in 2017/18, cotton consumption increased by 9%

to 26.8 million tonnes. About 83% of the cotton that was spun into yarn around the world occurred just in seven countries in Asia: China, India, Pakistan, Bangladesh, Vietnam, Turkey and Indonesia. In China, the gap between cotton consumption and production is estimated at 3.3 million tonnes in 2017/18. In 2018/19, cotton mill use in Bangladesh and Vietnam is forecast to reach new picks of 1.8 and 1.6 million tonnes, respectively. Ms. Ruiz pointed out that in the last two decades, cotton mill use in Africa has been steadily declining, going from around 600 thousand tonnes to just a little over 400 thousand tonnes. At the regional level, East and South Africa countries are currently the largest consumer of cotton, with a total consumption of 210 thousand tonnes, followed by North Africa with 190 thousand tonnes and francophone Africa with only 19 thousand tonnes.

Ms. Ruiz, mentioned that based on current projections of world economic growth, along with increase in population, world fibre demand is expected to rise to 121 million tonnes by 2025, which represents an increase of 27% or 25.5 million tonnes of additional demand compared

to current levels. This represents a huge opportunity for the cotton industry. If cotton consumption per capita, were as high as the level observed in 2007 (4 kilograms), then the cotton industry would be able to satisfy 28% of the additional demand for fibres. The additional production would have to come through yield increases in key producing countries, rather than increase in area. Ms. Ruiz' presentation is a statement of the meeting.

The CHAIR invited Mr. Andrei Guitchounts, Director of Trade Analysis at the International Cotton Advisory Committee to deliver her presentation.

Mr. Guitchounts, presented ICAC's annual report on government measures supporting the cotton sector. Direct assistance to cotton was

provided through direct support to production, border protection, crop insurance subsidies, and the minimum price support use. These were estimated at US\$5.9 billion in 2017/18, up 33% from 2016/17. Mr. Guitchounts also noted that there is a strong negative correlation between subsidies and cotton prices: in years in which prices are high, subsidies tend to decline and in years when prices are low, subsidies tend to rise. The share of world cotton production receiving direct government assistance increased from an average of 55% between 1997/98 and 2007/08, to an estimated 83% in 2008/09. During 2009/10 through 2013/14, this share declined and averaged 48%. In 2016/17 and 2017/18 the proportion of production receiving direct assistance decreased to 47%.

Mr. Guitchounts stated that the benefit (subsidy) received by producers in China is estimated at \$4.3 billion in 2017/18, or 33 US cts/lb. For the USA, the sum of all types of support provided to cotton producers, is estimated at US\$890 million or 9 cts/lb. In India, the minimum support price (MSP) for 2017/18 was not in effect because market prices were above the MSP levels. In the European Union, both Greece and Spain received direct assistance estimated at US\$225 and US\$205 million, respectively. Turkey provided US\$398 million in assistance in the form of a premium for high quality seed cotton. Mr. Guitchounts' presentation is a statement of the meeting.

The First Open Session was adjourned at 13:00 hrs.

Second Open Session

Combating the Effects of Climate Change on Cotton - What Scientists and Governments Can Do

9:00 hrs. Tuesday, 4 December 2018

Chair: Dr. Mamadou Coulibaly, former General Director, Company for the Development of Textiles (CIDT)

The CHAIR recognised Dr. Bruno Bachelier of CIRAD, France and requested him to deliver his presentation on the way to achieve sustainable cotton production in Africa in the context of climate change.

Dr. Bachelier reported that according to the fifth assessment report by the group of Intergovernmental Panel on Climate Change (IPCC) experts' projections on climate change indicated that temperature could rise by 1 to 4 degrees Celsius by year 2100, while CO₂ concentration could rise from current 410 ppm to between 475 and 800 based on different scenarios. Based on an optimistic scenario, rainfall in West Africa could decline by 5 to 10%, increase by 5 to 10% in Central Africa and is very uncertain for coastal areas, such as Ghana, Togo, Benin and Nigeria thus indicating that climate changes could mean different effects on cotton physiology and yields for different regions and countries. He noted that climate change could disturb the biodiversity equilibrium without biocontrol and could lead to increased pest populations. It is important to implement innovative cropping systems promoting resource conservation agriculture and agroecology methods in order to reduce pest pressures. There is also a need to adapt cropping practices on the local level to changing conditions and to implement innovative systems that preserve biodiversity and resources, such as water, organic matter and carbon storage. Dr. Bachelier presented examples of sustainable and innovative land management systems based on

local conditions in rainfed production in Africa and he described a soil, organic matter management initiative called "4 per 1000", launched in 2015 in Paris and supported by more than 280 organizations from 40 countries. The initiative's goal is to increase carbon matter in the soil to compensate for increasing CO₂ emissions. The importance of countries adapting phytosanitary practices to mitigate the risk of climate change introducing new pests that had the potential to become invasive was also highlighted and he described the work done by CIRAD in Cameroon to improve agro-ecological farming practices in order to reduce pest pressure while at the same time, preserving biodiversity and how cultivar adjustment could become an effective adaptation strategy. In conclusion, he described certain constraints for projections due to limited collected climate data in Africa. However, there are also positive adaptation possibilities including minimum tillage, integrated pest and disease management, permanent soil cover to reduce erosion and changes in sowing dates. He suggested that governments should also become involved in the "4 per 1000" initiative and promote the use of the ICAC's SEEP indicators. Dr. Bachelier's presentation is a statement of the meeting.

The CHAIR introduced Dr. Marcelo Paytas of INTA, Argentina to make a presentation on combating the effects of climate change on cotton. He reported that the Intergovernmental Panel on Climate Change (IPCC) projected that climate change will result in a substantial loss in agricultural productivity and that it was important to understand what actions should be taken to overcome limiting growing conditions. He demonstrated examples of extreme conditions that had occurred in different areas in Argentina

during the past two years that had led to severe losses of crops. As cotton is a perennial plant, an appropriate balance between vegetative and fruiting development is essential. About 70% of the boll weight is accumulated after the termination of the vegetative period. Any limiting factors during this period will be negative for yield and quality and therefore it was important to understand the critical stages of growth to investigate the limiting effects of environmental conditions. Drought is of the main limitations on cotton production and experiments had shown that drought stress during the vegetative stage caused 6 kg/ha of fibre loss and during the flowering stage yield loss rose to 15 kg/ha and during maturity stage yield loss was 4/8 kg/ha. Biotechnology and genetic selection by molecular markers and mutagenesis for abiotic stress could be an answer for the drought stress. At the other end of the scale, Dr. Paytas explained how waterlogging during flowering could also cause a reduction of 16-19% of fibre. Heat stress during floral development also causes represents a major limitation and low solar radiation (cloudy days) also causes a negative effect on yields as the plant needs sun – photosynthesis to grow. Further research is required into all these factors not only in cotton but in other crops as well and should also include soil health management, drainage or irrigation systems with a cotton crop simulation model being developed for each region. Proper regional agronomical practices, genetic improvement programs and varieties adapted to limiting conditions are needed as well as training for farmers. There now needs to be a global dynamic that highlights these problems but also how agriculture can be a positive solution for climate change. Dr. Paytas' presentation is a statement of the meeting.

The CHAIR invited questions from delegates.

The representative of ITMF said that yields in Africa are generally low. Would these practices aimed at combating climate change effect help to maintain yields or could they lead to higher yields?

The delegate of MALI said that in his presentation Dr. Bachelier talked about negative effect of climate change on West Africa, what is the effect on other countries.

Dr. Bachelier said that the impact of climate change on yields will depend on how much CO₂ levels would rise and on the choices we will make to combat negative effects. The scope of the effect also depends on the area, proximity to the oceans and the scenario that will play out in real practice.

Dr. Paytas said that if we properly understand the limiting factors we could propose management practices to combat those, including water and soil, management, timing of sowing and other practices adapted to the regional specific conditions.

The delegate of COTE D'VOIRE asked Dr. Bachelier to describe the "4 per 1000" initiative aimed at improving soil fertility. He also asked Dr. Paytas to provide more details on the crop simulation model that was used to obtain the results in his study.

The representative of ICRA commented that with climate change, cotton yields will depend on the adaptation of new technologies and crop management practices that are tuned to the changing conditions.

Dr. Bachelier said that the "4 per 1000" initiative was established in 2015 in Paris and brought together projects that already exist aimed at increasing organic matter in soil and improving soil fertility. Under the initiative, meetings are conducted every year. He urged everyone to participate and to support this global movement in order to find solutions for better soil fertility.

Dr. Paytas said that the crop simulation model he used was implemented with an Australian team with the use of climate data from the past 60 years and examining all kind of stresses and times of application of different factors.

Questions from emails:

To Dr. Bachelier: which beneficial insects may benefit climate change and provide effective pest control?

Dr. Bachelier said that he does not know the answer to this question at this point.

To Dr. Paytas: Did you use hormone treatment to mitigate water or heat stress, such as AVG?

Dr. Paytas said that they did not use hormone treatment to mitigate water stress.

To Dr. Paytas: what is the temperature that causes heat stress the length of exposer?

Dr. Paytas said that a temperature of 35 degrees Celsius for day and night for a period of 1 to 2 weeks could produce stress to the plant.

To both presenters: In addition to a rise in temperature and less rain fall, climate change has resulted in shifting the rain fall pattern to earlier in the season, which has resulted in rains to occur during the sowing of cotton. Delayed sowing causes reduction in production and high risk of pest and Cotton Leaf Curl Virus Disease in Pakistan or delayed harvesting of wheat, as we practice Wheat-Cotton cropping pattern. Secondly what can be done to keep the grower informed about climate change to take appropriate action at farm level.

Dr. Paytas said we need to provide information to farmers and training each season, based on changing conditions.

Dr. Bachelier said that farmers need to be informed about upcoming conditions for each season and be advised on transplanting cotton depending on the projected conditions.

To Dr. Bachelier: Have you done any experiment in OTC (Open Top Chamber) to study the effects of excess CO₂?

Dr. Bachelier said that they have a green house in CIRAD where they can run such experiments.

From the delegate from AUSTRALIA: The two speakers have outlined the challenge of an unclear future in terms of climate impacts and the need to do local research and analysis to understand each countries' situation. Given this context, in addition to better soil management to prepare for climate change, what other action would you recommend farmers take?

The CHAIR noted that it is becoming very difficult to control rainfed conditions in the field based on historical data. Rainfall patterns are changing. Farmers need timely advice on current conditions and planting times for optimal results. Scientists and governments should provide support to the farmers to provide solutions in order to control the negative effects of climate change.

Dr. Paytas said that it is very important to chose optimal planting days and historical data should be consulted.

A question: Is there a danger with a climate change that some pests from America would spread in Africa?

Dr. Bachelier said that pests could spread from one continent to another, but we should control the situation with the phytosanitary measures.

A question from the delegate from ARGENTINA: How to provide support to farmers on combating climate change?

Dr. Bachelier said that extension program is established to provide agroecological support to farmers in countries such as Benin and Mali. In other countries support is provided through NGO's or cotton companies to establish new cultivation systems in the whole country. Currently there are pilot projects that are demonstrating positive results that will soon be emulated at a country level.

To Dr. Bachelier: Smallholders in Africa are facing high costs of production and reduced cotton prices. Which combination of sustainable production models could work for poor producers?

Dr. Bachelier said that smallholder producers have limited financial resources to tackle climate change and they will need to rely on resources provided by producer associations, cooperatives and the public sector.

A President of the Cotton Producers' Federation from Côte d'Ivoire said that there is a problem in this country with pests and finding a right time for planting in order to receive a good yield and to avoid strong pest pressure. He asked if farmers could receive help and be provided with improved pesticides to control pest infestation so that they could plant cotton during times favouring higher yields, but controlling damage from pests?

The CHAIR noted that it would be helpful to add practical experience to theoretical knowledge to come up with local solutions of problems.

A delegate of EGYPT suggested that farmers could be aided in their struggle with climate change by breeding new heat and drought tolerant varieties and by developing extension services on cropping practices and irrigation.

The CHAIR thanked the participants for a very active and interesting discussion of the issue and the presenters for their excellent presentations. The climate change problem requires local solutions and governments should assist farmers to achieve this through their national policies. It was important to find new varieties and new 'weapons' to protect cotton and to be ready for the future.

Third Open Session

Mechanisation, Drones and Robotics for Small-Scale Farms: Opportunities and Issues

11:00 hrs. Tuesday, 4 December 2018

Chair: Mr. Yatié Diomande, Director of the Agriculture, Geographical and Digital Information Division of CI

The CHAIR recognised Mr. Paulin Konan, Technical Director of WeFLY-Agri, Côte d'Ivoire and requested him to deliver his presentation on drones and utilities of the new technologies for agriculture. Mr. Konan started his presentation by noting that in some less developed countries, technology is being used to perform agricultural tasks and facilitating data-driven decision making. The use of drones could help to measure crop fields, determine the best strategy for more profitable planting, gather data which then could be used to determine the fertilisers or inputs required for certain crops, collect aerial images, detect diseases and pests, forecast yields, and provide recommendations for water management, among other uses. Mr. Konan presented examples of drones uses in cotton fields in Côte d'Ivoire and he noted that governments should invest more on education, training and information on high-tech and its benefits in agriculture. Mr. Konan's presentation is a statement of the meeting.

The CHAIR introduced Mr. Manohar Sambandam, founding partner and CEO of Green Robot Machinery Pvt. Ltd., India to give a presentation on their precision cotton picking machine. He reported that in India cotton harvesting is manual and labour availability during the peak picking

season is a challenge. He noted that by using a small precision cotton picker, one could reduce capital and operational costs for small farmers. Mr. Sambandam presented a cotton harvester pilot machine that can pick up to 250 kilograms per day. It uses 3D vision for detecting and locating cotton, it can operate in low light/night and it is suitable for small-scale farms. The speaker concluded his presentation by noting that pilot tests were being conducted in Karnataka, India. Mr. Sambandam's presentation is a statement of the meeting.

The CHAIR introduced Mr. Rajesh Jain, Senior Director, Wadhwani Institute, India to give a presentation on artificial intelligence for small scale farmers. He opened his presentation by providing a summary about the work developed by the Institute. He noted that Artificial Intelligence (AI) solutions have many uses in different domains including health, agriculture and education. In agriculture, AI is being used to detect disease, weather prediction and area estimation. Additionally, diagnosing pest and soil defects can provide early pest infestation alerts by using AI algorithms. Mr. Jain pointed out that there are several mobile crop advisory apps that can help farmers diagnose crop diseases in the field, as well as pest damage and nutrient deficiencies and provide corresponding treatment measures. Mr. Jain's presentation is a statement of the meeting.

The CHAIR introduced Mr. Glen Rains, Professor, University of Georgia-Tipton, USA to give

a presentation on mobile robotics for cotton production. Mr. Rains noted that historically, mobile robotics were large, slow and expensive. However, new developments in sensors and processing speed, have helped the application of engineering science for applications in precision agriculture. He pointed out that topics for sustainable robotics in cotton, include areas such as:

- Solar-charged and battery powered platform
- Appropriate harvest throughput per harvesting system (Ha/day/harvester)
- What sensors to adopt for boll detection, pest detection, depth mapping
- What method to adopt for picking bolls: vacuum, needles, gripper (grab and place), others?
- Field ginning and cotton transport

Mr. Rain's presentation is a statement of the meeting.

The CHAIR thanked the presenters for their excellent presentations and concluded that Artificial Intelligence in agriculture faces significant challenges, but the new digital technologies have opened a variety of new opportunities to both small and large-scale farmers. However, more efforts, funding and skills are needed to integrate these technologies into agriculture.

The Third Open Session was adjourned at 12:55 hrs.

Fourth Open Session - Technical Seminar

Combating Pest Resistance to Biotech Cotton and Pesticides

13:45 hrs. Tuesday, 4 December 2018

Chair: Mr. Marcel Bi Kouakou Goore, General Director of Production and Food Security (MINADER)

Speakers:

Dr. Keshav Kranthi: Pest Resistance to Biotech Cotton & Pesticides

Dr. Tom Walsh: *Helicoverpa armigera*; Bt resistance monitoring, management, mechanisms and genomics

Dr. German Ochou: Managing the resistance of insect pests to pesticides: The experience of Côte d'Ivoire

Mr. Anil Kakkar: Insect Resistance to Bt-cotton and Insecticides -The way forward

Dr. Keshav Kranthi: Pest Resistance to Biotech Cotton & Pesticides

Insects have been demonstrating a continuous propensity to develop resistance to almost all insecticides developed to control them. At least 40 weed species developed resistance to glyphosate and several weed species across the world developed resistance to major classes of herbicides. At least 586 insect species have been reported to be resistant to insecticides. Resistance has been reported in 168 countries to 325 different insecticide molecules.

The cotton bollworm *Helicoverpa armigera* ranks first in the list of the worlds' most notorious insect species in resistance development and potential for damage to crops. Cotton bollworms and whiteflies are known for their ability to rapidly adapt to insecticides in many parts of the world. High levels of 21,000-fold resistance to pyrethroids in *H. armigera* were reported in India in 2001 and 2002, which resulted in frequent outbreaks. Whitefly resistance to insecticides

caused an outbreak in 2015 resulting in an estimated loss of US\$ 600 million in revenues. Pink bollworm resistance to Cry1Ac and Cry2Ab toxins in Bollgard-II caused an outbreak in 2017 in India causing an estimated loss of US\$ 1.28 billion. The cotton bollworm in USA and pink bollworm in India developed resistance to Bt-cotton. Intensive selection pressure especially in the absence of proper refuge crops intensifies and accelerates resistance. It has been observed that simple point mutations in specific genes that are common in several species can enable insects to develop high levels of resistance to insecticides and Bt-toxins. While development of resistance is an evolutionary eventuality, it can be delayed by deploying resistance management strategies so as to ensure continued efficacy of the specific pest management technologies for the longest possible time. Dr. Kranthi's presentation is a statement of the meeting.

Dr. Tom Walsh: *Helicoverpa armigera*; Bt resistance monitoring, management, mechanisms and genomics

Helicoverpa armigera is considered the most resistance prone insect in the world. It has a wide host range of 300+ plants species; it is adaptable to a wide climatic range; it has a high migration potential of up to 1000s of km and it readily develops resistance. It invaded South America during 2008-2012. The potential global distribution of *Helicoverpa armigera*, was modeled using CLIMEX, taking into account climate suitability, irrigation patterns, and the existence of suitable crop hosts. *H. armigera* resistance to synthetic pyrethroids spread during 1980-1995 across Asia, Africa, Europe and Australia.

In Australia, the first generation Bt-cotton containing the insecticidal toxin Cry1Ac was introduced in 1996 as Ingard. Subsequently, dual gene (*cry1Ac* and *cry2Ab*) varieties, were introduced in 2004 followed by the introduction of a three gene (*cry1Ac*, *cry2Ab* and *vip3a*) variety in 2016. The stacked toxin varieties are expected to delay the development of resistance in bollworms. For the single gene *cry1Ac*, the area of Bt-cotton was restricted not to exceed 30% to delay resistance development. Resistance management strategies for Bt-cotton in Australia have been successful so far with no evidence of resistance in bollworms. Australia adapts rapidly to technological changes and relies on a single technology provider. Bt and pesticide resistance are perceived as the biggest threats to sustainable cotton production. Resistance Management Strategy is flexible and responsive. It is based on four main components - Based on the philosophy that resistance management is about preventing resistance. The strategies are:

1. Plant refuge crops and no Bt sprays;
2. Pupal busting;
3. Planting during a defined window and
4. Regular monitoring and screening for Bt resistance.

The refuge options for 100ha Bt-cotton are, sprayed cotton 100ha or corn 20ha or unsprayed-cotton 10ha or pigeonpea 5ha. The current IRM programme since 2017 for BG-3 (Cry1Ac + Cry2Ab + Vip3A) has 5% non-Bt as refuge crop with no cap on Bt-cotton; planting is done in a defined '12-16 week window' followed by destruction of final generation of moths.

Molecular mechanisms of Cry2Ab resistance were tagged to ABCA2 – ABC transporter and were confirmed with CRISPR in Nanjing. Vip3A resistance gene was identified through transcriptomics; RAD Tag markers ~3500 markers on this linkage group (female informative); down to one MB (male informative). The resistant gene was located in the mapping region and confirmed with CRISPR. A new dominant resistance allele was identified for Cry1Ac in China. Resequencing

was found to capture all the variation in each individual for Bt-resistance genes, conventional pesticides including population genetics. All the resistances to Cry1Ac, Cry2Ab and Vip3A are being examined for the role of multiple alleles. Experiments showed that molecular testing for resistance is possible and can be incorporated into a monitoring and management program. There is a keen interest to conduct research on population genetics of *H. armigera* obtained from Africa (Mali, Uganda, Cameroon, Madagascar, Burkina Faso, Chad and Senegal); Asia (India, China and Pakistan); Europe (France, Corsica and Spain); Australasia (Australia, New Zealand) and South America (Brazil, Argentina, Uruguay and Paraguay). Issues of biosecurity related to new species, new genotypes and invasion of *Spodoptera frugiperda* were also highlighted. Dr. Walsh's presentation is a statement of the meeting.

15:45 hrs. Tuesday, 4 December 2018

Chair: Mr. Marcel Bi Kouakou Goore, General Director of Production and Food Security (MINADER)

Dr. German Ochou: Managing the resistance of insect pests to pesticides: The experience of Côte d'Ivoire

Cotton pests in Côte d'Ivoire are controlled mainly using insecticides. The massive use of pyrethroid products over more than 20 years resulted in a selection of resistant individuals in the African bollworm, *Helicoverpa armigera*. During the initial phase of pyrethroid use from 1985 to 1988 bollworm susceptibility in field strains was equivalent to the reference strain BK77. Initial indications of decreasing sensitivity at levels of more than 2-fold resistance were observed from 1989 to 1995. During the period from 1996 to 2001, bollworms were found to be adapting to pyrethroids with resistance levels of 10 to 20 times higher than that of reference strain BK77. From 1993 to 1997, cotton bollworm infestations were being reported in the cotton zones on a regular basis, but an outbreak was observed in 1998 in Côte d'Ivoire. Heavy infestation of the bollworm was reported from West Africa during the same time. Failure to control *H. armigera* with synthetic pyrethroids in Benin, Mali and Burkina Faso provided initial indications of resistance. In 1997 and 1998, bollworm resistance in Benin and Burkina Faso reached critical levels of 300 to 450 times to deltamethrin and cypermethrin compared to 10 to 20 times in Côte d'Ivoire and Mali. A regional project "the PR-PRAO (Prevention and Resistance Management of *H. armigera* to pyrethroids in West Africa)" was launched in 1998, which later became PR-PICA (Regional Program of Integrated Cotton Protection in Africa). The platform was in a network mode connecting cotton sectors of six countries: Benin, Burkina Faso, Ivory Coast, Mali, Senegal and Togo. For 20 years, annual workshops were

held in the six-member countries to take stock of the resistance situation and also to recommend management strategies.

The insect resistance management (IRM) strategies were inspired by "window programs" of Australia. IRM strategies have been adopted since 1998 in Côte d'Ivoire. The strategies recommend a restriction period that excludes the use of pyrethroids before 10th August in the northern zones and before 20th August in the southern zones. During this period, only alternative recommended insecticide molecules are allowed. In addition to window programs, the IRM strategy is based on integrated pest management approaches such as: adoption of disease-tolerant varieties, including the dreaded wilt *Fusarium* and other diseases; the application of good farming techniques, especially early planting to avoid periods of heavy outbreaks; surveillance of pests and diseases to provide early warning of any impending outbreaks; threshold treatments to reduce the overall quantities of pesticides used; biopesticides to reduce the use of chemical pesticides; and quality control of marketed products. In view of the influence that climatic disturbances may have on the parasitic species, this whole strategy is guided by regular updating of scientific knowledge on spatio-temporal evolutions of infestations and levels of insecticide resistance in the major cotton pests. In addition, pest management programmes are strengthened at the national level by training and providing information to producers and agents of cotton companies at the sub-regional level by setting up a permanent platform bringing together all the actors in the sector (cotton companies, research, agrochemicals, regulatory authorities, interprofessional organizations, OPA, donors, etc.). This experience of managing insecticide resistance has been a case of successful plant protection for cotton in Côte d'Ivoire and the sub-region for about twenty years. Dr. Ochou's presentation is a statement of the meeting.

Mr. Anil Kakkar: Insect Resistance to Bt-cotton and Insecticides -The way forward

Dr. Kakkar described the cotton scenario in India with reference to insect pest resistance to Bt-cotton, insecticides and management strategies and the way forward. The American bollworm, *Helicoverpa armigera* which was not a key pest, appeared during 1990 on cotton and became serious pest from 1995 onwards. The American Bollworm, a polyphagous pest developed resistance to insecticides particularly synthetic pyrethroids and resulted in heavy loss and failure of cotton crop in spite of 15-20% higher cost of insecticide application.

Bt-cotton was commercially cleared for cultivation in March 2002 in India, mainly to control *Helicoverpa armigera*. About 95% of total cotton area is currently under Bt-cotton. Adoption of Bt-cotton lead to reduction in the cost of production due to reduction in insecticide sprays

by 50% and increase in the production by 50% in the first 5 years after 2002. Improvement in quality of lint led to better price realization. Increase in seed demand led to growth in area under cotton. The cotton seed industry grew 8-fold apart from resulting in additional benefits across the value chain. India became the 2nd largest exporter of cotton in 2016. *Bt*-cotton continues to be effective for management of American bollworm and spotted bollworm without any reported development of resistance to *Bt*-cotton in these bollworms. However, resistance was reported in pink bollworm against Bollgard-I and Bollgard-II in India and *Helicoverpa zea* in the United States of America. Pink bollworm management can be managed during and in the off season using pheromone traps, light traps, curtailing crop duration, management near gins and adoption of IPM and IRM practices. Quality seed for refugia can ensure sustainable yield and suitability for particular climate. The long duration hybrids may not provide long term solution and may accelerate resistance if bollworms are not managed properly. In recent years, jassids (leaf hoppers) have developed resistance to chloronicotinyl compounds that are being used at much higher dosages due the availability of limited other options of management. Whitefly has developed variable degree of resistance to triazophos and ethion. Post *Bt*-cotton introduction insecticide use fell from 1.0-1.2 kg/ha to 0.5 kg/ha. However, insecticide use increased almost to the pre-*Bt* levels over the past 5-6 years due to a surge in the appearance of aphids, jassids, thrips etc., and for the control of pink bollworm (PBW) in some states. Whitefly management can effectively be done with new chemicals like diafenthiuron, spiromesifen, pyriproxyfen, but improper use can lead to poor performance as was the case in north India. Insect resistance to *Bt*-cotton and insecticides can be managed by using multiple toxins, rotation of toxin genes, crop rotation, seed mixes, gene pyramiding, high or ultra-high dosages, and spatial and temporal refuge plants. Dr. Kakkar's presentation is a statement of the meeting.

Questions and Answers

- **Question:** I come from a country where *Bt*-cotton is undergoing field trials and if successful it will be recommended for commercialization. However, I understand that to slow down insect resistance to *Bt*-cotton,

there is need to grow non-*Bt* cotton alongside the *Bt*-cotton even within the same field. Can the presenters from India and Australia comment on this hypothesis.

Answer: Dr. Tom Walsh: Refuge crops ensure the survival of susceptible insects so that they may mate with resistant insects to dilute resistance and delay resistance development.

- **Question:** *Bt*-cotton is a genetic modified crop, so it is the same as other GM products that are banned by the international community. Especially for oil and meal. Are its oil and meal safe for us?

Answer: Dr. Tom Walsh: Oil from *Bt*-cotton is being used for consumption and seed-meal is being used as animal feed over the past 20 years and there have been no scientific concerns so far.

- **Question:** What is the stability of gene expression?

Answer: *Bt*-cotton is characterised by temporal variation in expression of *Bt*-toxins which is influenced by cultivars, but the genes are stably inherited.

- **Question:** What durable solution can be suggested against simultaneous resistance to insecticides and *Bt* toxins? What sustainable strategy can be recommended to control the resistance of sucking pests, including *Bemisia tabaci* and *Jacobiella fascialis*?

Answer: The best way to ensure sustainability is to follow integrated pest management (IPM) and insecticide resistance management (IRM) strategies whether is *Bt* or conventional cotton. For *Bt*-cotton it is important that the varieties chosen have inbuilt resistance to sucking pests so that the use of pesticides for sucking pest management is minimized. The use of hybrid cotton should be minimized in rainfed regions to avoid late season stress of water and nutrients.

- **Question: Dr. Khalid Abdullah:** Why was pink bollworm resistance in India faster and why didn't it develop resistance in Pakistan and other countries?

Answer: Pink bollworm resistance to BG-II developed faster in India and in no other country so far mainly because India followed production practices that are very different

from other countries. India grows only hybrid *Bt*-cotton, whereas other countries grow *Bt*-varieties and also *Bt*-hybrids in some. The crop duration of hybrid cotton in majority of the central and southern regions of India is longer by about 30-80 days compared to other countries. Refuge compliance has been poor in India. Both these factors are unique to India and contributed to accelerated resistance.

Questions:

Dr. Philippe Menozzi CIRAD: Have you an idea to explain why resistance to pyrethroids concerning *Helicoverpa armigera* appeared at the same period (end of 1990) in Asia and Africa?

Dr. Walsh: What are the thresholds of *H. armigera* development of resistance.

Answer: Dr. Kranthi: *H. armigera* resistance to pyrethroids developed to very high levels in 6-7 years of use in India and China in an accelerated manner compared to other countries, because of overuse and indiscriminate use. Bollworm resistance to pyrethroids took longer to develop in Africa because of the intensive use that happened over a longer period of time.

- **Question:** Is it possible to reduce the proliferation of insect pest populations?

Answer: Dr. Kranthi: Pheromone based mating confusion or mass trapping or male sterile techniques are commonly used to control the pink bollworm in several countries.

- **Question:** I think that the insects will escape from the cultured *Bt*-cotton field to the neighboring fields, especially if they are cultivated with a non-resistant crop, which leads to the contamination by pesticides. So what is the solution now?

Answer: Dr. Tom Walsh: Such cases of insect escapes from *Bt*-cotton have not been reported anywhere.

- **Question: Dr. Khalid Abdullah:** During the 75th Plenary Meeting of the ICAC in Pakistan, a gene that controls sucking pests was mentioned effectively. Which genes are these and how can this technology be procured in West Africa?

Answer: Information on such genes is yet to be published.

Fifth Open Session - World Café

Organic Cotton Challenges and Policy Perspectives

9:00 hrs. Wednesday, 5 December 2018

Moderators:

Mr. Wolfgang Bertenbreiter, Program Director, GIZ, Germany

Mr. Bart Volland, Program Director, Organic Cotton Accelerator, The Netherlands

The ICAC conducted a World Café conversation on organic cotton. Topics discussed were

farm economics, ecology and environment, innovation and R&D, organic seed production, processing, diversification and policies.

Yield improvement in organic cotton production is still an area where more research is needed. One suggestion was to have dedicated zones for organic cottonseed production and ginning to facilitate the production and marketing of organic cotton.

Market intelligence for organic cotton should be strengthened. Some participants suggested that there is a need to develop policies for organic cotton production on national and regional levels.

Mr. Volland's presentation is a statement of the meeting.

Sixth Open Session

Intergovernmental Policies on Seed Exchange

13:45 hrs. Wednesday, 5 December 2018

Chair: Mr. Marcel Bi Kouakou Goore, General Director of Production and Food Security (MINADER)

Dr. Jodi Scheffler, Research Geneticist (Plants), USDA noted that there are many barriers to seed-exchange programs between countries: Most people don't know what seed resources are available, there may not be established procedures in place to allow or facilitate exchange. There are often national laws protecting biological and genetic resources that make it difficult to send seed to other countries. Dr. Scheffler said scientists from donating and receiving countries need to work toward facilitating exchanges. She proposed that a common website with links to information about where public national and international collections, as well as available private seed collections can be found, which potentially could be facilitated through ICAC and ICRA.

Current laws can make it difficult to share seeds with other countries but the speaker said successful seed exchanges are possible and beneficial with proper guidelines, oversight and carefully written agreements where both the donor and recipient recognize the benefits.

Dr. Scheffler added that there is an existing International treaty (ITPGRFA) to establish a system and protocols to facilitate access to plant germplasm for conservation and research, breeding, or training — but cotton is not on the list of crops covered under that treaty.

As an example of a successful intergovernmental partnership, she highlighted the US-Pakistan collaboration on cotton leaf curl virus, which is endemic in Pakistan. Working together, the countries identified multiple sources of resistance to the virus and each country is now developing varieties adapted to their own environmental

conditions. This resistant germplasm now is freely available to cotton researchers worldwide. Dr. Scheffler's presentation is a statement of the meeting.

Dr. Ghorban Roshani, Soil Scientist and Director of the Cotton Research Institute in Iran opened his presentation by pointing out that cotton is one of the most important commercial fibres in the world. He said that in the USA, the production of a single year's cotton crop involves the purchase of more than \$5.3 billion worth of supplies and services, and that processing and handling the cotton after it leaves the farm generates even more business activity.

Beyond the economic benefits, Dr. Roshani said cotton production has a small greenhouse gas footprint — approximately 300 pounds of carbon equivalent emissions per acre. Cotton producers, he said, have reduced their greenhouse gas emissions by 30% since 1980.

Dr. Roshani said he has been calling for international collaboration for some time, pointing out that he first introduced the idea of establishing an international cotton research institute during the 71st Plenary Meeting in 2012, but no action was ever taken. He insisted that seed is the most important input of any crop production system and is the primary step to achieving the potential of quantitative and qualitative yield of a genotype in the real world.

Dr. Roshani said that the yield gap is directly related to weaknesses in seed technology. He added that production of some basic human foods in most developing countries would be virtually impossible without international seed exchanges, and that thousands of new lines of wheat, barley, corn and rice are given annually by international research institutes to agricultural research centres in many countries.

The speaker concluded by saying that in many

countries, cotton production is the responsibility of governments. But six years ago, the production of all commercial cotton cultivars in Iran were assigned to the non-governmental sector, which has since reversed the trend of declining cotton production. Dr. Roshani's presentation is a statement of the meeting.

Dr. N'Guessan Esoi, Researcher at the National Research Centre of Côte d'Ivoire said that before the crisis in the early 2000s, production in Côte d'Ivoire was high at 400,000 tonnes with a yield of 1.4 tonnes of seed-cotton per hectare. Much of the country's cotton research and genetic resources were destroyed in a war, driving the country's yields to pre-1967 levels.

Dr. Esoi said that Ivorian soils continue to weaken, leading to new outbreaks of pests and diseases. He noted that among the most concerning developments in the soil degradation are acidification and nutrient loss. The speaker said that while researching soil fertility, scientists discovered that there are two distinct zones in Côte d'Ivoire, each with its own fertility. As a result, researchers are working to develop fertilisers tailored for each region.

Researchers trying to develop and assess bio-pesticides for each region as well, including 'pheromone based insect mating-confusion', as a means of protecting yields. The timing of treating the fields should also be evaluated to determine its impact.

In terms of genetics, Dr. Esoi pointed out that the challenges are considerable because all of the country's phylogenetic resources had been destroyed in a war. Côte d'Ivoire was forced to use foreign seed banks and efforts are now underway to rebuild the country's genotypes and create new varieties and new seed production systems.

Those efforts, however, must include new genetic materials to address climate change and introduce specific traits, including drought tolerance, fuzziness, and the ability to resist disease. This is critical if Côte d'Ivoire hopes to be able to develop and introduce quality varieties in the future.

In addition, Dr. Essoi said, Côte d'Ivoire needs a structure to manage genetic materials, but no such structure exists. There is no means to

quarantine the genetic resources introduced in the country, and that must be addressed. Such regulations exist for food crops, but for cash crops like cotton, there are no official regulations to place new varieties of cotton in the national catalogue, meaning the seeds can't be certified.

At the conclusion of Dr. Essoi's presentation, the CHAIR asked the audience if there were any questions. When none were asked, Dr. Scheffler asked Dr. Roshani what his thoughts were on the

steps needed — both from the government and private sector — to establish an international cotton research institute. He replied that such a topic was outside of his area of expertise and that he didn't know how or where it would be created, but insisted that its establishment would be critical to ensuring cotton's future. Dr. Essoi's presentation is a statement of the meeting.

Seeing no other questions, the CHAIR thanked the speakers and adjourned the session at 15:15 hrs.

Meeting of the Steering Committee

13:45 hrs. Thursday, 6 December 2018

Chair: Mr. Kai Hughes, Executive Director, ICAC

Working Paper 1 Election of Standing Committee Officers

The CHAIR opened the session and noted that the Standing Committee had provisionally approved as Chair, First Vice Chair and Second Vice Chair — Mr. Ali Tahir of Pakistan, Ms. Maha Zakaria of Egypt, and Mr. Selman Kurt of Turkey, respectively. The delegate from the UNITED STATES endorsed them and the delegate from BRAZIL seconded. Seeing no other comments, the CHAIR declared them elected as officers of the Standing Committee for the ensuing year.

Working Paper 2 Proposed Topics for the 2019 Technical Seminar

The CHAIR informed the Steering Committee that three topics had been proposed for next year's Technical Seminar and had been discussed at the previous day's session with 'International Seed Exchange' having been chosen. The delegate from BRAZIL said that although the topic had already been discussed at the current Plenary Meeting, Brazil had not been present and strongly proposed the subject of Cotton Traceability Technology as the topic instead. Delegates from AUSTRALIA and TURKEY agreed.

The delegate from INDIA recommended that Seed Exchange be the topic because of the need for improved varieties whilst the delegates from the UNITED STATES, EGYPT and KENYA supported Traceability. The Chair indicated that there seemed to be consensus for Traceability and asked for any further comments. The delegate from PAKISTAN urged the Committee to choose Seed Exchange, especially in light of climate change and the need to develop new varieties to meet those challenges.

The CHAIR said there appeared to be consensus on Traceability and declared that be the topic but the delegate from INDIA asked if a vote were possible since many delegates had not

voiced an opinion either way. The delegate from SWITZERLAND proposed taking an informal 5-minute, 'off-the-record' break for delegates to discuss and potentially come to a consensus thus avoiding a vote. The delegate from UNITED STATES agreed with the delegate from SWITZERLAND in order to avoid the unprecedented vote. The delegate from BRAZIL proposed that 'Traceability' be the Technical Seminar topic, but that Seed Exchange be included in the agenda to ensure the subject was addressed in 2019. The delegate from AUSTRALIA acknowledged the importance of Seed Exchange but pointed out that the discussions at this year's World Café illustrated the urgent need for traceability technology and encouraged the Committee to choose that for the Technical Seminar.

The delegate from INDIA said it would be difficult to stress the importance of germplasm exchange in only 5 minutes and asked to make her case in front of the group. There being no opposition to this suggestion, the Delegate from INDIA said that increasing cotton production through seed exchange was critical and that growth rates in most countries were stagnant or decreasing. She pointed out that many technology companies were already addressing traceability in the private sector and that the role of ICAC was to make recommendations to governments, thus Seed Exchange should be the topic. The delegate from PAKISTAN added that his country had lost 4.5 million USD to leaf curl virus in 1992-97 and that Pakistan's production would never have recovered had they not received five CLCuD resistant varieties from different countries which helped the country's productivity to recover.

The delegate from TURKEY agreed that all of the topics were important but Traceability was crucial for consumers, who want transparency. The delegate from UNITED STATES pointed out that while both subjects were important, 'Traceability' was best aligned to meet the goals set out in ICAC's Strategic Plan and that expansion of membership — especially adding consuming countries — was imperative and that 'Traceability' would be best suited to achieve that.

The delegate from SWITZERLAND proposed enlarging the World Café and using it to address both of these important topics, but the Chair said one topic needed to be discussed in the Technical Session and that the remainder of the agenda was determined by the host country. The delegate from BRAZIL disagreed with having a vote and pointed out there already was consensus and the delegate from COTE D'IVOIRE said that Traceability was a more relevant topic and advocated it be chosen.

The delegate from AUSTRALIA said that Australia also strongly preferred that the Technical Seminar be held on Traceability, and then offered a compromise, saying Australia has a very successful crop breeding program and they could approach the organisers of Australia's crop breeding program and ask them to speak during the normal course of the conference, adding that their experience in this area exceeded germplasm — and thus in some ways might actually be even more useful than choosing Seed Exchange as the Technical Seminar topic. This solution seemed like the best compromise possible and was agreed by the Steering Committee.

Working Paper 3 Strategic Review of the ICAC

The CHAIR then turned the focus to the ICAC's Strategic Plan for the years 2019 through 2021, pointing out that it was the first Strategic Plan to have been developed since 2007. The Chair provided highlights of the process through which it was created, including the hiring of an independent strategic consultant and asking for input from more than 3,000 individuals who have had contact with ICAC over the years.

The Strategic Review process evaluated four main areas:

- 1) The governance structure,
- 2) Revenue-building activities,
- 3) Partnerships, and
- 4) The ICAC membership structure.

The CHAIR pointed out that membership was the most important element of the Strategic Plan with the emphasis on both retaining existing

members and encouraging new members to be part of the ICAC particularly from consuming countries. The addition of an associate membership structure, for national and international organisations, would also be explored as this would provide a critical link to the private sector as well as providing a revenue stream.

Encouraging research throughout the entire cotton value chain was also important. Currently the ICAC currently had four regional networks covering, Asia, the Mediterranean and the Middle East, South and East Africa and Latin America and there was a real need to develop one for West Africa as well. In addition, ICAC will also focus on innovation and wanted to develop a world cotton innovation conference and was actively looking for partners to develop that idea.

The current Strategic Review did not address ICAC's mission and vision statements and its values but these will be debated at the next Strategic Away Day. The Chair also emphasised the importance of utilising technology and in particular, he mentioned the need to use technology to assist producers, citing the ICAC's proposed soil health app and virtual reality training as examples.

Finally, the CHAIR provided an overview of ICAC finances and the need to both keep current revenue streams as well as to develop new ones through sources such as projects, advertising and sponsorships. Although ICAC is the smallest of the seven International Commodity Bodies recognised by the UN, the ICAC is the smallest in terms of staff and budget and performs as efficiently or more efficiently than any of the others with its limited resources. The Chair said the intention was not to fund the additional initiatives ICAC wanted to pursue in the Strategic Plan by raising the fixed portion of assessment fees above current levels but would be funded via the new revenue streams mentioned previously.

The delegate from the UNITED STATES said he had been involved in the development of the Strategic Plan and was very pleased at the final report. He congratulated ICAC for its ability to be effective despite having a zero-growth budget for the last 14 years, but reiterated that to accomplish the new initiatives, new revenues would be needed. He strongly encouraged the Steering Committee to adopt the Plan, and the delegate from BRAZIL seconded the adoption. The Chair asked the Committee for approval of the Strategic Plan and having received it, he adjourned the meeting.

ATTACHMENTS

Working Paper I

Election of Standing Committee Officers

Recommendation from the Standing Committee

The ICAC Nominating Committee met on 22 May, 2018, at the Office of the ICAC Secretariat, to propose the officers for the Standing Committee for the coming year. Delegates from Egypt, European Union, India, Pakistan, Switzerland, Taiwan, and the United States participated. Ms. Claudia Fontana Tobiassen, Chair of the Standing Committee, agreed to serve as Chair of the Nominating Committee.

The Rules and Regulations specify that when practical, the First Vice Chair will be nominated to succeed the outgoing Chair, and the Second Vice Chair nominated to succeed the First Vice Chair.

The Chair found that there was a consensus to confirm the nominations of Mr. Ali Tahir (Minister of Trade, Embassy of Pakistan, current First Vice Chair) as Chair, and Ms. Maha Zakaria (Counsellor, Economic and Commercial Office, Embassy of Egypt, current Second Vice Chair) as First Vice Chair, from the end of the 77th Plenary Meeting in Côte d'Ivoire to the end of the 78th Plenary Meeting in Australia.

The Rules and Regulations say that the election of officers should take into account:

1. Rotation on as broad a geographical basis as possible.
2. Adequate representation to importing and exporting countries.
3. Ability, interest and participation in the work of the Committee.
4. Timely payment of assessments.

After consideration of these factors, the Nominating Committee agreed that Mr. Selman Kurt, Foreign Trade Specialist, Embassy of Turkey, should be nominated to serve as Second Vice Chair.

The nominations received provisional approval from the Standing Committee at its 555th Meeting on 7 June, 2018.

Accordingly, the Standing Committee proposes the following officers to the Plenary Meeting for the period from the end of the 77th Plenary Meeting in 2018 to the end of the 78th Plenary Meeting in 2019:

Mr. Ali Tahir, Pakistan, for Chair

Ms. Maha Zakaria, Egypt, for First Vice Chair

Mr. Selman Kurt, Turkey, for Second Vice Chair

Working Paper 2

Proposed Topics for the 2019 Technical Seminar

Proposals from the Secretariat to the Committee on Cotton Production Research

The following topics are proposed for the 2019 Technical Seminar:

1. International Seed Exchange
2. Cotton Traceability Technologies
3. Recent Advances in Cotton Biotechnology

International Seed Exchange

The cotton genetic base in many countries is narrow, and access to new seeds or germplasm holds the key for genetic improvement and progress. Such new germplasm could be available generally across continents and can assist in enhancing genetic diversity and expanding genetic variability for useful traits. Recently a few global treaties and national policies have been drafted with intentions of facilitating germplasm sharing, protecting native bio-diversity, food security, farming community rights and breeder rights. The policies developed through the 'Convention on Biological Diversity-1993', the 'International Treaty on Plant genetic resources for Food and Agriculture (ITPGRFA)-2004', and the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits -2014' established clear guidelines for germplasm exchange and use between signatory countries. However, some countries have opted to draft their own national policies, which could be in broad consonance with the global policies but are strongly restrictive in stipulating conditions for seed transfers and benefit sharing. There is emerging evidence that some aspects of these policies could slow germplasm exchange across countries, which could be detrimental to the progress of cotton improvement. The seminar will discuss the implications of national policies on gene-banks and biodiversity of major cotton growing countries on the possible frictions and the emerging uncertainty of trans-boundary seed movement exchange with an objective to developing a roadmap to create a global platform that operates as a smooth and trustworthy channel of seed exchanges amongst countries across boundaries.

Cotton Traceability Technologies

Traceability methods are expected to establish authenticity of fiber quality, establish fiber origins, quantify fiber purity and track the processing path from fiber to fabric. Origins of a fiber could be related to the place of cultivation, or a type of farming method such as organic or sustainability related practices, or a particular

fiber quality such ‘Egyptian cotton’, or a specific species or a variety. While a few methods can trace origins and enable quantification of the fibres in a blend, others add labels to fibres and claim authentic tracking of the label along the value chain all the way to the apparel. Currently traceability methods employ either ‘elemental-relative-isotope technology’ to detect origins or tagging fibres with DNA or fluorescent probes or block-chain technologies to track the labelled fibres. New methods related to characterizing of microbiome signatures or DNA-nanotechnology or phosphorescent probes have also been proposed for tracking the journey of fibres in the value chain. The seminar will discuss the state-of-art cotton traceability-technologies that are available to ascertain the integrity of claims in a cost-effective manner.

Recent Advances in Cotton Biotechnology

The newly discovered genomic editing and gene-silencing tools may revolutionize health and agriculture. Over the past 20 years, insect resistant and herbicide tolerant biotech cotton have delivered impressive benefits to major cotton growing countries across the world. New exciting tools of gene silencing through Ribonucleic Acid Interference (RNAi) and genome editing through Mega-Nucleases (MN), Zinc Finger Nucleases (ZFN), Transcription Activator-Like Effector Nucleases (TALENs) and Clustered Regularly Interspersed Short Palindromic Repeats (CRISPR) along with CRISPR associated protein-9 (CAS-9) have added radically new dimensions to the prospects of biotechnological applications in cotton improvement. Genome editing, RNAi and genetic engineering can be used to develop new varieties resistant for sustainable control of bollworms, boll weevils, sap-sucking insects, cotton leaf curl virus disease, wilts and bacterial blight while adding new traits for nitrogen use efficiency, drought-tolerance, water use efficiency, climate resilience and premium fiber qualities. Trans-gene pyramiding at a single desired locus through the recently developed CRISPR-CAS9 technology by genome edited locus-specific site directed integration will immensely accelerate introgression of the multiple traits into native varieties of new biotech cotton. The seminar will discuss ways to effectively utilize these next-generation tools of cotton-biotechnology to either add novel genes at a precise locus on the genome or effectively knock-out undesirable genes. The seminar will take stock of the recent advances that have potential to revolutionize the cotton sector.

Working Paper 3

Strategic Review of the ICAC

Recommendation from the Standing Committee

Introduction

The International Cotton Advisory Committee (ICAC) last conducted a review of its mission and functions in 2007. At its meeting on 7 September 2017, the Standing Committee gave approval to conduct a further review and its recommendation was put before the Steering Committee at the Plenary Meeting in Tashkent, Uzbekistan on 27 October 2017.

It was also approved that a Strategy Subcommittee of the Standing Committee be designated to take oversight of the process and report to the Standing Committee on progress at each of its meetings. The Standing Committee would then agree on the Strategic direction of ICAC, and report that decision formally at the Plenary meeting in Côte d’Ivoire. That report is appended as Annex A for final approval.

Governance Process

The Standing Committee at its first meeting of 2018, agreed that the Strategic Review process would benefit from the involvement of an independent consultant who had experience of developing strategy within governmental/not-for-profit bodies. This consultant would work closely with the Executive Director to ensure that the Review could be completed within a very tight time frame. Following a recommendation from Mr. James Johnson, USA, Ms. Patricia (Trish) Kyle was asked to assist the Sub Committee.

Ms. Kyle is a strategic organisational development specialist, management consultant and master level leadership coach with over 20 years of experience leading organisations and people through transformation and growth. She has provided strategic expertise, guidance, planning and coaching to organizations planning for, or in the midst of, transformation. Her most recent being the Smithsonian Institution. She has held diverse leadership positions in Human Resources and human capital consulting as well as management consulting working with a range of organisation including federal government and non-profit.

The resultant Strategic Plan would cover a 3-year time frame (2019 – 2021) and would be revisited annually to monitor progress and to develop the next Strategic Plan covering a further three years. The Strategic Plan process would therefore form an intrinsic part of the Governance Cycle of the ICAC.

A Strategy Subcommittee was formed of volunteers from amongst the delegates of the Standing Committee. The Sub Committee consisted of the following delegates;

- Ms. Agnes Capony (European Union)
- Mr. Colin Hunter (Australia)
- Mr. James Johnson (United States)
- Ms. Maha Zakaria (Egypt)
- Ms. Mariam Coulibaly (Côte d’Ivoire)
- Mr. Rado Wang (Taiwan)
- Mr. Selman Kurt (Turkey)

Mr. Rado Wang, Taiwan, was elected Chair and Ms. Maha Zakaria, Egypt, as Deputy Chair.

The first duty of the newly formed Strategy Sub Committee was to agree on the timelines associated with the process which is explained below and detailed in Annex B. The minutes of each meeting of the Strategy Sub Committee are attached as Annex C.

Process

The approach adopted in this Strategic Review was a ‘bottom up’ approach thus ensuring that everyone in the organisation and associated stakeholders were engaged in the process and their views sought and information collected. This information would then be presented to members of the Standing Committee and key stakeholders at a Strategic Away Day where themes would be identified and enablers agreed.

The following procedure adopted a ‘bottom up’ approach where much of the debating and information gathering was conducted internally by the Secretariat and then presented to stakeholders at a ‘Strategic Away Day’ where themes and priorities were identified with resulting enablers.

Following the Plenary Meeting in Tashkent, the Secretariat held a ‘brain storming’ session to conduct a Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis. This helped to organise and prioritise ideas around the organisation and would form the basis of engagements with key stakeholders. The SWOT analysis is shown in Annex D.

At the same time, the Secretariat conducted desktop exercise collecting data on other international commodity bodies. That data was made available to Standing Committee Delegates and was presented in a comparative table, shown in Annex E.

In order to engage with the various groups of stakeholders and solicit their views and ideas for the future direction of the organisation, a questionnaire was produced and agreed by the Strategy Sub Committee and Standing Committee and was sent out to over 3000 contacts in the ICAC database. These being contacts that have at some time in the last few years had some form of engagement with the ICAC either as a member government via the Coordinating Agencies and Standing Committee, member of an ICAC subcommittee such as SEEP, CSITC, PSAP and IFCP, attendance at Plenary Meetings, members of the International Cotton Researchers Association (ICRA), purchasers of ICAC publications

and Observer organisations. 205 replied to the questionnaire and a summary of the replies can be found at Annex F.

All the above information was then presented during a Strategic Away Day held on 12 July 2018 and attended by members of the Standing Committee, ICAC staff and the Chair of the Private Sector Advisory Panel (PSAP) – all Chairs of all the main committees were invited to attend. The Strategic Away Day was led by the outside consultant, Trish Kyle and the Executive Director and the comments from that meeting are shown in Annex G. These comments were then translated into a draft Strategic Plan and presented to the Strategy Sub Committee and Standing Committee for comments and for priorities to be added. The final version of the Strategic Plan is attached as Annex A.

It is important for member governments to note that every stage there have been three filters and therefore three opportunities for governments to contribute to the development of the Strategic Plan. Each stage has been reviewed by the Strategy Sub Committee, the Standing Committee and, therefore by default, the Coordinating Agencies.

Strategic Plan Impact

The strategic review process and the resultant Strategic Plan needs to address the following four fundamental questions:

- Where are we now?
- What are we trying to achieve?
- Where do we want to be?
- What resources are required in order to get there?

It is this last question that should be addressed here as this has the potential to impact on future assessment fee commitments from member governments. In the Strategic Plan, where additional resources are required to achieve an objective, they have been noted in the last column. No monetary figure has been placed on these resources as, at this stage, the detail has not been worked out and where additional staff need to be employed there are many different options – full time, part time, employed abroad etc. This will need to be the subject of a further paper and further deliberations at the Standing Committee.

However, it is the intention that the implementation of the Strategic Plan should not result in an increase in the current assessment fees. Additional income obtained from increased membership and increased revenue from projects should be in place first in order to offset any additional costs associated with additional resources required.

Future Actions

As detailed above, the Standing Committee will review the organisation's progress against the Strategic Plan annually at a Strategic Away Day

and progress reported to the Steering Committee at its Plenary Meeting.

Details of the Strategic Plan and progress will be reported widely to all stakeholders via an Annual Report which will be produced in the first quarter of each year and be made available on the website.

Now the basics of the Strategic Plan are in place, it should be the aim to review and enhance the plan each year. In 2019, the aim will therefore be to review in particular, the Mission, Vision and Values of the organisation.

Recommendation

That the attached Strategic Plan be approved and that the Standing Committee continue to monitor progress against the plan until the next review in 2021 when a new Strategy Sub Committee should be established. Progress will also be reported every year to the plenary Meeting and to all stakeholders via an Annual Report.

Working Paper 4

Uncollected Assessments of ICAC Members

Recommendation from the Standing Committee



INTERNATIONAL COTTON
ADVISORY COMMITTEE

1629 K Street NW, Suite 702,
Washington, DC 20006, USA

	ASSESSMENT FEES									
	2018 - 19		2017 - 18		2016-17		Prior Years		Total Owed	
	Owed	Paid	Owed	Paid	Owed	Paid	Owed	Paid		
ARGENTINA	31,300	0	29,100	0	30,900	30,900			60,400	
AUSTRALIA	100,400	100,400	105,000	105,000	120,400	120,400			0	
BANGLADESH	152,200	0	133,300	133,300	38,550	38,550			152,200	
BRAZIL	99,600	0	99,200	99,200	107,935	107,935	192,300	192,300	99,600	
BURKINA FASO	51,100	0	46,600	46,600	45,800	45,800	38,100	38,100	51,100	
CAMEROON	35,300	0	32,200	0	32,200	0			99,700	
CHAD	29,500	0	27,375	27,375	27,300	27,300	21,600	21,600	29,500	
CÔTE D'IVOIRE	41,900	0	38,300	38,300	38,900	38,900			41,900	
EGYPT	37,100	0	33,300	33,300	35,200	35,200			37,100	
EUROPEAN UNION	65,100	65,100	61,700	61,700					0	
INDIA	185,600	0	179,800	179,800	216,400	216,400			185,600	
KAZAKHSTAN	29,800	0	28,300	28,300	29,000	29,000			29,800	
KENYA	25,200	0	23,600	23,600	23,800	23,800			25,200	
KOREA, REP.	51,600	51,264	49,100	49,100	51,800	51,800	44,818	44,818	336	
MALI	46,600	0	41,400	41,400	0	0	64,300	64,300	46,600	
MOZAMBIQUE	27,300	0	25,300	11,579	27,500	27,500	41,400	41,400.00	41,021	
PAKISTAN	70,500	0	63,877	63,877	70,677	70,677	64,704	64,704	70,500	
RUSSIA	31,500	31,500	29,600	29,600	29,900	29,900			0	
SOUTH AFRICA	27,700	0	24,400	24,400	25,000	25,000	21,200	21,200	27,700	
SUDAN	27,000	0	21,425	0	40,100	40,100	31,796	31,796	48,425	
SWITZERLAND	25,300	25,300	23,800	23,800	24,000	24,000			0	
TAIWAN	41,800	41,800	40,400	40,400	42,300	42,300			0	
TANZANIA	28,900	0	27,700	0	28,300	0	23,200	13,538	94,563	
TOGO	28,500	0	26,800	26,800	6,400	6,400	600	600	28,500	
TURKEY	116,700	116,700	107,300	107,300	110,400	110,400			0	
UGANDA	27,000	27,000	0	0	0	0			0	
USA	275,000	0	244,300	244,300	276,300	276,300	280,600	280,600	275,000	
UZBEKISTAN	76,900	0	78,800	78,800	85,000	85,000			76,900	
ZIMBABWE	29,000	0	28,600	28,600	31,800	31,800			29,000	
	1,815,400	459,064	1,670,577	1,546,431	1,595,862	1,535,362				

Closing Plenary Session

15:45 hrs. Thursday, 6 December 2018

Chair: Mr Kai Hughes, Secretary General, ICAC

The 'Mistress of Ceremonies' gave welcoming remarks and presented Mr. Siaka Minahaya Coulibaly, Director of Cabinet of the Minister of Agriculture and Rural Development of CI, and Dr. Adama Coulibaly, President of the Organising Committee and Director General, Cotton and Cashew Council.

The nominated Chair, Mr. Coulibaly, requested the Secretary General to take the Chair for the session. This was approved by the delegates.

The CHAIR opened the session with the item 'Reading of the Final Statement'. The delegate from BRAZIL proposed that, in the interests of time, the document which had already been presented to Delegates be approved. This was

seconded by the delegate from the UNITED STATES. There being no further comments the motion was approved.

The delegate from AUSTRALIA delivered the invitation to the 78th Plenary Meeting as hosts for the 2019 meeting. The meeting will be held in Brisbane, Australia between 1-5 December 2019 under the theme 'Global leadership: Pushing Cotton's Boundaries'.

On behalf of all delegates, the delegate from UZBEKISTAN made closing comments on behalf of all the delegates, expressing gratitude to the leadership of the ICAC and the Government of the Republic of Côte d'Ivoire for the invitation to visit this wonderful country and be participants in this forum. Mr. Kuliev's closing remarks are a statement of the meeting.

The President of the Organising Committee,

Dr. Adama Coulibaly made thank you remarks. The quality and value of the open and breakout sessions was noted with expert presenters, moderators and active discussions.

Closing remarks were presented by Mr. Siaka Coulibaly representing the government of Côte d'Ivoire spoke on behalf of the Minister of Agriculture and Rural Development Mr. Mamadou Sangafowa Coulibaly, who had wished to be present to make the closing remarks but due to conflicting responsibilities, was not able to do so. He however, presented his remarks through Mr. Siaka Coulibaly. He congratulated the delegates and participants on a successful 77th Plenary of the ICAC and the pleasure of hosting the meeting.

The CHAIR thanked the Minister, the Organising Committee and all the delegates on behalf of the staff for attending and formally closed the 77th Plenary Meeting at 16.50 hrs.

First Breakout Session

New Biotechnologies - New Gene Biotech-Cotton, Gene-Editing, Low-Gossypol Cotton, Pink Bollworm, Male Sterile Technologies

11:00 hrs. Tuesday, 4 December 2018

Chair: Dr. Alexis Wongeve Yte, Director General of the National Agricultural Research Center of Côte d'Ivoire

Dr. Maria Fatima Grossi-de-Sa, Research Leader of the Plant-Pests Molecular Interaction Group at EMBRAPA Genetic Resources and Biotechnology and professor at the Catholic University of Brasilia spoke on the topic of Bt Toxins and New Biotech Tools for Crop Protection. She pointed out that environmental factors inhibit plant development, and the tools of biotechnology can help to optimize agricultural production by reducing, in an environmentally friendly way, the negative influences of the environment. In Brazil, 95% of cotton production is biotech. She noted that the four major methods of controlling plant pests are chemical controls, conventional breeding, genetic engineering, and new biotech tools.

Biotechnology includes the exchange of genetic material among any plant species to enhance endogenous traits. New traits can be developed in 5-10 years. New biotech tools include RNA interfering (RNAi) strategy in planta; RNAi strategy for topical application in cotton (Sprayable); Fine-tuning miRNA to improve resistance; and Genome editing to improve traits.

Dr. Grossi-de-Sa explained how scientists in Brazil are using the new biotech tools to protect cotton from the boll weevil using a gene called Cry10Aa. She reported that six elite events have been selected for field trials. Field-screening will be conducted in 2019 and 2020. She said that Cry10Aa GM events may have great commercial potential for integrated management of the boll

weevil, and Cry 10A gene stacking, or the use of RNAi technologies could result in powerful new cotton cultivars. Dr. Grossi de Sa's presentation is a statement of the meeting.

Dr. Hesham Hamoud, Director, Egypt's Cotton Research Institute, spoke about Gossypol Content of Egyptian Cotton Seeds and its Inheritance. Dr. Hamoud noted that gossypol, a compound that is toxic to insects and animals, is present in the cotton plant. Gossypol is produced by pigment glands in cotton stems, leaves, bolls, seeds, and flower buds. This compound is a natural defense, necessary for plant survival, but it also limits the use of cotton seed and oil for human and animal consumption.

Dr. Hamoud reported that the gossypol content of cotton seed is a heritable character. He said that Egyptian scientists are selecting genotypes that minimize the gossypol content in cotton seed and oil while preserving glanding in other parts of the plant. Dr. Hamoud's presentation is a statement of the meeting.

Prof. I. Abdurakhmonov, Director, Centre of Genomics and Bioinformatics, and Minister of Innovative Development, Government of Uzbekistan (Paper delivered by Mr. Tokhir Kuliev); the title of Dr. Abdurakhmonov's paper was, "High quality RNAi-cotton cultivars with superior fibre quality and improved agronomic traits."

Dr. Abdurakhmonov reported that scientists have cloned and characterized cotton's phytochrome gene family and found a close association of the phytochrome A1 gene with fibre length and strength. Further, scientists have developed a binary RNA interference (RNAi) genetic construct and somatically transformed it into embryogenic

G. hirsutum L. cv. Coker 312.

He said that research indicates that the phytochrome regulatory network of cotton may have a fundamentally different dynamic architecture than that of the model plant, *Arabidopsis*. Previous findings from *Arabidopsis* with loss-of-function phyA mutations showed no increase in expression of other phytochromes. Transcriptome and miRome analyses deciphered a complex network of key genetic regulation pathways and miRNA expression profiles in RNAi plants. Dr. Abdurakhmonov's presentation is a statement of the meeting.

The CHAIR thanked the three presenters and asked if there were questions or comments.

Dr. Grossi-de-Sa was asked if she considers events produced with New Biotech Tools to be biotech or GMO. She emphasized that none of the six events selected for field trials for boll weevil control have been released.

Dr. Grossi-de-Sa was also asked if there are genes to provide resistance to the pink bollworm. She answered that it is possible to identify specific genes to target particular pests, but you need to have knowledge of the DNA of the target pest.

Dr. Hamoud was asked if cotton plants can survive without the expression of gossypol. He repeated that Egyptian breeders are working to breed barbadense varieties that minimize the expression of gossypol in seeds while retaining the pigment glands in other parts of the plant.

Seeing no other comments or questions, the CHAIR again thanked the presenters.

The First Breakout Session was adjourned at 12:30 hrs.

Second Breakout Session

Busting the Misinformation About Cotton

13:45 hrs. Tuesday, 4 December 2018

Chair: Mr. Mike McCue, Director of Communications, ICAC.

Mr. McCue noted that #TruthAboutCotton is an awareness campaign created by the International Cotton Advisory Committee (ICAC) to counter the lies and misunderstandings that have become so rampant in the media in recent years. He said that many of these falsehoods about cotton have come to be accepted as facts by the media, as well as by those who seek to benefit from undermining the global cotton industry. #TruthAboutCotton uses statistics, research and verifiable facts to counter these falsehoods. By empowering everyone in the global value chain to confront lies and mistruths when they see them — ‘If you see something, say something’ — #TruthAboutCotton seeks to defend the hundreds of millions of people around the world who depend upon cotton for their livelihoods.

Mr. McCue said that many mis-facts about cotton are communicated so often that editors accept them without question. He noted that manufacturers of synthetic fibers are not the source of myths about cotton. Instead, the bigger problem is the organic community.

He said that most of the #TruthAboutCotton entries fall into one of ten categories: water, pesticides, land use, consumer preferences, organic, non-fiber uses, synthetics, The Cotton Plant, Social Impact and Innovation. He said the campaign seeks to build a mountain of truth to combat lies about cotton. Mr. McCue's presentation is a statement of the meeting.

Ms. Elke Hortmeyer, Director of Communications and International Relations, Bremen Cotton Exchange, Germany reported on Cotton Production – the European view. She noted that organic is very popular in Europe, and GMO has met with enormous public opposition in the past two decades. She added that problems in the textile value chain are very often linked with cotton fiber, even though there is no connection.

She noted that one of the major political parties in Germany is explicitly opposed to agro-genetic engineering, and 19 of 28 members of the EU have either partially or fully banned GMOs for food crops.

However, she also reported that 173 genetically engineered drugs are currently approved in more than 200 medications in Europe. Nevertheless, there are negative perceptions of GMOs for emotional reasons. For instance, people believe that DNA is the “essence” of an organism, and when genes are transferred among distantly-related species, people believe that this will cause the characteristics of the source organism to emerge in the recipient. Anti-GMO organizations exploit

these intuitions by publishing images of tomatoes with fish tails.

Regarding organic cotton, Ms. Hortmeyer noted that 6% of agricultural area in the EU is organic. She noted that Greenpeace claims that organic cotton production has the potential to improve people's livelihoods, take care of the environment, reduce water use, avoid the use of GMOs and prevent the use of dangerous pesticides.

Ms. Hortmeyer noted that there is an immense gap between agriculture and fashion, between soil and the catwalk, and people from urban areas have little understanding of agriculture. Modern agriculture has achieved such a degree of security in the supply of food that people no longer understand what an extraordinary achievement this is. She noted with irony that if agriculture were less successful, there would be food shortages and greater appreciation for the successes of agricultural technology.

Ms. Hortmeyer concluded that negative information about cotton hits the entire sector. She suggested that increased communication and cooperation among all stakeholders in supporting the cotton industry would be helpful. She encouraged individuals and organizations to join forces with the International Forum for Cotton Promotion and to support the #TruthAboutCotton campaign. Ms. Hortmeyer's presentation is a statement of the meeting.

Dr. Terry Townsend, Consultant, Cotton Analytics, USA, spoke on the topic of, “Combating Demonization: Time to Name Names.” He said that demonization occurs when practices that are years out of date are described as being current, statistics are given without context or perspective, or linkages are alleged between cotton and harm without scientific basis. He said these practices will not stop unless the structure of incentives that motivate such behaviour is changed.

He noted that critics of cotton are motivated by self-interest. He said they do not repeat myths about cotton out of ignorance, and thus it is insufficient to provide more information. He said that the cotton industry must criticize individuals and organizations by name, thereby increasing the implicit cost of demonizing cotton, to reduce the misinformation being promulgated. He noted for example that the Pesticide Action Network, the Textile Exchange and C&A Foundation have all moderated or eliminated some of their more strident allegations against cotton in recent years. He suggested that the cotton industry begin systematically challenging retailers and NGOs that provide egregious false information about cotton. Dr. Townsend's presentation is a statement of the meeting.

Dr. Allan Williams, Manager, Investment & Impact, Cotton Research & Development Corporation, Australia spoke on the topic of, “Cotton and water: the need for facts and story-telling (but not myths).” He explained the complexities involved in defining and measuring water use. Water use can be measured by calculating how much physically moves through the plant, or by calculating how much water is provided to the crop, either by irrigation or rainfall, and we can calculate the sum of how much rain falls on the crop (green water), the volume of irrigation water provided (blue water) and a modelled amount of water required to dilute pollution from nearby water bodies (grey water). There is also a water scarcity index, which seeks to account for the relative scarcity of water in a production area. Dr. Williams highlighted that Life Cycle Assessments do not include rainfall (green water) in their calculations.

Dr. Williams noted that however defined and measured, cotton's water requirements vary widely depending on region, length of growing season, climate, cultivar and irrigation method. Cotton accounts for about 3% of global agricultural water use. The volume of water required to grow one kilogram of lint is in the range of 3,000 to 7,000 liters. However, if we average over all the cotton produced in the world each year, then just over 1,200 liters of water are required per kilogram of lint. Cotton uses much less water than some other crops such as rice, and about as much water as nuts and sugarcane.

However, Dr. Williams agreed with other speakers that it is not sufficient that the cotton industry provide facts in response to allegations that cotton “is a thirsty crop.” Many issues facing agriculture are inherently emotive, and entrenched bias is hard to sway because people form beliefs or make decisions that do not reflect an objective assessment of facts. Accordingly, Dr. Williams urged members of the cotton industry to tell compelling stories that are based on facts in order to combat the myths about cotton. He said that transparency and dialogue, where shared values can be identified, are the keys to building trust. Dr. Williams' presentation is a statement of the meeting.

The CHAIR thanked the presenters and asked if there were any questions for the panel.

A member of the audience asked who should be the target audience for the #TruthAboutCotton campaign, retailers or consumers? He recounted an incident in which Ikea was selling 100% polyester sheets with a cotton emblem on the packaging. When confronted with the obvious deception, a representative of Ikea responded that the emblem was a “flower,” not an emblem of cotton.

Mr. McCue and other speakers said that retailers sell what people want. Therefore, consumers determine what retailers do. Accordingly, efforts to confront demonization of cotton needs to be consumer focused.

Dr. Williams suggested that retailers should be informed of the practical implications on their supply chains of advocacy of impractical

production systems. He added that the cotton industry needs a strategy of communication, not just a case-by-case tactical approach.

The panel was asked if estimates of water use in cotton included textile production. Dr. Williams responded that the water use figures he had given were for cotton growing only. He added that there are assessments of the water use in processing.

An audience member noted that water use by consumers in washing clothing is far greater than the water use in cotton and textile production combined.

Seeing no other comments, the CHAIR thanked the speakers, and the session was adjourned.

The Second Breakout Session was adjourned at 15:15 hrs.

Third Breakout Session

Producing Fibre Characteristics that Spinners Desire

16:00 hrs. Tuesday, 4 December 2018

Chair: Mr. Frédéric N'da Mougo Komenan, General Director of Industrial Activities, Ministry of Commerce, Industry and Promotion, Government of Côte d'Ivoire

The CHAIR emphasized the importance of cotton in Côte d'Ivoire and the need to expand textile production.

Dr. Jean-Paul Gourlot, textile engineer with a specialization in cotton processing spoke on the topic of, "Producing Fiber Quality that Spinners Desire: a look from the final consumer side."

He said that consumers have an influence on the fiber properties that spinners request from their suppliers. He acknowledged that the link is not direct, as many operators and stakeholders perform activities and apply material transformations between the shop shelves and the raw fibre stocks of spinning mills.

Nevertheless, consumer demands for garment performance factors, such as fit, durability, dimensional stability, abrasion and piling resistance, colorfastness and consistency of look, feel and fit affect the quality characteristics of fabric.

Fabric quality characters demanded by clothing manufacturers to meet consumer requirements include drapé, dimensional stability, pilling and abrasion properties, softness, stiffness, moisture and water sorption, desorption and permeability, crease resistance, and color stability.

These fabric characters in turn affect demand for yarn quality characters, including abrasion, count, defects, elongation, evenness, friction, hairiness, imperfection content, Lea strength, moisture regain, strength, and Twist.

Finally, yarn quality parameters are transferred to cotton quality requirements, such as color, fineness, foreign matters, friction, length, length distribution, length uniformity, maturity, micronaire, rigidity, short fiber content, stickiness, and strength. Dr. Gourlot's presentation is a statement of the meeting.

Mr. Axel Drieling, Senior Cotton Manager & Member of the Executive Board Faserinstitut Bremen e.V. (FIBRE), reported on the results of a worldwide survey undertaken by the Faserinstitut Bremen and the Bremen Cotton Exchange, in partnership with ITA Aachen on the properties

of cotton that spinner desire. Results were based on survey responses from 178 spinning mills in 28 countries, covering all important cotton processing countries and spinning technologies. The survey was conducted during 2016/17.

Respondents indicated that tenacity, neps, thick/thin places, and evenness were the most important yarn properties. In turn, the most important quality characteristics for cotton fibers were strength/tenacity, short fiber content, micronaire, and staple length. Other important fiber properties include, leaf/trash amount, stickiness and source, maturity, length uniformity, yellowness, seed coat fragments and bark or grass content. Mr. Drieling's presentation is a statement of the meeting.

Dr. Eleni Tsaliki, Executive Researcher, Institute of Genetic Enhancement and Plant Genetic Resources, Hellenic Agricultural Organization -- DEMETER spoke on the topic of, "The case study of Greek cotton sector to match the evolving needs of the textile industry worldwide." She reported that research is focused on yields and quality. She noted that growers are highly informed of cotton production practices, and that Greek production complies with all EU regulations and eligibility requirements for subsidies under the Common Agricultural Policy. She observed that social and environmental sustainability criteria are increasingly important.

Dr. Tsaliki said that future activities of the cotton sector in Greece include the development of a national cotton label and implementing a multi-country EU promotion program. Greece will benchmark its integrated crop management practices with BCI criteria. Dr. Tsaliki's presentation is a statement of the meeting.

The CHAIR thanked the presenters for the clear presentations. He noted that Greek producers have achieved high quality and environmentally sustainable production.

A spinner from Taiwan in the audience noted that in his experience, spinners must meet consumer needs, but buyers are always demanding lower prices for yarn and fabric. He said that foreign matter and short fibre content are extremely important, along with staple length and maturity.

A representative of Mali asked what do producers have to do to produce the cotton that spinners want.

Mr. Drieling noted that ginners can reduce short fiber content through proper practices, and plant breeding is the most important factor affecting inherent quality parameters.

Dr. Gourlot noted that centralizing pest management and improving soil fertility can enhance cotton quality in Africa.

Mr. Drieling also noted that farmers in the United States demanded the use of HVI in the 1970s, and the information produced with HVI classing created the incentives for farmers and breeders to improve fiber quality. He said that the lesson is that payments to farmers should be linked to fibre quality.

Dr. Tsaliki said that farmers must choose high quality varieties and follow recommended management practices, and ginners must gin well.

A participant from the European Union noted that her research indicates that comfort is a crucial consumer requirement, and cotton fibres must meet consumer demands. She said that blended fibres result in improved yarn and fabric performance.

Dr. Gourlot reported that there is an initiative in France to determine optimal textile design.

A representative of the United States asked whether we need to develop additional fibre measurement parameters used in HVI testing.

Mr. Drieling said that practical measurements of elongation, SFI, fineness and maturity would be helpful to spinners.

A cotton merchant from Turkey noted that the biggest problem with SFI comes with the second crop, or late-harvested cotton.

In response to a question, Dr. Tsaliki said that farmers in Greece know how to produce cotton. She said that the cotton companies provide extension services in cooperation with government organizations.

Seeing no other questions, the Chair thanked the panel and participants for their contributions. He observed that the cotton sector is complex with interrelated components, and that good clothing requires good cotton.

The Third Breakout Session was adjourned at 17:36 hrs.

Fourth Breakout Session

Commercial Products (Briquettes, Bio-Char, Particle Boards, Mushroom Cultivation, Compost, etc.) from Cotton Stalks: Small-Scale Business Opportunities, Environmental Benefits and Government Support

14:05 hrs. Wednesday, 5 December 2018

Chair: Mr. Pierre Ackan Angniman, Special Advisor to the Prime Minister of Côte d'Ivoire

Mr. Kris Terauds, Economic Affairs Officer, Commodities Branch, United Nations Conference on Trade and Development (UNCTAD), Geneva, Switzerland spoke on the subject of, "Promoting cotton By-Products in Eastern and Southern Africa, Commercial Products from Cotton Stalks." Four countries in East Africa, Tanzania, Uganda, Zambia, and Zimbabwe, have identified Briquettes and Pellets made from Stalks in their national cotton agricultural plans, and Uganda has added Mushrooms from Stalks/Hulls to its national plan.

Mr. Terauds provided financial projections:

- A briquetting plant with a capacity of 20 metric tons per day, would require a capital investment of \$69,000 and would result in a profit of \$35,000 per year.
- A pelleting plant with a capacity of 4 metric tons per day, would require a capital investment of \$25,000 and would result in a profit of \$8,000 per year.
- A mushroom farm with a capacity of 3,600 kilograms per year, would require a capital investment of \$14,850 and would result in a profit of \$3,600 per year.

Despite the optimistic projections, Mr. Terauds noted that an effective supply chain is a prerequisite for a successful stalk-related business. Commercializing stalks would require modifying any pest management rules requiring their destruction. Briquette and pellet plants require a supply chain organized around mobile chipping machines, and briquette plants must source other biomass raw material outside the 3-4-month cotton season. A briquetting plant of 4 MT/day requires approximately 1,000 MT/year of biomass, equivalent to 300-400 ha, on average, or a catchment radius of 25-30 km.

Mr. Terauds concluded that briquette, pellet and mushroom businesses can be profitable and

scalable – from multi-family cottage activities, to SMEs. He noted that farmers can invest directly (pellets and mushrooms) in these activities or earn additional income by selling chipped stalks to entrepreneurs. The main challenge is to establish a cost-effective supply chain for raw material, based on mobile chipping machines. Biomass fuels respond to policy priorities on forest conservation, emissions reduction and substitution of wood charcoal and fossil fuels. Mr. Terauds' presentation is a statement of the meeting

Dr. Greg Holt, Research Leader, Cotton Production and Processing Research, United States Department of Agriculture (USDA) spoke on the topic of, "Finding Successful Applications/Products Utilizing Cotton Plant Materials." He noted that segregation of sticks, fines, burs and notes is the key to successful use of co-products.

Applications for cotton co-product include livestock feed fuel soil & turf products such as geotextiles, mulch/compost (soil nutrients, fertilizer), composites (acoustic absorbers, building materials, packaging, etc.) and other products ("textilebio", interior décor).

Dr. Holt focused on the use of mycelium fungus with a substrate of cotton co-products to produce a fully-biodegradable polystyrene substitute with numerous potential applications. Dr. Holt's presentation is a statement of the meeting

Dr. Amal Saber Owis, Professor, Cotton Research Institute, Agricultural Research Centre, Giza, Egypt spoke on the topic of, "Bio-Processing of Cotton Stalks Residue for Producing High Quality Compost." She spoke about the transformation of stalks into compost, animal feed, wood, cellulosic derivatives, charcoal and other products.

Dr. Owis said that on average, 3 tons of biomass are obtained from one acre of cotton, and she demonstrated how cotton stalks, combined with other material such as cress or barley seed, are turned into compost. The resulting compost has higher water holding capacity and nutrient content and can be used in agriculture as a natural

fertilizer. Dr. Owis' presentation is a statement of the meeting.

Following the presentations, the floor was opened for questions and discussion.

Mr. Terauds was asked about the implications for soil carbon content of removing cotton stalks from fields. He said that researchers and government officials in the four project countries were aware of this concern and were studying potential remedies.

Dr. Holt was asked about variations in the quality and types of co-products produced in the ginning process. He noted that it is possible to screen unwanted material to maintain co-product consistency.

Mr. Terauds was asked what were the constraints to development of briquetting and pelleting factories or mushroom farms if the potential returns on investment are as high as estimated. He said that the constraint to utilization of cotton stalks is the supply of raw material. It is difficult to gather sufficient volume in an economically viable radius around a point of purchase.

Dr. Owis added that composting is economically viable, and it is possible to make the high-quality compost on a small scale.

Dr. Holt clarified that the benefit of using gin co-products is the cost savings associated with not having to haul away and dispose of what is otherwise a waste product.

Dr. Holt further clarified that the mycelium technology is licensed to users in the United States and elsewhere, and he did not know the cost of machinery required to produce the polystyrene substitute.

Mr. Terauds reported that farmers in India receive R2,000 per ton of stalks (USD\$30) collected from their farms.

Seeing no other questions or discussion, the Chair thanked the presenters and adjourned the session.

The Fourth Breakout Session was adjourned at 15:20 hrs.

Fifth Breakout Session

Insecticide Management – Recent Advances

9:00 hrs. Thursday, 6 December 2018

Chair: Mr. Marcel Bi Kouakou Goore, Director General, Ministry of Production and Food Security, Government of Côte d'Ivoire

Dr. Joe Kabissa Director General, Tanzania Cotton Board, Tanzania. Dr. Kabissa spoke on the topic of, "Insecticide Management: Progress and Prospects" and began by observing that insecticides accounts for 25% to 45% of the variable costs of production in low-income countries. A complex of Lepidoptera (bollworms) account for over 50% of insecticides used on cotton around the world, and 60% of global cotton insecticide use occurs in low-income countries.

Dr. Kabissa said that the drivers of increased pesticide use in cotton are, 1) pest complexes have changed in response to environmental stress (sucking pests have emerged and pests have developed resistance to the proteins produced in Bt plants), 2) pest complexes have invaded new territories (boll weevil in Latin America, fall armyworm in Sub-Saharan Africa, and *Helicoverpa armigera* in Brazil), 3) the development of resistance to common pesticides, and perhaps most importantly, 4) market failure in countries with weak regulatory systems and large numbers of poorly-trained farmers.

Dr. Kabissa added that informal trade in insecticides leads to a proliferation of cheap, generic products that may be banned, obsolete, fake or expired. Many farmers are illiterate and do not understand the principals of Integrated Pest Management, and there is weak enforcement of regulations covering insecticide sales and use.

Dr. Kabissa said that farmers need to change from "preventative" insect management strategies in which insecticides are used too often, to "as-needed" management strategies in which insecticide use is minimized. Farmers should also switch from general, all-kill products, to selective products that affect only targeted pests. Farmers can reduce the need for insecticides by implementing pest suppression tactics, such as use of short-season varieties, enforcing mandatory plow-down and first-plant dates,

and intercropping. Farmers can select varieties with natural tolerance to insects, and farmers can employ biological controls. When needed, insecticides should be employed as part of an integrated management program.

Dr. Kabissa noted that the tools used to manage insect pests in cotton are evolving. He said new insecticides and new technologies are being developed using the tools of genetic engineering. However, there are barriers to the adoption of IPM strategies, including farmer illiteracy, increased costs, weak extension services in some countries, and sales pressures by insecticides manufacturers.

Dr. Kabissa emphasized that government enforcement of regulations and funding for research and extension are required if insecticide use on cotton in developing countries is to decrease. Dr. Kabissa's presentation is a statement of the meeting.

Dr. Robert Mensah, Senior Principal Research Scientist and Centre Director, New South Wales Department of Primary Industries, Australian Cotton Research Institute (ACRI) spoke on the topic of, "IPM is Key to Insecticide Management: Alternative Tools and Solutions for IPM in Cotton crops." He said that cotton producers need to implement Integrated Pest Management (IPM) strategies in order to reduce reliance on insecticides. He said that insect scouting is necessary in IPM programs, and he described methods of teaching small holders how to scout their fields and differentiate between beneficial and harmful insects. He said it is also necessary to teach small holders appropriate spraying techniques.

Dr. Mensah described control methods that are alternatives to the use of synthetic pesticides. Alternative insect control methods include 1) spraying a food source in cotton fields to attract beneficial insects, 2) collecting secondary plant compounds (SPCs) from non-host plants and spraying these compounds in cotton fields to discourage damaging pests, 3) the use of fungal biopesticides, 4) spraying cotton fields with

petroleum oils to confuse insects, and 5) the use of trap crops. Dr. Mensah's presentation is a statement of the meeting

The CHAIR thanked the two presenters and asked if there were questions.

Prompted by a question asked by Dr. Fok in the audience, there was a discussion of the need for better metrics used in measuring pesticide use. There was agreement that as dosage rates change, it is not sufficient to gather data on kilograms of active ingredients used per hectare, but it is also necessary to gather data on the number of sprays and their toxicity.

Prompted by a question, there was a discussion of the impact of rising insecticide costs on their use. There was agreement that higher costs will discourage use, but there was a consensus that insecticides are still a necessary component of crop protection, and higher costs will reduce farmer's incomes. Dr. Mensah said that high insecticide costs result in farmers buying cheaper generic pesticides that are harsher, or they dilute the dosage, or they may simply not spray at all. Consequently, high prices for insecticides cause low yields and low cotton quality. He said that it is better to train farmers to use alternative crop protection methods to minimize, rather than eliminate, the use of synthetic insecticides.

Prompted by a question about the composition of food sprays to attract beneficial insects, Dr. Mensah said that the spray consists of a dilution of sugar and maize meal in water.

Dr. Mensah added that the standard FAO model of farmer field schools and training of trainers is used to instruct farmers on pest identification and IPM methods.

Seeing additional questions but realizing that the scheduled necessitated that the session end, the Chair thanked the speakers and the audience, and he adjourned the session.

The Fifth Breakout Session was adjourned at 10:35 hrs.

Sixth Breakout Session

Boosting Yields in Africa – What Technologies Work

11:00 hrs. Thursday, 6 December 2018

Chair: Ms. Nathaly Konan Bogui, Counselor, General Director of the National Agency for Rural Development, Government of Côte d'Ivoire

Dr. Serunjogi Lastus Katende, Technical Advisor, Cotton Development Organisation, Uganda

spoke on the topic of, "Boosting Yields in Africa – What Technologies Work." He noted that African yields are below the world average. He said that the determinants of yields include genetic, agronomic and environmental components, and he pointed out that agronomic conditions in Africa are highly suitable for cotton production.

Therefore, the prevalence of low yields in Africa must be caused by low technology adoption and poor implementation.

He indicated that strengthened seed breeding programs and better planting seed production systems were needed in Africa. In addition, farmers need more training in appropriate

agronomic practices, including Integrated Pest Management (IPM) strategies.

Dr. Katende said that the use of biotechnology to enhance variety performance would be beneficial. He said that seven countries in Africa have approved the use of biotechnology: South Africa, Sudan, Swaziland, Kenya, Malawi, Ethiopia and Nigeria.

Other technologies that would benefit African yields include the use of bio-pesticide extracts from locally-available plants. Dr. Katende said that a Bio-pesticide lab located at NaSSARI in Uganda will be upgraded to produce enough bio-pesticides for the Eastern Africa region. The laboratory will also have a soil testing facility to advise farmers on fertilizer requirements.

Dr. Katende endorsed the use of biological agents, such as predatory insects. He encouraged the production of bio-fertilizers, including intercropping systems involving legumes, using green manure, and using *Tithonia* leaves in furrows.

He also encouraged the use of a chemical called "Vitazyme" to stimulate plant growth. He said that a product sold in Uganda called Celite 610 (trade name is Deadzone) helps to delay the development of resistance to insecticides by target pests. He said that plant growth regulators and mechanical de-topping encouraged fruit development. Canopy management to enable high plant densities would also contribute to increased yields.

Dr. Katende concluded by noting that governments and the private sector need to collaborate in the training of farmers and the implementation of IPM strategies. Dr. Katende's presentation is a statement of the meeting.

Dr. Michel Fok, Doctor of Agricultural Economics, the French agricultural research and international cooperation organization (CIRAD) spoke on the subject of, "How to Have New Technologies Working in Africa." He acknowledged that yields in Africa are low, but he questioned whether yield (kilograms per hectare) is a good indicator of economic performance in the African context. He observed that low yields can be appropriate in a low-input environment, and he noted that the amount of cotton planted by each household, and the number of households growing cotton, are highly variable in Africa from year to year. He suggested that it might be more relevant to calculate production and net revenue per household rather than per hectare. He indicated that because of innate structural differences in economic conditions, the average yield in Africa might never equal the world average.

Dr. Fok said that yields are a function of capital, labor, technologies requiring expensive inputs, technologies not requiring expensive inputs, and a farmer's perception of risk. He noted that in the African small holder context, it is appropri-

ate to design production systems that minimize farmer's exposure to economic risk by utilizing labor and simple technologies that do not require the purchase of expensive inputs.

Accordingly, researchers should focus on the development of appropriate (low cost) technologies, such as simple machinery and various tools of conservation agriculture utilizing on-farm inputs. For example, farmers in Africa might copy the practice of farmers in Eastern China by starting cotton seedlings in small pots and transplanting them by hand to ensure perfect spacing and crop timing. African farmers might make better use of intercropping and double cropping systems such as cotton/peanuts. They might be encouraged to use mulches, or to plant in furrows for better water retention.

Dr. Fok emphasized that small holders are risk averse, and technology adoption is limited by risk exposure. Accordingly, low-risk technologies and government policies that reduce year-to-year fluctuations in cotton prices will be beneficial to African producers. Dr. Fok's presentation is a statement of the meeting.

The CHAIR thanked the two presenters and asked if there were questions or comments.

Dr. Katende was asked to clarify which countries in Africa use or have approved the use of biotechnology. Dr. Katende clarified that six African countries have approved biotech cotton events, South Africa, Burkina Faso, Sudan, Swaziland, Ethiopia and Nigeria. However, Burkina Faso no longer plants biotech cotton because the fiber quality characteristics in the event approved for use in Burkina Faso are lower than in domestic varieties. Finally, Kenya and Malawi are in the final stages of the approval processes for biotech cotton events.

Dr. Fok was asked about the effects of chemicals used on cotton on a food crop such as peanuts, if cotton was intercropped with peanuts. He said that his example came from China, where all cotton is biotech, resulting in less chemical use. However, he noted that because peanuts are protected from chemical exposure in the ground and in their shells, he did not think there would be a human health risk from a cotton/peanut cropping system.

Dr. Fok was asked to explain why he was recommending reduced input use in Africa. He emphasized that he is not recommending reduced input use. Rather, he observed that farmers are risk averse and so they avoid expenses in order to reduce economic risk in years of poor rainfall and lower yields. Dr. Fok noted that since national economies in Africa would benefit from increased yields, it would be appropriate government policy to protect farmers from price fluctuations to encourage increased input use.

One of Dr. Fok's examples of input application in China was the use of a drone to apply insecticides. He estimated that the cost of such

a drone was around USD\$7,000. Obviously, this technology would only be feasible if purchased and operated by the major cotton companies and utilized over a wide area.

A questioner challenged Dr. Fok's assertion that yields in Africa might never catch up to the world average. Dr. Fok noted that the world yield is influenced by countries with competitive economies in which farmers who are less able eventually leave farming for some other occupation, and more-able farmers expand, resulting in increases in measured yields. He also noted that the calculation of the world yield includes cotton grown with irrigation. In contrast, in Africa cotton is a "social crop," meaning that governments require cotton companies to provide inputs to every household that demands them as a form of social welfare. Consequently, new households without good knowledge of cotton production practices are constantly entering the industry, resulting in lower average yields. Further, there is almost no irrigation of cotton in Africa, and rainfed yields are inherently lower than irrigated yields.

From the audience, Mr. Ba of Mali reinforced the assertion by Dr. Fok that yield (production per hectare) is not the correct metric to use in evaluating African cotton production. He said that without irrigation and with millions of small holders in Africa, it is not relevant to compare yields with other regions.

From the audience, Dr. Kranthi of ICAC said that he does not accept the assertion that African yields will not rise to the world average. He said that African agronomic factors are optimal. Therefore, improving production practices can result in improvements in yields in Africa.

From the audience, Mr. Bruwer of Cotton South Africa noted that his country has limited rainfall and still achieves high yields. He said that he agrees with Dr. Kranthi that it is possible to increase yields in Africa.

Dr. Katende was asked what is the chemical composition of the product known as Deadzone. He replied that it is mostly a wax product. The product is a non-chemical agent that kills insects by dissolving the animal's cuticles.

Dr. Katende was also asked if there are small manufacturing units to produce insecticides. He answered that there are small manufacturing processes to produce machinery, however insecticide manufacturing is a huge enterprise and there are no small units to produce insecticides.

The CHAIR observed that time had expired for the session, and even though there were more questions she felt it necessary to adjourn the session. She thanked each of the speakers. She noted that the session had been very well attended, with many participants standing room only, and she thanked the audience members for their participation.

The Sixth Breakout Session was adjourned at 12:45 hrs.