COMMON FUND FOR COMMODITIES

Technical Paper No. 60

FINAL REPORT OF THE PROJECT CFC/ICAC/33

Commercial Standardization of Instrument Testing of Cotton with particular consideration of Africa

Drieling, A., Gourlot J.P., Scientific Editors

International Cotton Advisory Committee

This project is co-funded by the European Union and the Common Fund for Commodities

Funding Agency

Common Fund for Commodities (CFC)
Stadhouderskade 55
1072 AB Amsterdam
The Netherlands
Tel: ++31 20 575 4949
Fax: ++31 20676 0231
Web site: www.common-fund.org

Co-financing

European Commission
as part of its EC All ACP Agricultural Commodities Programme

Sponsoring organization

International Cotton Advisory Committee (ICAC)
1629 K Street NW, Suite 702
Washington, DC 20006
USA
Tel: ++1 202 463 66 60
Fax: ++1 202 463 69 50
Web site: www.icac.org

Disclaimer

Edition: Axel Drieling, Jean-Paul Gourlot, David Wheeler

Impression: Faserinstitut Bremen e.V.

Cover picture: Tanja Slootmaker

Produced by Faserinstitut Bremen e.V., Germany

Participating bodies in the Project

FIBRE - Faserinstitut Bremen e.V.
Am Biologischen Garten 2
28359 Bremen
Germany
Tel: ++49 421 218 58650
Fax: ++49 421 218 58710
Web site: www.faserinstitut.de

CIRAD-Persyst – Centre de coopération internationale en recherche agronomique pour le développement
UPR 102/SCA
Cotton Technology Laboratory
TA 70/16
34398 Montpellier Cedex 05
France
Tel: ++33 467 61 58 00
Fax: ++33 467 61 56 67
Web site: www.cirad.fr

TBS - Tanzania Bureau of Standards
P. O. Box 9524
Dar es Salaam
Tanzania
Tel: ++225 22 2450206
Fax: ++255 22 2450959
Web site: www.tbstz.org

TCB - Tanzania Cotton Board
PO Box 9161
Dar es Salaam
Tanzania
Tel: ++255 22 212 2564
Fax: ++255 22 211 2894
Web site: www.tancotton.co.tz

CERFITEX – Centre de Recherche et de Formation pour l'Industrie Textile
BP 323, Ségou
Mali
Tel: ++223 21 32 04 93
Fax: ++223 21 32 13 08
Web site: www.cerfitex.edu.ml

SOFITEX - Société Burkinabé des Fibres Textiles
BP 147, Bobo DIOULASSO
Burkina Faso
Tel: ++226 20 97 72 24
Fax : ++226 20 97 15 03
Web site: www.sofitex.bf

For any technical information concerning this report, please contact FIBRE.

Foreword

The cotton marketing industry is dynamic and subject to continuous market-driven developments. Actors in such a competitive, commercial environment who cannot optimize their operations and meet customers' demands will eventually lose out, either by losing market share, by obtaining lower prices for their products or just be pushed out of the market completely.

Against that background of competitive reality, testing the quality parameters of cotton lint precisely and accurately is of major importance to sellers, as such information enables them to target cotton of particular qualities to users requiring those particular parameters. Accurate and precise instrument testing of cotton also provides information to spinners enabling them to optimize the laydowns used for yarn production, thus encouraging the use of more cotton. Accurate information about the quality parameters of individual bales and of the composition of traded lots are necessary tools in cotton marketing. The movement from manual classing towards instrument measurement of fiber characteristics is an important step forward in making cotton trade more transparent and objective.

The CFC/ICAC/33 project on Commercial Standardization of Instrument Testing of Cotton (CSITC) mobilized substantial technical and financial resources from several partners, among which the Faser Institut Bremen, which was also responsible for the implementation of the project, and the European Union, which provided substantial co-financing for the project through its All ACP Agricultural Commodities Programme. The CFC project greatly facilitated the work of the ICAC Task Force on Commercial Standardization of Instrument Testing of Cotton. The project provided the resources to begin quarterly Round Trials among cotton testing laboratories around the world. The CSITC Round Trials serve as a benchmark against which all laboratories can measure their performance to ensure that laboratories in different locations will provide similar test results. By assisting in the establishment of CSITC Round Trials, the project contributed to global cotton industry competitiveness in all countries.

In addition, the project assisted African cotton producing countries to develop the tools for instrument testing of cotton. The project enabled the establishment of two regional technical centers in Africa, each of which has now state-of-the-art equipment and highly competent trained experts, capable of providing extensive services to cotton testing facilities in the Eastern/Southern region of Africa and in Western/Central Africa. The CFC/ICAC/33 project was completed at the end of March 2012. This Technical Paper describes the work of the project.

Instrument testing of cotton cannot counteract to the difficult global price trends on its own. On the other hand, instrument testing can provide cotton companies with tools to understand the technical parameters, and thus the spinning value, of cotton. Marketing managers can use these data to increase the returns from cotton production, and textile mills can use the information for optimizing their cotton blends. The tools of instrument testing are now established within Africa, and the remaining challenge is to make appropriate use of these tools.

It is our belief that the current project effectively contributed towards increasing the quantity of cotton traded on the basis of precise and accurate quality parameters.

Amb. Ali Mchumo
Managing Director
Common Fund for Commodities

Terry P. Townsend
Executive Director
International Cotton Advisory Committee

Acknowledgements

This report was prepared by Mr. Axel Drieling (FIBRE), Mr. David Wheeler (FIBRE) Drs. Philipp Lehne (FIBRE), Jean-Paul Gourlot (CIRAD), Everina Lukonge (LZARDI) and Modeste Aboé (AIC), Mr. Dominic H. Mwakangale and Mr. Gervas Kaisi (TBS), Mr. Mamadou Togola (CERFITEX).

Our special thanks go to the ICAC for sponsoring the project and to the CFC and European Union for financing this project. Many thanks go to Dr. Terry Townsend from ICAC, Dr. Sietse van der Werff from the CFC, Mr. Henny Gerner, Mr. Willem Olthoff from EU and Mr. Pierre Berthelot and Mr. Fabio Berthi from the European Union, All ACP Program, for their involvement in the practical organization of this research work and for their assistance throughout the project.

We would like to thank several people from our direct partners' institutions as they were and/or are providing much support in the realization of the Project activities:

- In West and Central Africa:
    - in CERFITEX, our thanks go to the Directors who operated the RTC during the Project, namely Dr. Djibrilla Maïga and Dr. Moumine Traoré and their staff members;
    - in SOFITEX, our thanks go to M. Célestin Tiendrébeogo, General Director, Augustin Zagré, Commercial Director and their staff;
    - A special appreciation goes to the Experts of the Regional Technical Center who are Mamadou Togola (CERFITEX) and Joël Rodolphe Ky (SOFITEX);
- In Eastern and Southern Africa:
    - In TBS, our thanks go to the Directors who operated the RTC during the Project, namely Mr Daimon Mwakyembe and Mr Charles Ekelege and their staff members;
    - In TCB, our thanks go to the Directors who operated the RTC during the Project, namely Dr. Joe Kabissa and Mr Marco Mtunga and their staff;
    - A special appreciation goes to the Experts of the Regional Technical Center who are Dominic H. Mwakangale and Gervas Kaisi (TBS), Humphrey Shango and Maryam Mbwana (TCB).

The African Cotton Association and its Presidents, MM. Ibrahim Malloum, Bachir Diop and Mohamed Iya, deserves our thanks as they supported our Project from its creation, during its implementation and, most important, after the completion of the Project for the future.

We want to thank the ICAC-CSITC Task Force Members for their contribution and support for the installation of instrument testing worldwide for the cotton trading. Namely, our gratitude goes to Andrew Macdonald CSITC-Chairman and all the members and observers.

Several organizations welcomed training sessions in their facilities during this Project; we would like then to thank the Directors and staffs of the following organizations: FIBRE, CIRAD, Bremer Baumwollbörse, Gdynia Cotton Association, Texas Tech University-FPIR, USDA-AMS Memphis.

For both welcoming training sessions and/or supplying equipment for the Project Partners, we want to thank the following instrument manufacturers: Branca Idelair, Cotimes / Proclima, Premier, Uster Technologies.

We would like to convey our gratitude to the following partners who helped us to initiate and run the 'variability studies' in 15 African countries:

- SONAPRA: Idrissou Bio Gounou SINA, General Director
- AIC: Dr. Narcisse Djegui, Permanent Secretary, and Dr. Modeste Aboé for the realization of the experiments;
- LZARDI : Dr. Peter Kapingu, Director, Dr; Mafuru Directors, and Dr. Everina Lukonge for the realization of the experiments;
- Special thanks is directed to all the involved cotton companies Directors and Staff in the « variability studies » who opened their doors to Dr Lukonge and Dr Aboé for realizing cotton sampling in their facilities;

We would like to thank the mid-term evaluation team for their involvement and their external observation on the Project, namely Mrs. Mona Qaud and M. Eduard Hegetschweiler;

For the implementation of the CSITC Round Trial database and website and the continuous support, our thanks go to the Generation 10 team, especially Richard Williamson, Mark Littlewood and Adam Bridger. For the continuous operation, our special thanks go to the teams at USDA (James Knowlton, Gretchen Deatherage) and ICAC (Terry Townsend, Rosa Soper, Rosangela Dayer).

The Project Executive Agency management of this Project was done at FIBRE; our gratitude goes to Axel Drieling, Philipp Lehne, Saskia Meyer-Lippek, Valérie Bordas, David Wheeler, Daniel Djedouboum, Tanja Slootmaker, Hannelore Gerardi, Peter Rödig, Gabi Meyer and Mansour Mirzaghavam.

CIRAD was in charge of realizing component C activities in West and Central Africa, as well as for running the Technical Development activities. Our special thanks to all of the persons involved from the initiation of the Project through to the technical, supporting and reporting activities. All of the following persons deserve our gratitude for supporting this Project: Jean-Paul Gourlot, Laura Payet, Eric Gozé, Liliane De Cloedt – Lignot, Hervé Gace, Kareline Pilot, Florent Maraux, Bruno Bachelier, Michel Giner, Serge Lassus, Monica Gouirand, Marie-Elyse Lapeyre, Mireille Poitel, Michèle Vialle, Brigite Giudicelli, Jocelyne Sallin, Gérard Gawrysiak, Benoit Cervello, Philippe Gallet and Philippe Francalanci;

Part of the activities of the Project have been approved and supervised by the University of Haute Alsace, Laboratoire de Physique et de Mécanique Textile in Mulhouse. We want to thank Pr. Jean-Yves Dréan, Pr. Artan Sinoiméri and Agnès Schwob for their support and their contribution for the scientific recognition of the instrument testing application studies in Africa.

Contents

The technical report is supplemented by 33 annexes, giving the full content of this project. These annexes are not integrated in this Technical Report, but are available separately, e.g. on www.csitc.org → CSITC CFC/ICAC/33 Project → Public Information

1
Introduction and objectives

Introduction

Since the invention of the cotton gin approximately 200 years ago, cotton quality has been determined subjectively based on the visual evaluation of fiber properties by human classers. Instrument testing of cotton began approximately 90 years ago, but high speed, accurate, reproducible tests on every bale have become available during the past 30 years, and are now increasing rapidly.

Initially it was the cotton producers in Texas that pushed towards instrument testing of their whole cotton production for their benefit, with the desire to

- sell their cotton on its true value
- improve varieties and have the improvements recognized objectively
- improve fiber quality by optimizing the ginning process
- pay farmers for the actual quality that they deliver

As a result, Texas cotton started receiving premiums instead of being discounted, and the development of improved cotton varieties for Texas accelerated. With this success, high volume and standardized instrument testing was eagerly adopted in the other states of the USA. Today, many other countries like Australia, Uzbekistan, China, Brazil or Colombia have already built up their national cotton quality assessment systems, in most countries based on the demand from producers. Approximately half of all globally produced cotton is tested with "high volume instruments" or "standardized instruments for testing of cotton (SITC)".

The benefits of instrument testing on cotton sales are for example: having objective and reliable data for selling, delivering the quality that the customer needs, and avoiding claims. For cotton processing, test results are used to optimize the cotton input for the demanded yarn quality, to care for constant properties from laydown to laydown, and to assure a properly running process from spinning to knitting/weaving and wet processing. Finally, the importance of transparency and reliability of the fiber characteristics is an important element of current cotton trading from the producers to the spinning mills.

The instrument classification has resulted in a competitive advantage in the global market. Whereas estimates for a direct monetary benefit for each bale of cotton are given from 5 to more than 10 USD per bale), the benefit for marketing is unquestioned, giving a clear comparative advantage for tested cotton. But finally the indirect advantages of improved cotton quality and avoided claims contribute even more.

a) It is crucial that tests at different locations are conducted in suitable laboratories under standardized procedures so as to yield comparable and reliable results, thus providing increased transparency and efficiency in cotton trading. The related global activities are one of the topics covered in this technical report.

b) It is obvious that the establishment of an adequate instrument cotton testing system for the cotton producing countries in Africa and elsewhere will facilitate the access of their cotton to diverse global markets and will additionally help to improve the cotton production and quality. The current developments in several African cotton producing countries show that this achievable benefit is acknowledged by the industry. The related Africa-specific activities for supporting these efforts form the second topic area of this technical report.

Project Objectives and Components

The first objective of the Project was to support the development of a globally accepted system of quality assessment of cotton based on instrument testing, including the setting of testing rules, certification criteria, instrument calibration standards, etc. The second and core focus of the Project was to develop a program of initial support for the establishment of two regional centres in Africa that will be capable of providing all required services to national quality control institutions (in particular in the field of laboratory certification, instrument calibration, equipment and facility maintenance, etc) to enable African cotton producing countries to fully participate in the global system of cotton trade on the basis of instrument-tested quality parameters.

The Project, as further detailed in the Appraisal Report, comprised of the following components:

Component A: Global CSITC configuration.

The world wide cotton testing laboratory certification system that was to be implemented in the Project needed careful preparation to fulfill the expectations and the demands of all actors in the global cotton chain. As this international system only works when it is voluntarily adopted by the majority of the cotton producing countries, the majority of the cotton associations and the cotton testing laboratories, all relevant and constructive demands had to be addressed, assessed and eventually incorporated. For this purpose, the global CSITC configuration and the basic test method for Standardised Instrument Testing of Cotton (SITC) testing had to be fixed. Additionally, it was inevitable to imbed the CSITC system in trade and in the trade rules.

Component B: Evaluation of cotton testing laboratories.

In order to obtain the commercial acceptance of instrument testing results, it was and will remain essential to check the reliability of the cotton testing laboratories and the test results provided by these. It is not sufficient to do this regionally, but this has to be an independent, international action that should be applied to the cotton producing regions of the world.

To obtain, to assure and to prove the reliability of the laboratories and their results, the first and most appropriate activity was the implementation of a global check system based on a qualified international round trial ("CSITC Round Trial"). There was no suitable round trial completely fulfilling the requirements for this purpose until now. This CSITC Round Trial had to be prepared and to be performed. After the first years of execution, this system was to be self-financing based on participation fees by the participating laboratories.

Component C: Support to the African cotton producing countries to fulfill testing quality requirements.

Components A and B were, as global components, essential to prove the reliability of the measuring results obtained by the participating laboratories, when measuring the quality of the cotton by means of instrument based testing and their subsequent grading of the cotton. The quality of the testing was the key component in the value-assessment and determination process. Many countries had failed in adopting SITC testing, as testing reliability was not considered as a core objective and not maintained. In order to achieve a sustainable system, it was be necessary to build up Regional Technical Centres (RTC's) to help the existing cotton testing laboratories in adopting and implementing the international quality requirements.

These RTC's were to get initial international support and international verification of the reliability of the testing quality achieved, and were then to be a support system within the regions, regarding the specific necessities and problems in their region (e.g. organisational and technical problems).

Two regions were chosen for the implementation: West/Central Africa, which has the highest cotton production of the continent; and East/Southern Africa, covering the countries from Sudan to South Africa. The routine work that was to be done by the Regional Technical Centres for the region covered mainly the two activities:

- Provision of information and training to run cotton testing laboratories with SITC instruments and to fulfill quality requirements;
- Reference activities to prove the reliability of test results.

Component D: Technical developments to improve instrument testing reliability (mainly Africa-specific topics)

This component produced a detailed assessment/requirement listing of both institutional and technical infrastructure that was required for cotton testing laboratories to perform reliable testing activities. It was to include studies/analysis of minimum/optimum levels of samples to be taken from cotton bales and their processing and subsequent testing to ensure reliable results from the sample analysis.

Component E: Technical Evaluation and Dissemination

The Project was intended to be a pilot for other regions in the world. To evaluate the changing impact of SITC instrument testing on the cotton market, an impact assessment was included. The assessment was to consider the different benefits of SITC testing and was be done in close co-operation with the national cotton marketing boards. Transfer of knowledge obtained in the Project directly to other interested regions, initial discussions and exchanges/advice with interested regions were included in the Project. The final dissemination activities has shown the enhancement of reliability of cotton testing to the people involved in cotton business, and will therefore increase the market for African cotton.

Component F: Project Management and Financial Administration

The major share of project management was done by FIBRE as the PEA. The PEA established and maintained close working relations with CIRAD, the core counterpart who provided substantial technical expertise. Local project management was based at the RTC's who ensured that an adequate management and technical expertise were available throughout the Project (and beyond).

The report is based on the objectives mentioned in the description of the project components, which are stated in the project document. The structure of the report is slightly varied to allow an overall perspective and to regard the actual development of the CSITC topic.

2
Global CSITC configuration / Implementation of instrument testing

Author: **Axel Drieling**

Organization: Faserinstitut Bremen e.V. (FIBRE), Bremen, Germany

Summary

The aim of the ICAC Task Force on Commercial Standardization of Instrument Testing of Cotton (CSITC Task Force) is to facilitate the adoption of instrument testing at the producer level as a basis for cotton quality evaluation and trading, to uphold and improve the reliability of instrument testing, and to foster adopting instrument testing standards and procedures. The CFC/ICAC/33 supported in fixing the structures and duties related to this international activity.

Additionally, modifications in trade rules have been proposed. Now Micronaire, Strength, Length and Color Grade are completely or in part included in the trade rules of for example the International Cotton Association, the Bremen Cotton Exchange and the Gdynia Cotton Association.

Introduction

Manual classification of each produced cotton bale has been done for centuries, and is still prevailing in many countries, although the benefits of instrument testing are undisputed. Whereas in the USA most properties are now solely tested instrumentally and only foreign matter is left for manual classification[1], many other countries are introducing instrument testing parallel to the continuing manual classification, with for example in Tanzania 100% of all bales classed manually, and 10% tested on SITC instruments. Even more important, manual classing is still predominant in the thoughts of many people involved in the cotton supply chain from the producer to the spinner, trying to convert instrument test results into the manual classing system instead of using them independently and with this achieving the full benefit. Often instrument testing is considered to be just one supporting tools to check some

[1] Trash results are since 2011 tested solely instrumentally

quality properties of a crop. However it becomes more and more important to solve quality disputes between merchants and spinners.

CSITC Task Force

On the instructions of the 62nd ICAC Plenary Meeting held in 2003, an Expert Panel on Instrument Testing of Cotton was formed, later renamed into the Task Force on Commercial Standardization of Instrument Testing of Cotton (CSITC Task Force). The members of the Task Force represent both exporters and importers and all segments of the world cotton industry[2]. The CFC/ICAC/33 supported in fixing the structures and duties related to this international activity.

The aims of the CSITC Task Force are:

- Facilitate the adoption of instrument testing as a basis for cotton quality evaluation and trading
- Facilitate the widespread use of instrument testing systems at the producer level
- Uphold and improve the reliability of instrument testing by:
- encouraging improvements in instruments, and
- encouraging improvements in the operation of cotton testing facilities
- Facilitate the adoption of instrument testing standards and procedures as defined by the Universal Cotton Standards Agreement.

The tasks of the CSITC Task Force were defined as:

- Facilitate international cooperation leading to the commercial standardization of instrument testing of cotton
- Establish international standards for cotton testing (sampling, cotton testing method, calibration material, properties/parameters to be regarded)
- Facilitate the adoption of instrument testing values in international trade in cotton
- Provide information that will facilitate the use of instrument testing values as a basis for arbitration of quality disputes
- Configure a system for documenting instrument performance and for providing support to Cotton Testing Facilities
- Document instrument performance in CSITC Round Trials
- Provide global support to Regional Technical Centers (RTCs) and Cotton Testing Facilities
- Provide regional support to Cotton Testing Facilities by means of RTCs
- Ensure that calibration standards are produced in accordance with the Universal Cotton Standards Agreement
- Provide statistical information that can be used to establish commercial tolerances for cotton trade
- Encourage technology development in fiber testing.

The aims, the tasks, the principal cooperation structure and the duties are defined in annexes A and B. They were approved by the CSITC Task Force during the ICAC Plenary in September 2009 in Cape Town, South Africa. The structure and duties are additionally addressing Regional Technical Centers with their prerequisites and tasks.

Since the start of the CSITC work, the share of instrumentally classed cotton shifted from approx. 30% to 50%, with major developments for example in China and in Brazil.

[2] See membership list on icac.org → instrument testing

Thanks to this Project, Africa is on also the way to adopting instrument testing as it has been done earlier at the global scale. The African Cotton Association itself and its Metrology Commission have been developing their own plans toward instrument testing, sometimes with the support of other external bodies (like UNIDO and ITC). Individual countries, alone or with partners and external funding, engaged themselves into their own developments and investments toward the use of instrument data for marketing their cottons (see chapter 4).

Trade Rules

In cooperation with the Bremen Cotton Exchange, proposals for adjustments of the trade rules have been developed to possibly include all reproducible SITC tested cotton properties in cotton contracts, these are Micronaire, Strength, Length, Length Uniformity, Color Rd and Color +b. Aspects to be considered for each property are for example

- the valid test method , calibration, number of tests/measurements per bale/sample, dimension unit, rounding of results (number of decimals)
- given measurement uncertainties, applicable control limits , one-sided or two-sided application
- deviation tables and according allowances

Now there are some new regulations for the following properties in the rules of the International Cotton Association, the Bremen Cotton Exchange and the Gdynia Cotton Association:

- Micronaire
- Strength
- Length (UHML)
- Color Grade, calculated based on SITC Rd and +b results

Additionally arbitration rules have been adjusted to enable arbitration based on these instrument testing results.

As the cotton properties vary between the bales, and additionally a measurement uncertainty is given for the results of each bale, future developments should direct towards not trading based on single bale results, but on sales lot averages and allowed variations. Due to the statistical background, sales lot averages and variations with significantly lower tolerances than the single test results can be agreed upon.

Annexes

Annex A: CSITC: Documentation of Structure and Duties – Short (see extra document)

Annex B: CSITC: Documentation of Structure and Duties, Including Detailed Tasks (see extra document)

3
Evaluation of cotton testing laboratories

3.1 Development of the International Round Trial System

Author: **Axel Drieling**

Organization: Faserinstitut Bremen e.V. (FIBRE), Bremen, Germany

Summary

One of the most important missions of the ICAC Task Force on Commercial Standardization of Instrument Testing of Cotton (CSITC Task Force) is to check the reliability of cotton testing laboratories and the test results provided by the laboratories. Within the project, a specific CSITC Round Trial system for laboratories involved in commercial instrument testing of cotton has been developed and implemented. The CSITC Round Trials allow the laboratories to demonstrate their capability to meet recommended standards. Additionally, the CSITC Round Trials help them to achieve more accurate results.

The defined aims of the CSITC Round Trials are:

- Evaluation of the test methods / test result variability
  - inter-laboratory variability
  - within-laboratory variability
  - additional evaluations as the variations between instrument types etc.
- Evaluation / rating of the participating laboratories, based on the accuracy of the results
- Detailed analysis of laboratory results to achieve more accurate results, based on accuracy and precision

The Round Trial was developed in a co-operation between the Bremen Fibre Institute (FIBRE) and the USDA-AMS. It is headed by the International Cotton Advisory Committee (ICAC), and is conducted regularly in co-operation between the USDA-AMS and the Bremen Fibre Institute (FIBRE). After the end of the CFC/ICAC/33 project, the CSITC Round Trials will continue based on participation fees.

A database system has been developed that allows internet-accessible online administration of the Round Trials, laboratory access to the database for data upload, report download and additional evaluations.

Background: Cotton Round Trials

The CSITC Round Trial system cannot fully replace the existing USDA and FIBRE round trials, but has attributes that the presently existing Round Trials cannot fulfill. A comparison of the existing round trials is given in Table 3-1. The major advantages of each round trial system are underlined.

Table 3-1: Comparison of international round trial systems on cotton

Attribute	USDA HVI Checktest	Bremen Round Trial	CSITC Round Trial
Organized by	USDA-AMS	FIBRE, Bremen	ICAC with USDA-AMS and FIBRE
Number of participants	50 to 80 SITC	100 to 150 SITC	110 registered labs (2011) 100-140 HV instr. (2011)
Kinds of instruments	Restricted to High Volume Testing	Every kind of Testing instrument	Restricted to High Volume Testing
Cottons: Origin and type	USA; Upland	World; broad range of prop.	4 US Upland; 1 international
Costs	Annual fee	Free of charge	Annual fee: 2012: 1000 USD
Frequency	12 times/year each 2 samples	3 times/year each 1 sample	4 times/year each 5 samples
Number of tests per sample	Asked for 12 tests per sample	Proposed: 6 tests per sample	30 tests per sample (fixed)
Aim	Information for the laboratory	Information for the laboratory	Official laboratory evaluation and detailed analysis for the laboratory
Evaluation of	Laboratory average	Laboratory average	Laboratory average and all single data
Evaluation of	Accuracy only	Accuracy only	Accuracy and precision
Additional benefit			Calibration Material delivered with the RT samples (starting 2012)

In sum, the new CSITC Round Trial is the first interlaboratory comparison that allows evaluating the participating instruments / laboratories with a summary evaluation parameter according to the accuracy of the results for the 6 cotton properties: Micronaire, Strength, Length, Length Uniformity, Colour Rd and Colour +b. And it is the first Round Trial giving a detailed analysis of the results, so that the laboratories can improve their performance based on these findings. All calculations and evaluations are based on a very sound data basis with 5 samples and for each 30 tests.

Round Trial Configuration

The CSITC Round Trials are conducted 4 times per year and each single Round Trial includes 5 cotton samples. Four cotton samples are Upland type and are well pre-tested for

homogeneity. A 5th cotton with different behavior is included in the Round Trial for information purposes, e.g. from a different origin or with different processing or different behavior. This cotton is not taken for the evaluation of laboratories, but for the overall evaluation of laboratory performance on different kinds of cotton samples.

Testing for CSITC purposes is fixed on the following prerequisites:

- Fixed calibration with Universal Standard Material (HVICCS etc.)
- A limited number of suitable parameters with sufficiently low result variation. At present this is
    - Micronaire
    - Strength
    - Length: UHML
    - Uniformity Index
    - Colour Rd
    - Colour +b
- Suitable instrument types
    - Instruments have to conform to Universal Standard Material results and calibration
    - Instruments have to show no systematic deviations
    - Instruments have to show no extended result variability

There was a consensus in the CSITC Task Force that current technology for measuring other parameters such as trash, short fibres, neps, fineness/maturity or stickiness are either not fast enough or not sufficiently reproducible to include them in an international system at this time. It was recognized that these measurements should be added to the international instrument testing system as soon as an acceptable, reliable measurement system can be authenticated. For this reason, additional test results for Maturity, Short Fibre Index, Trash Count and Trash Area are generally evaluated, but not taken to evaluate the participating instruments/laboratories.

CSITC Round Trial testing has to be done on 5 days to enable reliable evaluation of accuracy and precision (see Figure 3.1-1). 6 tests have to be done on each day and for each cotton sample. So there are 30 tests on each cotton sample, 150 tests in total.

	Cotton 1	Cotton 2	Cotton 3	Cotton 4		*Cotton 5*
day 1	6 tests	6 tests	6 tests	6 tests		*6 tests*
day 2	6 tests	6 tests	6 tests	6 tests		*6 tests*
day 3	6 tests	6 tests	6 tests	6 tests		*6 tests*
day 4	6 tests	6 tests	6 tests	6 tests		*6 tests*
day 5	6 tests	6 tests	6 tests	6 tests		*6 tests*
Sub Total	30 tests	30 tests	30 tests	30 tests		*30 tests*
Total	150 tests for each Round Trial					

Figure 3.1-1. Test scheme for each CSITC Round Trial

All measurements have to be done in compliance with the Universal Calibration Standards (e.g. HVI-CCS and USDA Colour Calibration Tiles). Each test consists of

- 1 measurement for micronaire,
- 2 measurements for length/strength
- 2 measurements for colour

The laboratories are asked to strictly follow the Round Trial procedure, implying e.g. the accurate number of tests per day and per sample. Every single test result is used for the evaluation, so that it is possible to calculate the accuracy as well as the precision of the results.

The laboratory results are compared to reference results that are based on the interlaboratory average. These reference results are always compared to the USDA established results of these samples, so that systematic influences from the participating laboratories can be avoided.

As outlying results are detrimental to the evaluation,

- Results outside wide fixed limits (e.g. Micronaire 1.5 to 8) are not accepted and automatically deleted (step 1)
- For the calculation of interlaboratory averages and interlaboratory standard deviations, Grubbs' Method (95%) for the detection of outliers was chosen in order to achieve statistically stable results without influence of single outliers (step 2).
- For the laboratory evaluation, all results after step 1 are taken.

Evaluation of the Instrument Performance

For all users of instrument test results, it is helpful to know about the reliability of cotton testing laboratories, their instruments and their test results. For this, the CSITC Round Trials include an objective and summarizing evaluation of the instrument accuracy. The evaluation of the participating laboratories/instruments is solely done regarding the trueness of the instrument test results; precision is not taken into account. The procedure for the analysis is easy to follow, and it is useful to understand the evaluation process. Therefore the steps of evaluation for one exemplary instrument are shown in Figure 3.1-2. The steps are:

- Step 1: The evaluation is done in comparison to the reference results, which were calculated from the inter-laboratory averages (after excluding outliers).
- Step 2: For each cotton and each cotton property, the average result of all tests for all days of this instrument is calculated (average of 30 test results).
- Step 3: For each cotton and each cotton property, the distance between the laboratory result and the reference result is calculated.
- Step 4: For each cotton property, the average absolute distance of all cottons is calculated.
- Step 5: For each cotton property, the mean absolute distance is divided by a “Scale Value”. This step allows a comparison between the parameters. The scale factors are based on the USDA Reproducibility Limits in 2000. For Rd this Scale Value was slightly enlarged regarding the decision of the CSITC Task Force due to the increased variability of these results. The result of this step is a Summary Evaluation for Each Property.
- Step 6: Based on the evaluations for each property, the Combined Summary Evaluation of All Properties is calculated by averaging the results of each property.

(Additionally it is possible to apply different relevance factors for each property, but at this stage this is not done.)

Performance of Laboratory 115							
		Micronaire	Strength	Length	Uniformity	Color Rd	Color +b
Reference Values	Cotton 1	3,83	32,82	1,207	82,42	76,31	12,14
	Cotton 2	5,17	28,22	1,136	81,90	78,06	11,53
	Cotton 3	4,40	25,54	0,948	78,53	74,86	10,86
	Cotton 4	3,81	32,89	1,177	83,65	76,08	10,98
Laboratory Average of All Days	Cotton 1	3,80	33,62	1,207	82,71	75,37	11,38
	Cotton 2	5,23	28,50	1,134	81,44	76,05	10,82
	Cotton 3	4,36	26,11	0,969	76,13	73,62	10,41
	Cotton 4	3,79	32,72	1,182	83,83	75,29	10,17
Rel. Distance to Reference	Cotton 1	-0,03	0,80	0,000	0,29	-0,94	-0,76
	Cotton 2	0,06	0,28	-0,003	-0,46	-2,00	-0,71
	Cotton 3	-0,04	0,57	0,021	-2,40	-1,24	-0,45
	Cotton 4	-0,02	-0,18	0,005	0,18	-0,79	-0,81
Mean Absolute Distance to Reference		0,04	0,46	0,007	0,83	1,24	0,68
Scale Factor (Based on USDA Reproducibility Limits except Rd)		0,10	1,50	0,02	1,00	1,50	0,50
Summary Evaluation for Each Property (=Mean Abs. Distance divided by Scale Factor)		**0,38**	**0,31**	**0,36**	**0,83**	**0,83**	**1,37**
Relevance of Property		1,00	1,00	1,00	1,00	1,00	1,00
Summary Evaluation of All Properties (=Average of all properties)		**0,68**					

Figure 3.1-2. Example for the steps of evaluation for a single instrument (#115)

The Combined Summary Evaluation Result of All Properties is a parameter that allows a comparison between different instruments/laboratories. The lower the Summary Evaluation Result, the better the accuracy of the instrument/laboratory. Comparing the Summary Evaluation Result of one instrument to the median of all participating instruments shows, whether this instruments belongs to the 50% better performing instruments or not. Figure 3.1-3 is showing the typical distribution of the evaluation with combined properties. This example is for Round Trial 2009-3. The best instruments usually have an evaluation result of 0.2 to 0.3. Typically about 50% of the instruments show an Evaluation Result below 0.5. The major part of all instruments is below or up to 0.9. And there are usually some outliers showing an evaluation result far higher than 1.

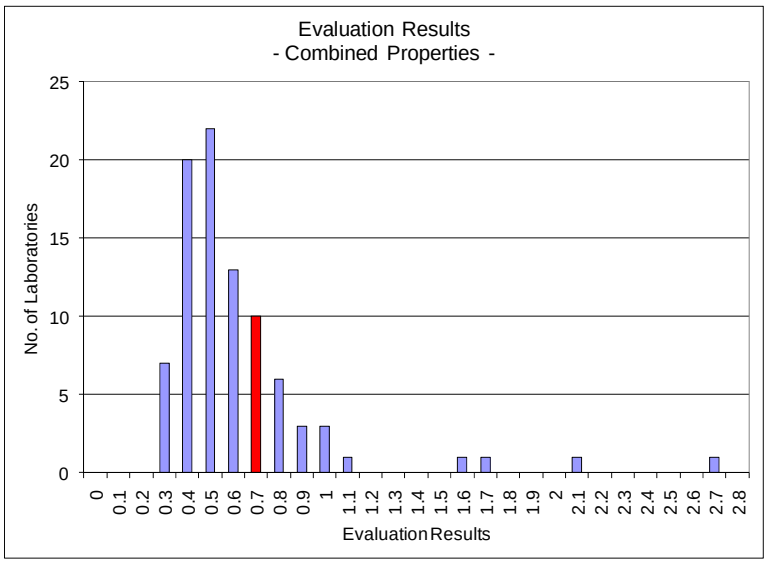


Figure 3.1-3. Evaluation result of the exemplary instrument #115 (marked in red) in comparison to the distribution of evaluation results for all instruments in Round Trial 2009-3

Since CSITC Round Trial 2011-3, an additional evaluation is added: For each instrument the share of results being inside commercial limits (fixed by the CSITC Task Force) for each cotton property is calculated ("Within-limits Evaluation"). This kind of evaluation doesn't give one summary evaluation result, but is instead closer to daily business reality, where it is important to have result deviations below commercial trade limits.

CSITC Round Trial Outputs and Use

From each CSITC Round Trial, a General Evaluation Report is created (see annex A). This Report includes detailed information about the inter-laboratory and within-laboratory result variability as well as on the typical laboratory evaluation distributions. All General Evaluation Reports are available via www.csitc.org. Results are summarized and additional evaluations are given on each CSITC Task Force meeting. This information is an ideal basis for estimating the reliability of the test instruments and results, and for fixing realistic commercial trade limits.

Each laboratory is getting two certificates for their participation, one with and one without the summary evaluation results for their instruments (see annex B). Additionally each laboratory is getting two according certificates for their annual participation. With these certificates, each laboratory can prove its performance to its customers or the buyers of their cotton.

Finally, each laboratory is getting a detailed result analysis for each instrument (see annex C), containing

- A detailed analysis of the results accuracy
- A detailed analysis of the result precision
- A specific presentation of their evaluation results in comparison to other instruments
- A specific presentation of their within-limits evaluation.

These analyses help the laboratories to improve their performance.

Conclusions and Outlook

There is little doubt that instrument testing is the future of cotton quality assessment. With this unique CSITC Round Trial system, laboratories can prove the reliability of their instrument test results objectively, and can improve where necessary. The future development will more and more demand this proof of reliability as the basis for using the laboratories' test results for trading.

ICA Bremen is planning a voluntary ICA Bremen laboratory certification, which is significantly based on the CSITC Round Trial results.

Literature / Publications during the project time

DRIELING, A., KNOWLTON, J.: Development of a Regular CSITC Round Trial. Beltwide Cotton Conferences, New Orleans, LA, USA, Cotton Quality Measurements Conference, Jan 9-12, 2007. Proceedings: National Cotton Council of America.

DRIELING A.: Results of the first year of implementation of the CSITC Round Trial. 29th International Cotton Conference Bremen, April 4, 2008. Conference Proceedings: Bremer Baumwollbörse / Faserinstitut Bremen e.V., p. 186-201

DRIELING, A.: Technical Measures for the Commercial Standardization of Instrument Testing of Cotton. Cotton Bangladesh (Magazine), April 2009

DRIELING, A.: High Volume Testing Result Variation – Results from the CSITC Round Trials. Beltwide Cotton Conferences, New Orleans, LA, USA, Cotton Quality Measurements Conference, Jan 4-7, 2010. Proceedings: National Cotton Council of America.

DRIELING, A.: CSITC Round Trials: 3 Years of Results. 30th International Cotton Conference Bremen, March 24-27, 2010. Poster. Proceedings: Bremer Baumwollbörse / Faserinstitut Bremen e.V.

DRIELING, A. / GOURLOT, J.P.: Cotton/Worldwide Harmonisation. Chapter 17 in Müssig, J. (Ed.): Industrial Applications of Natural Fibres — Structure, Properties and Technical Applications. Wiley-VCH, Weinheim, April 2010, p. 353-370. ISBN 978-0-470-69508-1.

DRIELING, A.: Commercial Standardization of Instrument Testing of Cotton – Results from over 4 years of International Round Trials. World Cotton Research Conference WCRC5, Mumbai November 7-11, 2011. Proceedings published by ICAC.

DRIELING A.: ICA Bremen Certification of Laboratories, b) Technical prerequisites and according CSITC Round Trial Data. 31st International Cotton Conference Bremen, March 24-27, 2012. Conference Proceedings: Bremer Baumwollbörse / Faserinstitut Bremen e.V., p. 83-92

Annexes

Annex A: Example for a General Evaluation Report (2012-1) (see extra document)

Annex B: Example for a Round Trial Certificate (see extra document)

Annex C: Example for an Instrument Evaluation Report (2012-1) (see extra document)

3.2 Results of the International Round Trial System

Author: **Axel Drieling**

Organization: Faserinstitut Bremen e.V. (FIBRE), Bremen, Germany

Summary

The development of the international CSITC Round Trial System was described in the previous chapter. The regular CSITC Round Trials started in 2007 with 55 laboratories and 70 instruments. These numbers increased to 80 laboratories with 137 instruments in RT 2012-4.

The Round Trials give statistically highly assured answers on the interlaboratory variation of the SITC Test results as well as on the within-laboratory variation of the results. These results form a very sound basis for fixing commercial trade limits.

The evaluation of the combined properties shows the overall status of each instrument. And it shows the improvement in performance over time. Unfortunately the median evaluation of all instruments did not improve from 2007 to 2011. Finally the evaluation allows comparing the performance of e.g. the laboratories in the African cotton producing countries to all laboratories worldwide, showing their improving performance.

The execution of the CSITC Round Trials is continuing after the end of this project based solely on the participation fees of the laboratories.

Aims

The defined aims of the CSITC Round Trials are:

- Evaluation of the test methods / test result variability
  - inter-laboratory variability
  - within-laboratory variability
  - additional evaluations as the variations between instrument types etc.
- Evaluation / rating of the participating laboratories, based on the accuracy of the results
- Detailed analysis of laboratory results to achieve more accurate results, based on accuracy and precision

For these aims, the results are given in this chapter.

Materials/Methods

Basis for the results in this chapter are the CSITC Round Trials, conducted from 2007 to 2011, with in sum 80 samples, tested in average by 95 instruments, each with 30 tests for each parameter. The Round Trial configuration and evaluation calculations are described in the previous chapter. Results are given for the six cotton properties with sufficiently low result variation: Micronaire, Strength, Length UHML, Length Uniformity Index, Color Rd and Color +b.

Participants

The Round Trial participants are located on all continents with the following number of registered participants in 2011: Asia 36, South America 22, North America 19, Europe 16, Africa 13, Australia 4. The majority of the participants is related to the cotton production (cotton companies, cotton boards, control companies), and only a minority related to spinning mills. The number of participating laboratories and instruments increased as shown in Figure 3.2-1. In Africa, laboratories participated from the following countries in 2011: Burkina Faso, Egypt, Mali, South Africa, Sudan, Tanzania, Uganda, Zambia and Zimbabwe.

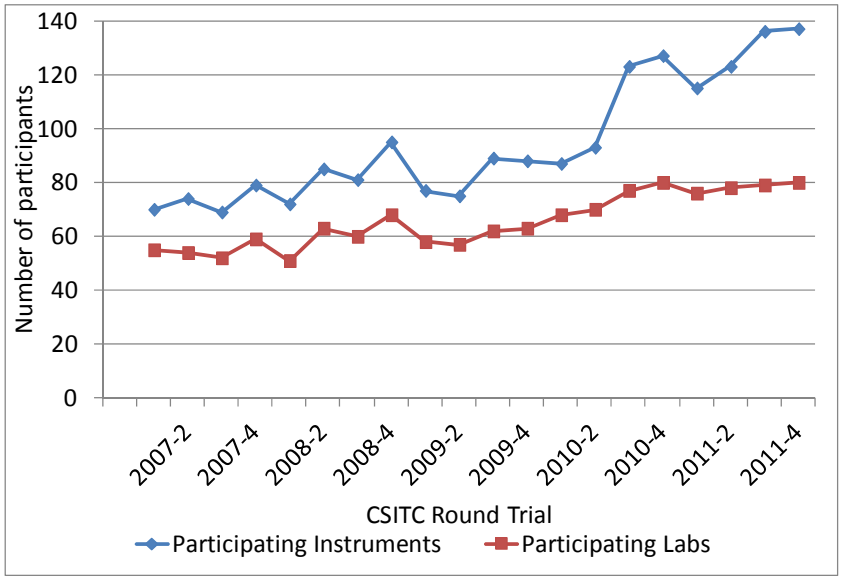


Figure 3.2-1 Participants in the CSITC Round Trials

Test result variation

Test results are generally, not only for cotton testing, always variable due to material variations and measurement uncertainties. For the test result variation, different parameters are suitable to describe the within-instrument result variation (precision) and the inter-instrument result variation in the CSITC Round Trials. Their definition is visualized in Figure 3.2-2. Typically all variations are given as standard deviations (SD). For the CSITC Round Trials, outliers are excluded based on Grubbs' algorithm before calculating these parameters. The results are valid for US Upland samples. For other origins, different variations may occur. For African cottons, an according variability study is reported in chapter 9.

Table 3-2 shows the within-instrument variations that were found in the CSITC Round Trials (median SD of labs / average of 72 samples / in average 90 instruments per RT and sample). This information is necessary to estimate the measurement uncertainty and to improve the precision.

Table 3-3 shows the inter-instrument variations in the CSITC Round Trials. These variations have to be considered for trading based on instrument test results, and form an ideal basis for fixing commercial trade limits.

For the trends given in this table, decreases might be caused by a learning process of the laboratories, whereas increases occur e.g. due to participation of new/more laboratories.

Calculations based on the 50% of the best laboratories showed that a reduction of the inter-instrument variation of approx. 20% can be achieved with the given instrument technology.

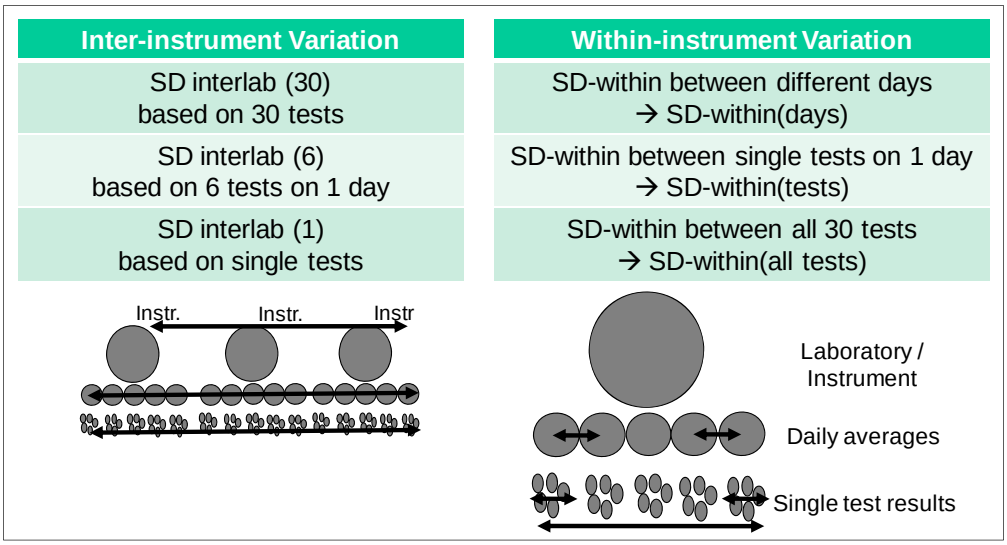


Figure 3.2-2: Parameters for the result variation

Table 3-2: Within-instrument variations

Property / Parameter	SD within instr. (between single tests)	SD within instr. (between days)	SD within instr. (30 tests on 5 days)
Micronaire	0.04	0.03	0.05
Strength, g/tex	0.60	0.42	0.73
UHML, Inches	0.010	0.006	0.012
Uniformity Index	0.52	0.30	0.59
Color Rd	0.25	0.26	0.38
Color +b	0.11	0.12	0.18

Table 3-3: Inter-instrument variations

Property / Parameter	SD inter-instrument (30)	SD inter-instrument (1)	Trend from 2007 to 2011
Micronaire	0.074	0.089	Slight decrease
Strength, g/tex	1.06	1.30	Decrease→ Constant
UHML, Inches	0.012	0.017	Constant
Uniformity Index	0.53	0.82	Constant
Color Rd	1.09	1.15	Incr.→Const.→Decr.
Color +b	0.37	0.42	Incr.→Const.→Decr.

For both tables, additional results are available for Short Fibre Index, Maturity, Trash Count and Trash Area. These parameters proved to be not sufficiently reliable for commercial purposes.

In comparison to results established by the USDA-AMS for these samples, the CSITC RT averages are for most properties not deviating systematically. For Micronaire, as small but systematic difference was found. The reason was identified in the utilization of old, improper

calibration cotton in many laboratories. Therefore new Micronaire calibration material was sent to all Round Trial participants, and accordingly the deviation from the USDA-AMS established results as well as the inter-instrument variation was significantly reduced.

Evaluation / rating of the participating laboratories/instruments

The CSITC Round Trials include an objective and summarizing evaluation of the instrument accuracy (described in the previous chapter). The lower the Summary Evaluation Result, the better the accuracy of the instrument. Comparing the Summary Evaluation Result to the median of all participating instruments shows, whether this instrument belongs to the 50% of the better performing instruments or not. The median evaluation result is in average of all Round Trials on a level of 0.51 units (see Figure 3.2-3).

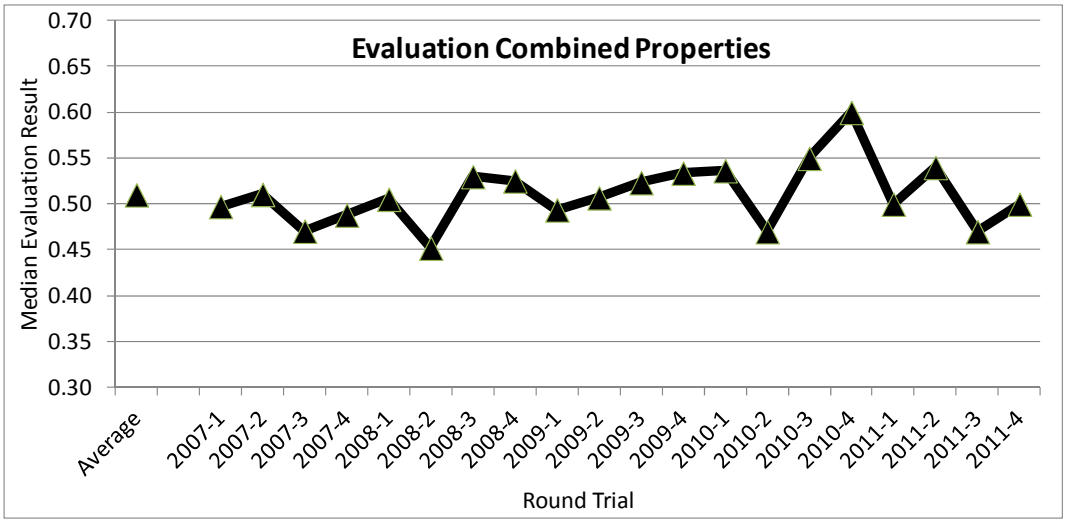


Figure 3.2-3: Median Evaluation Result (combined properties)

For any single instrument, laboratory, or group of laboratories, the evaluation of the combined properties can be compared to the median of all participating instruments. Figure 3.2-4 shows the median of all participating African laboratories to the median of all instruments worldwide. Whereas from 2007 to 2009 the African laboratories did not perform as well as the median of all instruments, this improved in 2010, so that their level is equally high. This proves the positive impact of this CFC/ICAC/33 project on instrument testing in Africa.

Discussion / Conclusions

The regular execution of the CSITC Round Trials gives very valuable results for the instrument variability. Additionally, comparing their performance to the performance of other laboratories worldwide, as well as getting detailed analyses on their Round Trial results, are suitable tools to help improving laboratory performance. Both results are helpful for the laboratories in the cotton producing countries in Africa as well as for all laboratories worldwide.

All general Round Trial results, except the specific performance of single laboratories / instruments are published and can be downloaded from www.csitc.org. Results and new evaluations are reported on every six monthly CSITC Task Force meeting, which is open for observers.

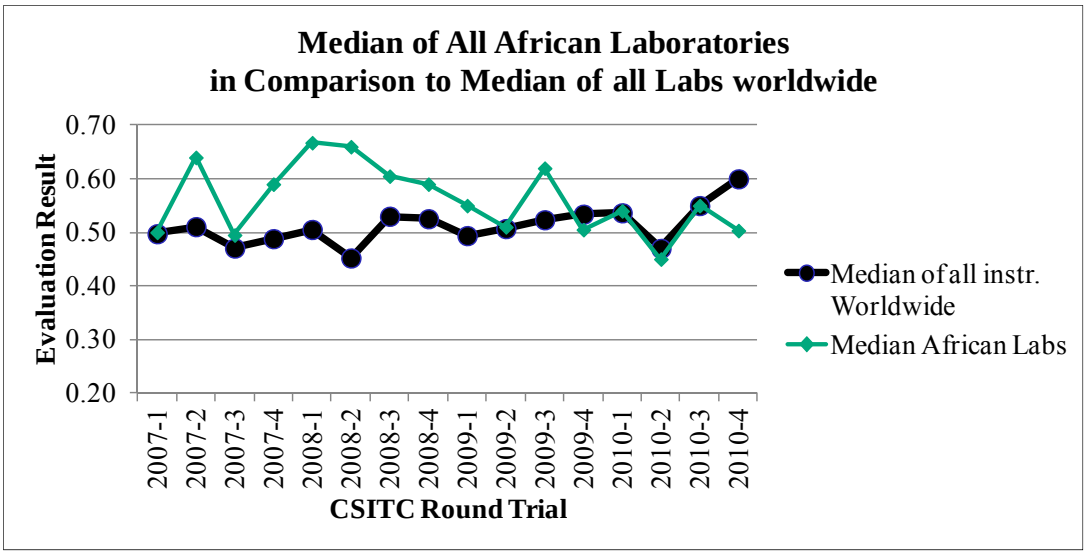


Figure 3.2-4: Median Evaluation Results (combined properties) of African laboratories compared to the median of all instruments worldwide

Literature / Publications during the project time (extract)

DRIELING A.: Results of the first year of implementation of the CSITC Round Trial. 29th International Cotton Conference Bremen, April 4, 2008. Conference Proceedings: Bremer Baumwollbörse / Faserinstitut Bremen e.V., p. 186-201

DRIELING, A.: High Volume Testing Result Variation – Results from the CSITC Round Trials. Beltwide Cotton Conferences, New Orleans, LA, USA, Cotton Quality Measurements Conference, Jan 4-7, 2010. Proceedings: National Cotton Council of America.

DRIELING, A.: CSITC Round Trials: 3 Years of Results. 30th International Cotton Conference Bremen, March 24-27, 2010. Poster. Proceedings: Bremer Baumwollbörse / Faserinstitut Bremen e.V.

DRIELING, A.: Commercial Standardization of Instrument Testing of Cotton – Results from over 4 years of International Round Trials. World Cotton Research Conference WCRC5, Mumbai November 7-11, 2011. Proceedings published by ICAC.

4
Cotton testing in Africa

4.1 Status and development of instrument testing in the regions

Authors: **Axel Drieling (1) / Jean-Paul Gourlot (2)**

Organization: (1) Faserinstitut Bremen e.V. (FIBRE), Bremen, Germany
(2) CIRAD, UPR SCA, F-34398, Montpellier, France

Summary

At least eight countries in Eastern / Southern Africa and five in West / Central Africa undertook intense developments during the project duration in order to achieve an instrument based classification system for their cotton production, examples of which are through establishing responsible governmental organizations, or through installing laboratories, SITC instruments, and suitable laboratory conditioning. The CFC/ICAC/33 project enhanced awareness about instrument classing of cotton which motivated countries in Africa towards instrument testing. Countries took initiatives independently and the responsible organizations started improving on their own. The project assisted the self initiatives to fulfill their objectives.

Status

In Africa, some countries started instrument testing several years ago. The major understanding of the importance of instrument test results for the African cotton production grew in this decade, leading to this CFC/ICAC/33 project. Test results can be and are applied for:

- Production overview
- Breeding/improving varieties
- Quality conscious seed cotton procurement/processing, finally resulting in quality related premiums for the farmers – depending on the organization of the cotton supply chain
- Ginning for process optimization

- Trading: pricing, assorting of homogenous lots, direct marketing, settling of claims – depending on the organization of the cotton supply chain
- Processing: settings, bale laydown

As of January 2012, the following countries had installed and operational laboratories for instrument classing of cotton.

- Eastern and Southern Africa
    - Egypt: Cotton Arbitration & Testing General Organization (CATGO)
    - Kenya: Cotton Development Authority (CODA) (lab installation in progress)
    - Mozambique: Instituto de Algodão de Moçambique (IAM) (lab installations in progress)
    - South Africa: Cotton South Africa (Cotton SA)
    - Sudan: Sudan Cotton Company (SCCL)
    - Tanzania: Tanzania Cotton Board (TCB)
    - Uganda: Cotton Development Organisation (CDO)
    - Zimbabwe: private cotton companies
    - In the other countries in the region there is either currently no operational laboratory or no fixed instrument classing structure to date
- West and Central Africa:
    - Benin: L'Association interprofessionnelle du cotton (AIC) (lab currently down)
    - Burkina Faso: Société Burkinabé des Fibres Textiles (SOFITEX)
    - Mali: Office de Classement du Coton (OCC) / CERFITEX
    - Senegal: Société de développement et des fibres textiles du Sénégal (SODEFITEX)
    - Togo: Nouvelle Société Cotonnière du Togo (NSCT)
    - In the other countries in the region there is either currently no operational laboratory or no fixed instrument classing structure to date

The full list of countries and their status is given in annex A, including the annual cotton production , responsible organizations, status of the laboratories, additional laboratories, current percentage of bales tested in production, main use of SITC results, developments during the project time, project support, and future perspectives.

Besides these laboratories devoted for cotton classing, several other SITC laboratories are working at research institutes, in spinning mills and with the private cotton companies, or private control companies. Table 4-1 and Table 4-2 are giving an overview for both regions.

Table 4-1: Rough/unverified overview: SITC Instruments in Eastern/Southern Africa

Country	Laboratory	No. of instr.	Manuf. / Type	Status
Egypt	CATGO	2		operational
Egypt	(Research)	1		operational
Egypt	(Spinning mills)	several		
Ethiopia	(Quality org.)	1	Premier	not in operation
Ethiopia	(Research)	1	Uster HVI 1000	operational
Kenya	CODA	1	Uster HVI 1000	Under installation
Lesotho	(Spinning mills)	1		
Mauritius	(Spinning mills)	several		
Mozambique	IAM	3	Premier ART 2	under installation
South Africa	CottonSA	3	diverse	operational
South Africa	(Cotton Comp.)			
South Africa	(Spinning mills)			
Sudan	SCCL	1	Premier HFT	operational
Sudan	(Research)	1	Premier HFT	operational
Sudan	(Spinning mills)			
Tanzania	TBS/RTC	1	Uster HVI 1000	operational
Tanzania	TCB	1	Uster Spectrum II	operational
Tanzania	(Control Comp.)	1	Premier	operational
Tanzania	(Spinning mills)			
Uganda	CDO	1	Uster Spectrum	operational
Zambia	(Cotton Comp.)			not in operation
Zambia	(Spinning mills)			
Zimbabwe	Cottco	3	Uster Spectrum	operational
Zimbabwe	OLAM	1	Premier ART 2	operational

*

Table 4-2: Rough/unverified overview: SITC Instruments in West/Central Africa

Country	Laboratory	No. of Instr.	Instr. Manuf.	Type	Status
BENIN	AIC	2	USTER	HVI 900 SA	currently down
BENIN	Internat. Comp. / Control Comp.	2			currently down
BURKINA FASO	SOFITEX	1	USTER	HVI 1000	new, replacing defective instr.
CAMEROON	SODECOTON		-	-	NO INSTRUMENT
CAMEROON	SICAM	1	SPINLAB	HVI 900 ?	?
CHAD	COTONTCHAD	2	USTER	HVI 900 div.	not in operation
COTE D'IVOIRE	CIDT	2	USTER	div.	not in operation
COTE D'IVOIRE	CIDT	1	?	?	procured
COTE D'IVOIRE	Research	1	PREMIER	ART	?
MALI	CERFITEX / RTC	2	USTER	HVI 1000	Operating
MALI	CMDT --> OCC	1	PREMIER	ART	Lab currently improved
NIGERIA	Research	1	PREMIER	HFT	?
SENEGAL	SODEFITEX	1	PREMIER	ART	operating again

					since 2011
TOGO	NSCT	1	PREMIER	ART	operating again since 2011

Additional information for the countries in the regions, including their cotton production, processing and testing structure, is collected in separate reports for each country ("country reports"), and is available on csitc.org.

At least eight countries in the Eastern / Southern Africa and five in the West / Central Africa undertook intense developments during the project duration in order to achieve an instrument based classification system for their cotton production, for example through establishing responsible governmental organizations, or through installing laboratories, SITC instruments, and suitable laboratory conditioning. One example is the Instituto de Algodão de Moçambique (IAM), where three laboratories have been erected and equipped during the project duration.

The CFC/ICAC/33 project enhanced awareness about instrument classing of cotton which motivated countries in Africa towards instrument testing. Countries took initiatives independently and the responsible organizations started improving on their own. The project assisted the self initiatives to fulfill their objectives (see next chapter).

Laboratories from nine African cotton producing countries participated in the CSITC Round Trials in 2011 and therefore were evaluated in comparison to instruments in 80 laboratories worldwide. The median evaluation results of the participating African laboratories are compared to the median of all instruments worldwide (Figure 4.1-1 & Figure 4.1-2) Initially the participating African laboratories did not perform as well as the median of all instruments (higher evaluation results) but they improved over time and the median of all African laboratories equalized in 2010 to rest of the labs. This shows the progress of the laboratories and the contribution of this CFC/ICAC/33 project on instrument testing in Africa, although still a wide distribution of laboratory quality/performance can be found.

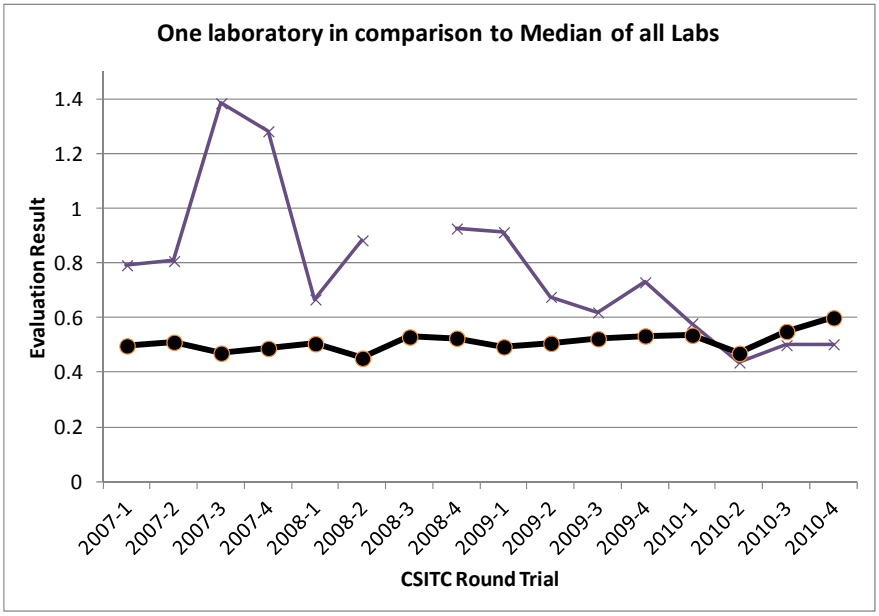


Figure 4.1-1 One examplary laboratory compared to the median of all instruments

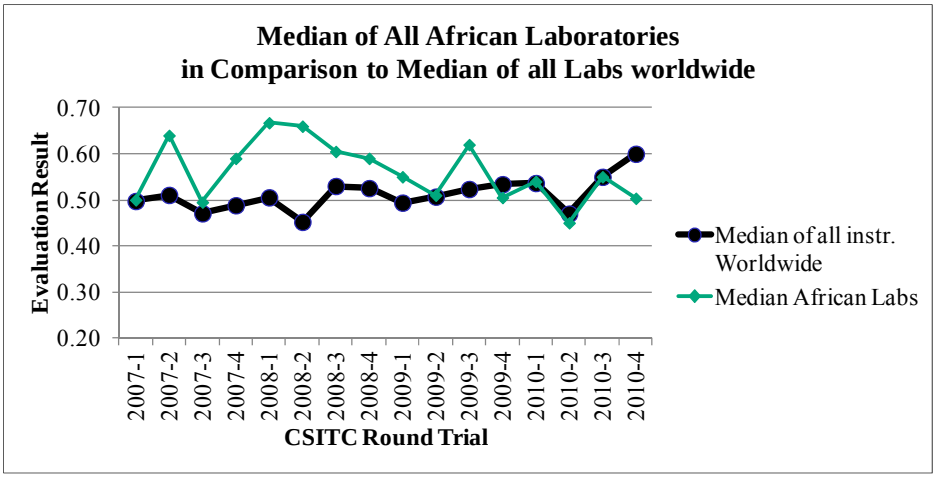


Figure 4.1-2 Comparison of African laboratories to all participants worldwide
(as presented on the ACA Annual Conference, Khartoum, March 2011)

Annexes

Annex A: Overview of laboratory developments in the regions (see extra document)

4.2 **Direct support to the laboratories**

Author: **Philipp Lehne**

Organization: Faserinstitut Bremen e.V. (FIBRE), Bremen, Germany

Summary

Despite that many laboratories of national cotton classing organizations have high volume cotton testing instruments many are not performing well. Among the reasons are old equipment, e.g. for laboratory climate management and difficult access to resources as maintenance service or calibration cotton standards. To increase its possible overall impact one of the activities of the project CFC/ICAC/33 was to provide direct support to national cotton classing organizations to install proper conditions of working, such as for the climate control of the laboratories in order to improve their performance. For this as step one is the status quo was analyzed and the necessary monetary support estimated. As second step the necessary support to improve the laboratory conditions for reliable testing was delivered.

Support criteria which cotton testing organizations need to fulfill to qualify for material support were agreed between the project supervisory body, the project funding body, and the project executing agency. Agreed support preconditions were the membership of the country to the ICAC and the CFC. The organization itself had to be the national responsible cotton classing organization, needed to have a high volume testing instrument, had established relationships with the Regional Technical Centre (through signed Memorandum), had a significant production of upland cotton lint with significant export share. Further the project limited its regular support to a maximum of USD 25,000 for each organization and did not contribute more than half of the overall improvement costs. Agreement on support was an iterative process for each organization which could only be successfully finished with a high level of motivation from the organization itself to ensure buy-in and effective use of project resources.

In the East/Southern African region organizations from 16 countries were assessed on their conformity with the support criteria. In the West/Central African region organizations from 14 countries were assessed on their conformity with the support criteria. An additional desk research was performed to evaluate the information already available and to further structure the material support program.

Questionnaires were sent to 10 potentially qualifying organizations in East/Southern African region to further evaluate conformity with support criteria and identify needs for laboratory improvement. Questionnaires were sent to 10 potentially qualifying organizations in West/Central African region to further evaluate conformity with support criteria and identify needs for laboratory improvement.

From the desk research it was assessed that likely none of the organizations had qualified independent laboratory climate measuring and recording instruments (climate recorders) and that many laboratories were using wrong, outdated, or overused calibration cotton standards.

The material support program was thus further structured into a general support component and an individual support component. In the general component modern climate recorders and calibration cotton standards were supplied to qualifying organizations. The individual support component was used to support the qualifying organizations to improve their cotton testing laboratories according to the actual deficits as reported in the questionnaires. Additionally a cotton laboratory technical expert was identified to further assess such laboratories for which

the possible support needed to be further detailed on the basis of technical conditions and local procurement options.

In the East/Southern African region questionnaires were returned by 8 cotton testing organizations. Based on the reported information seven cotton testing organizations from seven countries were taken up in both the general and the individual component of the material support program. Two further organizations were supported from the general component only. Supported countries are Egypt, Kenya, Mozambique, South Africa, Sudan, Tanzania, Uganda, and Zimbabwe. From the general component in total 11 sets of climate recorders and 14 sets of calibration cotton standards were delivered. Support from the individual component could be given to organizations in Kenya, Mozambique, Sudan, Tanzania, Uganda, and Zimbabwe for Air Management System procurement/repair and for Testing Instrument maintenance. The total financial support for purchase and transport of goods was EUR 137,000.

In the West/Central African region questionnaires were returned by 9 cotton testing organizations. Based on the reported information six cotton testing organizations from six countries were taken up in both the general and the individual component of the material support program. Supported countries are Benin, Burkina Faso, Mali, Nigeria, Senegal, Togo. From the general component in total 6 sets of climate recorders and 4 sets of calibration cotton standards were delivered. Support from the individual component could finally be given to organizations in Burkina Faso, Senegal, and Togo for Air Management System procurement and for Testing Instrument maintenance. Additionally a cotton laboratory technical expert did further assessment for laboratories in Mali, Nigeria, and Togo. An Air Management System technical expert assessed an Air Management System in Senegal. The total financial support for purchase and transport of goods was EUR 63,000.

Ending / Conclusion

Thanks to the initiatives of the national responsible cotton classing organizations and with the support from the project CFC/ICAC/33 many Sub-Saharan African countries (East/Southern African countries West/Central African countries) improved the ability on cotton instrument classing substantially in recent years. As a result it is expected that 8 out of the 11 East/Southern African countries with an annual cotton lint production larger than about 10,000 metric tons already have or will have within 2012 operational national cotton testing laboratories on an acceptable to excellent level of technical qualification. As a result it is expected that 5 out of the 10 West/Central African countries with an annual cotton lint production larger than about 10,000 metric tons already have or will have within 2012 operational national cotton testing laboratories on an acceptable to excellent level of technical qualification. This will achieve an increase from three at the start of the Project to thirteen.

Annexes

Annex A: Direct support to the laboratories, full text (see extra document)

4.3 Verification of test results / External re-tests

Author: **Axel Drieling**

Organization**:** Faserinstitut Bremen e.V. (FIBRE), Bremen, Germany

Summary

In order to achieve a reliable system for instrument testing, it has to be assured that the test results are given on the true level. This can be achieved with various steps of verification, to be summarized as:

- Calibration
- Comparison in round trials
- External re-tests on daily samples
- Certification/accreditation

Especially external re-tests on random daily samples are important for an assured daily performance. According procedures and evaluation software were developed during the project.

Introduction / Measures for test result verification

For the chosen African regions, the Regional Technical Centers (RTCs) are offering three different kinds of service:

- Information and expertise
- Reference activities
- Working as a testing center for the region.

The second, reference activities, is directly relating to the different steps of test result verification.

Calibration is necessary as the basic step for acquiring test results on the internationally accepted level. The RTCs can assist for any questions, and they can support obtaining valid calibration material.

By comparing themselves with other laboratories in round trials, laboratories can prove that their instruments are capable of producing test results on the internationally accepted result level. The most important round trial is the CSITC Round Trial, which is explained in chapter 3. Additionally the RTCs are offering regional technical round trials, which allow for comparing laboratories based on the locally given cotton origins.

Although round trials are a valid tool for checking if the instruments are capable of producing suitable results, this cannot assure the daily consistency and correctness of results. For this, the only suitable tool is a regular external re-test. This is the most complex and costly step of verification, but at the same time the most important one.

Finally, an accreditation or certification like the ISO 17025 accreditation or the ICA Bremen Cotton Laboratory Certification add a high level of quality assurance. In these certifications, typically the measures mentioned above are included.

External re-tests

Test results are always subject to measurement uncertainties. Given deviations are partly systematic (biased), and partly stochastic. Laboratory-to-laboratory reproducibility is more difficult to achieve than within-lab or same-machine reproducibility, but it provides a more realistic assessment of the degree of reproducibility that can be expected in the buyer's or

manufacturer's laboratory after shipment from the producer. The USDA-AMS is conducting and publishing its lab-to-lab reproducibility for each crop.

For conducting a meaningful re-test, the re-testing laboratory should provide a better accuracy/ precision that the testing laboratory. For this, only high level laboratories with proven good performance (proven in the CSITC Round Trials) should be taken. And the number of tests should be at least doubled compared to the testing laboratory, ideally on two different instruments.

Re-tests should be done on a daily basis, with a fixed percentage of samples re-tested. The samples should be chosen at random throughout the day. For the purpose of getting testing data verified before sending it, it would be necessary to send samples for re-test on a daily basis, and to test on the day following. As this is not feasible with the prerequisites in the African cotton producing regions, sampling and dispatch are planned for a longer period (e.g. each for one week). With this, the re-test results can still be utilized for the test result verification on a daily basis, but not for a check prior to result dispatch.

Based on the reproducibility limits of the USDA in 2000, the following limits are taken for the analysis:

- Micronaire 0.1 units
- Strength 1.5 g/tex
- Length UHML 0.02 inches = 0.508 mm
- Length Uniformity 1 unit
- Color Rd 1 unit
- Color +b 0.5 units

For each sample, the test result deviations between the test results and the average of all re-test results is calculated, and the number of deviations higher / lower than the limits is evaluated.

During the project, FIBRE developed a re-test software for combining the test and re-test data, and for creating full reports as well as executive summaries. Whereas the executive summaries give an overview about a possible bias and about reproducibility, the full report can be taken for tracing any major deviation back to the single laboratories and each sample. The software is available at FIBRE and is used in the RTCs.

Examples from the executive summaries are given in Figure 4.3-1and Figure 4.3-2.
Figure 4.3-1 is showing the share of test result differences that do not exceed the given limits. For an overview, these shares may be compared to the average of all laboratories in the region, or to the USDA reproducibility data in 2000. For this given example, the share of differences inside the reproducibility limits for Micronaire is 43%, which is substandard. Accordingly in Figure 4.3-2 it can be seen that there is a systematic bias for the Micronaire results as well as a high variation. The according laboratory should use this information for improving its performance.

Laboratory (and instrument)	Lab A	Period:	17.01.2011
Check Laboratory	FIBRE		21.01.2011

Outside Reproducibility Limits						
	Mic	**Str**	**Len**	**Unif**	**Rd**	**+b**
Limits	0.1	1.5	0.508	1	1	0.5
No. of tests	114	114	114	114	114	114
Share outside, %	57	40	56	45	73	46
Share inside, %	**43**	**60**	**44**	**55**	**27**	**54**
Comparison: Av. of all labs at RTC						
Comparison: USDA 2000, %	80	76	79	86	93	94

Figure 4.3-1 Re-test report summary: Outside reproducibility limits table

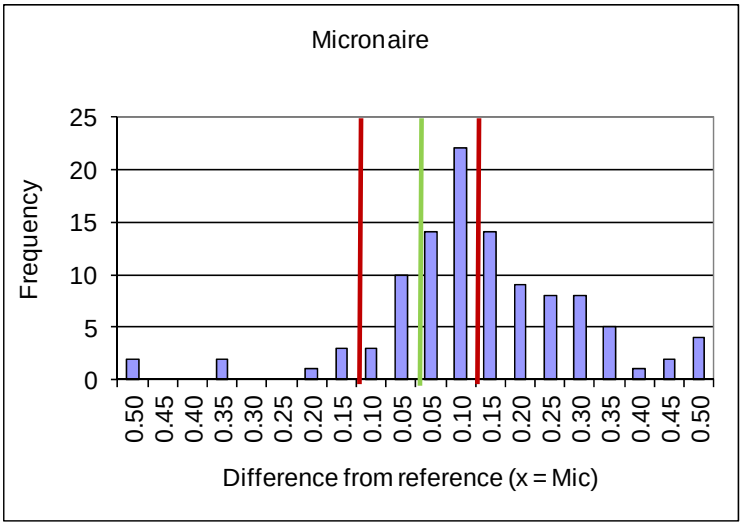


Figure 4.3-2 Re-test report summary: Deviation graph for Micronaire

Re-tests have been planned / carried out in the project:

- For samples from the RTCs at FIBRE or CIRAD (see chapter 5.4)
- For samples from the variability study at FIBRE or CIRAD (see chapter 9 / annex)
- For samples from laboratories at the RTCs (to a limited extent, see chapter 5 and 6)
- For samples from exemplary laboratories at FIBRE or CIRAD

5
Cotton testing in Eastern and Southern Africa

5.1 The region and laboratories

Author: **Gervas Kaisi**

Organization: Tanzania Bureau of Standards, Dar es Salaam, Tanzania

An overview of the cotton producing region in East / Southern Africa

The overall objective of the CFC Project is to assist the cotton producing countries in Africa, especially the developing countries and the Least Developed Countries (LDCs) to meet the emerging quality assessment demands of the global cotton market so as to strengthen or at least maintain their competitive position in the world market. This objective will be achieved through establishment of the Regional Technical Centres (RTCs), one in East / Southern Africa and the other in West / Central Africa.

The Regional Technical Centre (RTC) for East and Southern Africa is located at Tanzania Bureau of Standards (TBS) and was working in collaboration with Tanzania Cotton Board (TCB) to ensure that the cotton quality assessment demand for international as well as local market is achieved. The countries and seasons are given in Table 5-1. The typical annual crop production for these countries is given in Table 5-2.

Table 5-1: Crop seasons in the region

Country	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Tanzania						x	x	x	x	x	x	
Kenya	x									x	x	x
Uganda	x	x	x	x	x	x	x					
Malawi						x	x	x	x	x	x	
Mozambique												
Zambia						x	x	x	x	x	x	
Zimbabwe					x	x	x	x	x	x	x	
Sudan	x	x	x	x	x	x						

Table 5-2: Annual cotton production in 1000 tons
(ICAC average 2006/07 to 2009/10)

Country	Average production
Kenya	7
Malawi	19
Mozambique	23
Sudan	30
Tanzania	86
Uganda	18
Zambia	38
Zimbabwe	97

The main services

The main services of the RTC East/Southern Africa are:

- To conduct trainings for laboratories and stakeholders in the region.
- Expertise for the cotton testing laboratories with on-site visits.
- Collection and dissemination of technical information.
- Facilitate the cooperation between the cotton testing laboratories.
- Conduct regional round trials.
- To conduct re-tests on regional instrumentally classed samples.

The countries served by RTC East

The following countries supported by the RTC East/Southern Africa are as defined in Table 5-3.

Table 5-3: Countries supported by the RTC Eastern/Southern Africa

Country	Laboratory Name	Number of instruments	Type of instrument	Location	Status
Tanzania	RTC East	1	Uster 1000M700	Dar es Salaam	Operational
	TCB	1	Spectrum II		Operational
	Wakefield	1	Premier		Operational
Kenya	Cotton Development Authority (CODA)	1	Uster 1000M700	Nairobo	Under installation
Uganda	Cotton Development Organization (CDO)	1	Spectum	Kampala	Operational
Malawi	No Laboratory	N/A	N/A	N/A	N/A
Mozambique	IAM	1	Premier Art 2	Beira	Operational
		1	Premier Art 2	Nampula	Operational
		1	Premier Art 2	Montpuez	Operational
Zambia	No Laboratory	N/A	N/A	N/A	N/A
Zimbabwe	COTTCO	3	Spectrum	Harare	Operational
	OLAM (Zw)	1	Premier Art 2		
Sudan	SCCL	1	Premier HFT	Port Sudan	Operational
	ARC	1	Premier HFT	Wad Medan	Operational

Support given to regional labs

Reference activities

- Regional round trials (See chapter 5.4)
- Retests (See chapter 5.4)

5.2 The planned RTC structural and legal organization

Authors: **Dominic Mwakangale, Gervas Kaisi**

Organization: Tanzania Bureau of Standards, Dar es Salaam, Tanzania

Summary

Having become a Center of excellence, the services offered by the Regional Technical Centre for Eastern/Southern Africa fits into the Legal Standards Act which establishes the Tanzania Bureau of Standards. Given this the Government of Tanzania has decided to extend its support to include the RTC activities during the transition period from the end of the Project until the RTC becomes an autonomous site. To achieve this state a memorandum of understanding (MoU) between the RTC and partner states was drafted and has been created to assure the financial sustainability in such a way that the services of the RTC will be covered by an agreed fee.

The centre will have a regional steering committee composed of the chief executives from the cotton organizations of Tanzania, Uganda, Zambia, Zimbabwe Mozambique, Kenya, Malawi and Sudan

The main functions of the regional steering committee will be

- Monitoring and evaluation of the centre´s performance
- Advising the TBS management on the best ways of running the centre

The TBS management will have the responsibility to ensure that regional steering committee meetings are convened at the minimum of once a year without exception.

Not only has the RTC been earmarked to serve the Eastern/Southern Africa regions as a centre of excellence it has been noted in Tanzania as an impetus for the "Kilimo Kwanza" policy. This policy is directed to giving top priority to agriculture necessary for the progress in economical growth.

Organization, structure and manpower requirements

The RTC has developed procedures, training programmes which are implemented and offer Regional Round Trials and collects and disseminates information as well as perform expertise to cotton testing laboratories in the region and plans to expand its services to include re-checking of the tested samples from the regional laboratories.

To ensure sustainability of the Centre, the RTC developed the Business plan which details scenarios on the development of the cotton production and thus resources, work available and estimated required funds to operate it. Funds are planned to be raised from the region through either agreement on annual rates by the beneficiaries or by payments according to services procured from the RTC (see Annex A).

The developed RTC Business plan was complimented with the Memorandum and Articles of Association (MoA) a legal document which gives guidance on how the RTC will be managed. All the two documents including a report from John Lupton the ICAC Consultant on the future of RTC was submitted two years ago to the Chief Executives of the Cotton Authorities

in the region for their concurrence on the RTC Legal structure and the proposed scenarios to support the RTC (see Annex B).

All the three submitted documents proposes the Centre to have a Regional Steering Committee composed of the Chief executives from the cotton organizations of Tanzania,Uganda,Zambia,Zimbabwe,Mozambique,Kenya,Malawi and Sudan.

The main functions of the regional steering committee will be

- Monitoring and evaluation of the centre's performance
- Advising the TBS management on the best ways of running the centre.

On the other hand, it will be the responsibility of the TBS Management to ensure that Regional Steering Committee meetings are convened yearly without failure. However, transport and subsistence allowances for the committee members attending the meetings will be borne by the delegates themselves.

The MoA is yet to be signed and since the services offered by the RTC fit very well in the Law (Standards Act) which establishes TBS, The Government of Tanzania has decided to extend its support to include the RTC activities during the transition period from the end of the project until such a time when the RTC becomes autonomous site.

However partner states shall sign a Memorandum of Understanding (MoU) to use the services of the Centre at a fee that shall be agreed upon.

Annexes

Annex A: Business plan for the RTC East (see extra document)

Annex B: Consultancy report (see extra document)

Annex C: Income and expenditure (see extra document)

5.3 RTC laboratory, instruments and testing procedures

Author: **Gervas Kaisi**

Organization: Tanzania Bureau of Standards, Dar es Salaam, Tanzania

The RTC East/Southern Africa laboratory is located at the Tanzania Bureau of Standards premises which are at the junction of Sam Nujoma and Morogoro Road. The construction cost of the laboratory building was covered by the Government of Tanzania. The furnishing, instruments, and other related technical equipment and appliances (such as those listed in Table 5-4) in the RTC East laboratory were donated by the CFC and European Commission.

Table 5-4: Equipment and appliances donated by the CFC and EC

Equipment / Appliance	Type	Description
SITC	Uster HVI 1000M700	Testing and classification of cotton
Ambient Air Management System (AAMS)	Branca Idealair	control temperature and relative humidity
Air compressor		Supportive to the SITC
Cotton homogenizer		Preparation of samples for testing
Toyota SUV		Transport of samples
IT equipment		Office business Training purposes

To enhance the expertise, intensive trainings were given on the usage of the equipment and appliances.

For any testing laboratory to perform its activities in a more professional manner it needs to have procedures in place. In view of this fact, the RTC laboratory took initiatives to prepare procedures for activities done at the centre. Initially the RTC laboratory used the knowledge of procedures preparation from other laboratories of Tanzania Bureau of Standards before going on to finalize and implement three own devised procedures.

1. Retest procedure
2. Round Trial Procedure
3. Round Trial Results Evaluation Procedure

These procedures are given in detail in the Annexes

The following procedures were not extracted from the agreed procedure keywords

1. SITC testing procedure
2. Sample receiving procedure
3. Sample handling procedure
4. Sample conditioning procedure
5. Document control procedure

The RTC East and Southern Africa laboratory has prepared a draft of the quality/policy manual and submitted this together with the application to the Accreditation body SADCAS in March 2012. The Accreditation body confirmed reception of documents.

With the implementation of these procedures the RTC-EAST had to prove its competence and this competence has been gauged through the participation in the CSITC Global Round Trials. Since 2010 it is positively noticeable that the instrument results have been close to the median of all globally participating instruments. Figure 5.3-1

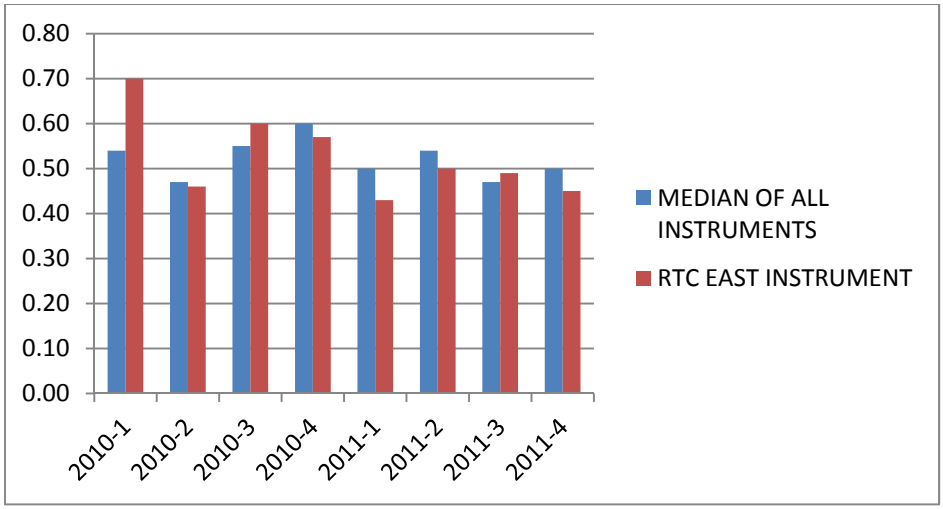


Figure 5.3-1: Global round trial test results

Picture 5.3.1 The RTC Laboratory

Picture 5.3.2 Laboratory visit

Annexes

Annex A: Retest procedure

Annex B: Round Trial Procedure (see extra document)

Annex C: Round Trial Results Evaluation Procedure (see extra document)

5.4 The RTC work as a testing center for the region, the regional round trials and recheck (re-tests) on samples

Authors: **Gervas Kaisi (1) / Mariam Mbwana (2)**

Organization: (1) Tanzania Bureau of Standards, Dar es Salaam, Tanzania

(2) Tanzanian Cotton Board, Dar es Salaam, Tanzania

Working as a testing centre for the region

Since the RTC East/Southern Africa laboratory was officially inaugurated in April, 2010, one of the main aspects was to use it as a testing center to serve research units and other regional cotton organizations that did not have state of the art testing instruments.

It received samples from the Cotton Development Trust (CDT)-Zambia, Cotton Development Authority (CoDA)-Kenya, OLAM-Tanzania and Cotton Company of Zimbabwe (COTTCO)-Zimbabwe. The requests of testing these samples were for research purposes and quality ascertainment.

The main aim of using the RTC as a testing center is to serve research institutes and other cotton organizations in the region which do not have state of art testing instrument.

The regional round trials

The RTC East and Southern Africa prepared and distributed three Regional Round Trials to the Regional Laboratories, RTC West/Central Africa, FIBRE Bremen and CIRAD for the purpose of checking their competence in testing cotton samples. The first one was in July 2009, November 2009 and January 2010. The Regional labs distributed with samples in the first round trial were as follows; TCB and WIS (Tanzania), CDO (Uganda), Dunavant (Zambia), RTC West, FIBRE-Bremen, CIRAD-France and COTTCO (Zimbabwe) whilst in the second round trial two more laboratories were distributed with samples namely; ARC (Sudan) and SCCL-Sudan. The feedback was not 100% fulfilled by the labs distributed with samples because not all labs sent back test results for RT. In the first RT; Dunavant (Zambia) did not sent back test results while in the second RT; ARC (Sudan) and SCCL-Sudan did not sent back test results. In the third RT; Dunavant (Zambia), ARC (Sudan) and SCCL (Sudan) were not given samples but other labs were given samples and sent back test results.

The round trial is designed to check laboratory's instrument accuracy and precision as well as personnel competence on a periodic basis. Regional round trials will allow comparing test results from different instruments based on cottons which are typically tested in the laboratory instead of cottons from other continents.

The recheck (re-tests) of samples

One of the crucial activities assigned to RTC laboratory was to recheck tested samples from other regional laboratories. In doing so, the RTC laboratory was also then rechecked by a third part which is FIBRE-Bremen. In this case a portion of rechecked samples from the RTC laboratory was then sent to FIBRE-Bremen together with its results so that after testing by FIBRE the results could be compared (see Figure 5.4-1).

Outside Reproducibility Limits						
	Mic	Str	Len	Unif	Rd	+b
Limits	0.1	1.5	0.508	1	1	0.5
No. of tests	228	228	228	115	228	228
Share outside, %	29	20	29	45	37	23
Share inside, %	**71**	**80**	**71**	**55**	**63**	**77**

Figure 5.4-1: Results for re-tests from November 2010

Discussion / Conclusions

The aim of this activity was to cross-check the correctness of the RTC lab instrument in comparison with two other instruments i.e. a regional lab instrument and instrument at FIBRE.

Only samples tested for variability study at RTC east lab were sent to FIBRE for re-checking purposed.

Due to problems such as high shipping costs, some regional laboratories were not sending samples for re-checking purposes to RTC laboratory

5.5 **The provision of testing related information**

Author: **Gervas Kaisi**

Organization: Tanzania Bureau of Standards, Dar es Salaam, Tanzania

Summary

The provision of testing related information was handled using the following methods:

- Trainings and workshops
- Expertise vists
- Collection and dissemination of information

Trainings and workshops

The training of the Regional Lab Managers of the Regional laboratories was conducted from 20-24 July, 2009 at the RTC Lab-Tanzania Bureau of Standards. The training comprised the Laboratory managers from the following countries; Tanzania, Uganda, Zambia, Zimbabwe and Mozambique.

The training of the Laboratory Technicians from the Regional laboratories was conducted from 30 November 2009 to 04 December, 2009 at the RTC East lab-Tanzania Bureau of Standards. The training comprised the Laboratory Technicians from the following countries; Tanzania, Uganda, Zambia, Zimbabwe, Kenya and one lab technician invited from Nigeria.

The training of the cotton chain stakeholders in the region was conducted on 09 April, 2010 during the official inauguration of the RTC laboratory. The training comprised the stakeholders from the following countries; Tanzania, Uganda, Kenya, Ethiopia, Zambia and Mozambique.

The training on the Instrument Service was conducted by USTER-USA on 23-25 March, 2011 at the RTC East laboratory. The training comprised the participants from the following countries; Tanzania, Uganda, Kenya, Mozambique, Zimbabwe and Sudan (See Annex A).

The training on the Instrument Service was conducted by PREMIER-INDIA on 15-17 June, 2011 at the RTC East laboratory. The training comprised the participants from the following countries; Tanzania, Uganda, Kenya, Mozambique, Zimbabwe and Sudan (See Annex B).

An awareness seminar at the beginning of the project and one day training was conducted in Dar es Salaam to sensitize them on the CFC/ICAC/33 Cotton Project.

The major aim of these trainings was to transfer knowledge from the RTC Experts to lab managers and technicians of the regional laboratories.

The knowledge was transferred to the regional laboratory managers and technicians of the following regional laboratories; Tanzania Cotton Board (Tanzania), Wakefield Inspection Services (Tanzania), Cotton Development Organization (Uganda), Cotton Development Authority (Kenya), Agricultural Research Corporation (Sudan), Dunavant (Zambia), IAM (Mozambique) and Cotton Company of Zimbabwe.

Also, cotton chain stakeholders were sensitized about the CFC/ICAC/33 Cotton Project during the awareness seminar and official inauguration ceremony conducted in Dar es Salaam.

The trainings for regional lab managers and technicians were planned to be conducted once a year for every group but practically it was not achieved as labs were proposing the same participants. The labs were doing this because lab manager and lab technician are the only permanently employed and other operators are working on a temporary basis. In view of this, the RTC laboratory did the training on instrument testing and lab management once to lab managers as well as to lab technicians to avoid repetition of training materials.

Instead, the RTC laboratory invited resource persons from USTER-USA and PREMIER-India to conduct trainings on instrument servicing as well as to enable them manage trouble shooting and minor maintenance.

The expertise for laboratories

Since the inception of the project, the RTC Experts and International Expert rendered expertise to the following regional laboratories with their countries in bracket; Tanzania Cotton Board (Tanzania), Wakefield Inspection Services (Dar es salaam-Tanzania), Cotton Development Organization (Kampala-Uganda), Cotton Development Authority (Nairobi-Kenya), Sudan Cotton Company Limited (Port Sudan-Sudan), Agricultural Research Corporation (Wad Medani-Sudan), Dunavant (Katete & Mumbwa-Zambia), IAM (Beira-Mozambique), Cotton Company of Zimbabwe (Harare-Zimbabwe) and Cotton SA (South Africa) as well as several other laboratories (e.g. spinning) and organizations. The visits were planned to be conducted twice a year at least to two laboratories. (Table 5-5)

Table 5-5: Regional expertise visits

Activity Code	Description	Purpose of visit	Project Partners	Date(s)
C.1.3.5	Expertise visit made to the Regional Laboratories in Kenya, Uganda and Zambia	Laboratory audit and advice for improvement	TBS / FIBRE	21-25/04/2008
C.1.3.5	Expertise visit made to the Regional Laboratories in Zimbabwe, Mozambique and South Africa.	Laboratory audit and advice for improvement	TBS / FIBRE	14-19/08/2008
C.1.3.5	Expertise visit made to the Regional Laboratories in Zambia and Malawi.	Laboratory audit and advice for improvement	TBS / FIBRE	16-20/03/2009
C.1.3.5	Expertise visit made to the Regional Laboratories in Sudan.	Laboratory audit and advice for improvement	TBS / FIBRE	08-14/08/2009
C.1.3.5	Expertise visit made to the Regional Laboratories in Kenya and Ethiopia	Laboratory audit and advice for improvement	TBS / FIBRE	12-17/04/2010
C.1.3.5	Expertise visit made to the Regional Laboratories in Zimbabwe and Uganda.	Laboratory audit and advice for improvement	TBS / FIBRE	26-31/08/2010
C.1.3.5	Expertise visit made to the Regional Laboratories in Zambia and Malawi.	Laboratory audit and advice for improvement	TBS / TCB	07-13/04/2011
C.1.3.5	Expertise visit made to the Regional Laboratories in Mozambique	Laboratory audit and advice for improvement	TBS / FIBRE	21-24/08/2011

The aim of the visits is to give expertise and advice to regional laboratories for quality improvement of test results produced by a particular laboratory. The expertise was for instrument service, documentation, ambient air management system, temperature/humidity recorders, testing room set-up etc.

A laboratory questionnaire and country report form were prepared by experts and used to evaluate a number of aspects in the laboratory including personnel skills. The country report

form was used to collect country information with regard to cotton industry development in a particular country including establishment of cotton regulatory body, if any.

Detailed laboratory reports were written based on the questionnaires and audits, giving useful recommendations for improvements. The reports indicated that several regional laboratories were in need of rehabilitation of their conditioning systems so as to be in line with international requirements for cotton conditioning at 21±1ºC and 65±2% in order to achieve the reliable test results.

The collection and dissemination of information

The RTC has to collect relevant technical information with regard to cotton from different sources worldwide and disseminate them to the regional cotton testing laboratories and other stakeholders through e-mails for better improvement of cotton industry in the region. In addition to this, the www.csitc.org was launched where technical information e.g. presentation papers and guidelines like ITMF Guidelines are uploaded so as to be accessible to other laboratories.

The aim of this activity was to enable regional laboratories to get the latest information without depending only at information provided at conferences, workshops or in magazines. Also, through this activity laboratories were supposed to get technical assistance from RTCs in terms of advice.

In order to accomplish this activity the following methods were used: e-mails, brochures and websites with helpful information on cotton, The most frequently used were for example www.csitc.org, www.icac.org and www.africancotton.net.

In most cases the information flow was one way direction from RTC East/Southern Africa. Few laboratories like COTTCO-Zimbabwe, CoDA-Kenya, IAM-Mozambique, TCB-Tanzania and CDO-Uganda used effectively the centre by requesting a lot of information regarding improvement of their testing laboratories. All mentioned laboratories were in the process of improving their testing environment like COTTCO-Zimbabwe was looking for a suitable compressor, CoDA was in the process of floating tender for installation of Ambient Air Management System (AAMS) so they were seeking advice on the specification for proper AAMS same as TCB-Tanzania, CDO-Uganda and IAM-Mozambique.

The target as per CFC/ICAC/33 Cotton Project was to serve eight countries namely; Tanzania, Uganda, Kenya, Sudan, Malawi, Zambia, Zimbabwe and Mozambique. So from this experience we can say this activity was achieved to almost 90%.

Annexes

Annex A: Premier service training at the RTC-East (see extra document)

Annex B: Uster service training at the RTC-East (see extra document)

6
Cotton testing in West and Central Africa

6.1 Summary of the project implementation results

Author: **Mamadou Togola**

Organization: CERFITEX, Ségou, Mali

Introduction

Cotton is the largest source of export earnings for many African countries. The cotton sector thus makes a critical contribution to rural poverty reduction, with cotton-related activities accounting for a major share of rural employment.

Instrument based cotton classing is one of the key determinants in promoting cotton on the world market. Although well recognized for its good quality, African cotton is "undervalued" because of its lack of a thorough characterization when it is placed on the international market.

The current method for evaluating the quality of cotton fiber in Africa is based on a manual and visual inspection. This method of evaluation, still used in African cotton companies even though most of their production is destined for export, is finding itself less and less in tune with demand from end users of cotton fibers.

To enable African countries to strengthen their position on the world market, and at the request of these countries, the International Cotton Advisory Committee (ICAC) launched the CFC/ICAC/33 Project on Commercial Standardization of Instrument Testing of Cotton for African Cotton Producing Countries.

The seminar launching the project took place on May 8, 2008 in Bamako in the presence of political officials, technical and financial partners, representatives of cotton companies, and manufacturers.

Project Objectives

The objectives of this project, co-funded by the Common Fund for Commodities (CFC) and the European Union (EU), under ICAC supervision, were to:

- Make the international cotton trade more equitable by establishing a reliable system for instrument testing of cotton, accepted by all cotton producing countries.
- Provide necessary technical and material assistance to the cotton testing laboratories of African cotton companies so they can satisfy international criteria with respect to analysis of cotton quality.

Conclusion

The CFC/ICAC/33 Project on Commercial Standardization of Instrument Testing of Cotton for African Cotton Producing Countries has been of great importance to the cotton sector of the region in as much as it has helped strengthen and harmonize instrument testing of African cotton.

The Regional Technical Center, an outgrowth of project implementation, has greatly contributed to upgrading and improving the analytical capacities of cotton company laboratories and research centers for varietal improvement.

Cotton sector stakeholders in the subregion have expressed particular interest in supporting the activities of the Regional Technical Center but, in the face of certain constraints, it will take some time to further inform them and raise their awareness to a higher degree so they will be inclined to make the decision to subscribe more fully to the activities of the West and Central Africa Regional Technical Center for Instrument Based Cotton Classing (Centre Technique Régional de Classement Instrumental de Coton d'Afrique de l'Ouest et du Centre: **CTRCIC-AOC**)

To reach the stated objectives, it is thus essential that cotton sector stakeholders in the region participate in the activities of the CTRCIC-AOC to ensure its sustainability at project completion.

Annexes:

Chapter 6 is only an extract for the Technical Report. The full report from The Regional Technical Center is given in Annex A (French) and Annex B (English)

Annex A: Rapport de résultat du Projet V2 (See extra document)

Annex B: Report of the project results (See extra document)

6.2 Seminar to launch the CFC/ICAC/33 Project in West and Central Africa

Author: **Mamadou Togola**

Organization: CERFITEX, Ségou, Mali

One of the major steps in implementing the CFC/ICAC/33 Project in West and Central Africa was the project kick-off seminar, which took place on May 8, 2008 at Hôtel Salam in Bamako.

The objective of this seminar, which drew broad participation from cotton sector stakeholders of the West and Central Africa region, was to provide the project's technical and financial partners with the opportunity to emphasize the importance of the project for Africa as a whole.

The seminar drew broad participation from representatives of cotton companies in West and Central Africa.

The proceedings were led by Mr. Tiéna Coulibaly representing the Office of the Prime Minister, assisted by the representative of WACIP and CFC.

6.3 Creation of the Regional Technical Centers

Author: **Mamadou Togola**

Organization: CERFITEX, Ségou, Mali

One of the significant outcomes of this project is the creation of two regional technical centers for instrument based cotton classing in Africa. The mission of these entities is to serve as regional technical centers for instrument based cotton classing in Africa.

- The Regional Technical Center of West and Central Africa created within the Research and Training Center for the Textile Industry (*Centre de Recherche et de Formation pour l'Industrie Textile*: CERFITEX), located in Ségou, Mali, in connection with the Burkina Faso Textile Fiber Company (*Société Burkinabé des Fibres Textiles*: SOFITEX), for the West and Central Africa region.

This RTC covers the following cotton producing countries: Benin, Burkina Faso, Cameroon, Chad, Côte d'Ivoire, Ghana, Mali, Nigeria, Togo, and Senegal.

- The Regional Technical Center of East and Southern Africa created within the Tanzania Bureau of Standards (TBS), located in Dar es Salaam, in connection with the Tanzania Cotton Board (TCB), for the East and Southern Africa region. The countries covered by this center are: Ethiopia, Kenya, Malawi, Mozambique, Sudan, Tanzania, Uganda, Zambia, and Zimbabwe.

Objectives of the Regional Technical Centers

The objectives of the Regional Technical Centers were to:

- Provide necessary **technical and material assistance** to the cotton classing laboratories of African cotton companies in order to:
  - Help them adopt and implement international criteria regarding the analysis of cotton quality,

    - Enable them to satisfy these criteria, thus ensuring successful promotion of cotton fiber,
- Carry out **the mission of Standard Regional Technical Centers** in order to:
    - Assist cotton classing laboratories in making the gradual and irreversible transition from traditional classing to instrument based classing,
    - More effectively promote African cotton on the world market.

The inauguration of the West and Central Africa Regional Technical Center for Instrument Based Cotton Classing (Centre Technique Régional de Classement Instrumental de Coton d'Afrique de l'Ouest et du Centre: CTRCIC-AOC) was held on June 3, 2010 in the presence of the representative of the Government of Mali, administrative and political authorities of the Ségou region, the managing directors and commercial managers of all the cotton companies of West and Central Africa, representatives of cotton producer associations, and the project's technical and financial partners (CFC, EU, ICAC, CIRAD, COTIMES Afrique, WACIP, etc.).

Results

The CFC/ICAC/33 Project has achieved a number of results, including the following:

- Training of experts, directors and managers of cotton classing laboratories, SITC operators, and various cotton industry stakeholders (cotton producers and commercial managers of cotton companies),
- Development of cotton classing laboratory management procedures,
- Strengthening of interregional cooperation by organizing exchange visits between the West and Central Africa Regional Technical Center for Instrument Based Cotton Classing and the East and Southern Africa Regional Technical Center for Instrument Based Cotton Classing,
- Performance of verification testing and inter-laboratory testing and participation in the Bremen and CSITC Round Trials,
- Analysis of samples for cotton companies,
- Expert appraisal of cotton classing laboratories of West and Central Africa,
- Development and transmittal through ACA of draft agreements for collaboration to all the cotton companies targeted by the project,
- Collection and dissemination of technical information on the prerequisites of instrument testing by SITC on (www.csitc.org),
- Stimulation of cooperation between partners from different countries of the subregion,
- Awareness-raising for industry stakeholders concerning the complexity of classing cotton fibers,
- Study of intra-bale variability.

Conclusion

The main objective of the project for Africa was accomplished by creating two Regional Technical Centers. These two centers are fully operational. The experts of the Regional Technical Centers have been trained intensively and are carrying out the designated functions in each RTC. The staff of the cotton classing laboratories of cotton companies, commercial managers, and cotton producers have also been trained in the analysis and classification of cotton through Integrated Testing Lines (SITC / in French: *Chaînes de Mesures Intégrées*: SITC) and in utilization of the results of instrument based classing in the cotton trade.

6.4 Cotton testing laboratories of the West and Central Africa region

Author: **Mamadou Togola**

Organization: CERFITEX, Ségou, Mali

Pinpointing all the entities responsible for analyzing cotton quality was the first step in preparing the list of relevant analytical laboratories. This activity was performed by CTRCIC-AOC in order to obtain maximum support in all the countries of the region during project implementation.

To prepare the cotton analysis laboratories of the region that need to satisfy the quality criteria for cotton testing, support for the installation of appropriate equipment was necessary (SITC not included). This support made it possible to bring certain laboratories of the region up to a more or less acceptable level.

To offer this essential support, the following steps were required:

- Questionnaire to assess the operational capacities of laboratories
- Audit of laboratories interested in instrument based analysis of cotton
- Recommendations for satisfying CSITC criteria
- Estimate of the material and financial support required
- Direct material support for necessary investments at laboratories
- Verification of completion of the necessary changes

Objectives

The stated objectives were to:

- Pinpoint all the entities responsible for analyzing cotton quality
- Prepare the cotton analysis laboratories of the region that need to satisfy the quality criteria for cotton testing
- Improve their cotton analysis capacities

Results

It was noted that, without major investments, some laboratories of the region would be unable to participate in some of the main activities of CTRCIC-AOC (regional inter-laboratory testing, re-testing, implementation of HVI testing procedures in controlled conditions, etc.) for lack of adequate infrastructure and equipment.

Conclusion

The provision of systems for measuring air temperature and humidity and for standard cotton testing in some cases and expert appraisal of air conditioning systems in other cases failed to produce the desired solutions.

However, a collection of addresses of the cotton companies of West and Central Africa was compiled (see Annex 1).

6.5 Structure and legal organization of the CTRCIC-AOC

Author: **Mamadou Togola**

Organization: CERFITEX, Ségou, Mali

Preparation of the structural and legal framework of CTRCIC-AOC is intended to meet the criteria for Commercial Standardization of Instrument Testing of Cotton (CSITC) in African cotton producing countries and ensure the system's sustainability after project completion.

Under the authority of the President of the African Cotton Association (ACA), a meeting of chief classers of West and Central African cotton companies, members of the "metrology and classing commission" of ACA, and CERFITEX took place in Bamako on February 17-18, 2012.

Table 6-1: Table of participants at the Bamako workshop

Participant	Company
Moumine Traoré	CERFITEX, Segou
Joel Ky	SOFITEX, Burkina Faso
Idy Ka	SODEFITEX, Senegal
Boubacar Traoré	CMDT-OCC S.A., Mali
Alidou Amadou Soule	AIC, Benin
Camile Madale	SODECOTON, Cameroun
Lucien Tcalla	NSTC, Togo
Franck Alou	CIDT, Côte d'Ivoire

This meeting was organized in order to prepare a draft agreement on collaboration between CERFITEX and ACA for the continuation, by CERFITEX, of the main activities of the West and Central Africa Regional Technical Center for Instrument Based Cotton Classing (*Centre Technique Régional de Classement Instrumental de Coton d'Afrique de l'Ouest et du Centre*: CTRCIC-AOC) of the CFC/ICAC/33 Project, as a standard technical center for the region, and to propose training modules to meet the needs of the respective cotton units.

After a thorough debate, the participants agreed to develop:

- A memorandum of understanding between CERFITEX and ACA;
- A collaboration agreement between CERFITEX and the cotton companies;
- Training modules.

At the close of the proceedings, the meeting participants:

- Adopted, after review and amendment, a final draft of the collaboration agreement between CERFITEX and the cotton companies;
- Reviewed and adopted training modules.

Objectives:

The meeting objectives were to:

- Develop a draft memorandum of understanding between CERFITEX and ACA;
- Develop a draft agreement between CERFITEX and the cotton companies to:
    - Ensure the post-Project future of CTRCIC-AOC through an arrangement negotiated with the cotton companies;

- Satisfy all individual or collective requests for services related to the mission assigned to CTR by the Project;
- Develop and adopt training modules that meet the needs of cotton units.

Results

At the end of the meeting, the following were developed:

- A memorandum of understanding between CERFITEX and ACA;
- A collaboration agreement between CERFITEX and the cotton companies;
- Training modules (See Annexes 3 and 4: CERFITEX-ACA Memorandum of Understanding, CERFITEX-Cotton Companies Collaboration Agreement).

Conclusion

The final documents (a draft memorandum of understanding between CERFITEX and ACA; a draft agreement between CERFITEX and the cotton companies; training modules to meet the needs of cotton units) elaborated after a thorough debate were then submitted for assessment by the President of ACA and will be signed by him at the next ACA meeting in Zimbabwe in March 2012.

Further to these decisions Dr. Moumine Traoré has shown how important the sustainability of the RTC is to be taken as cited from the following text:

"I would like to inform you that since April 2012, we have relaunched the ACA through Mr. Fahala Adéyèmi about the Memorandum of Understanding between ACA and CERFITEX and those between CERFITEX and the Cotton Companies.

On Mr. Ahmed Bashir Diop and Mr Tiéna Coulibaly's proposal, we asked Mr. Fahala to show and explain the various documents to President Mohamed Iya in the aim of accelerating the signing of this MoU which is a strong call for cotton companies to sign their MoUs with CERFITEX.

We were in this respect reassured of the support of these different partners, mainly the President Tiéna Coulibaly who committed to follow up the case at the Presidency of ACA before his nomination as Minister of Finance of Mali

For our part we feel important that the CERFITEX-ACA MoU be first signed before going to the MoUs between CERFITEX and the Cotton Companies, in order to avoid any failure.

Dr. TRAORE Moumine

Director General of CERFITEX"

Annexes:

Annex A: Protocole d'accord ACA-CERFITEX (see extra document) French

Annex B CONVENTION DE COLLABORATION CERFITEX Soc. Cotonnières modèle C (see extra document) French

Annex: C: PROCEDURES (see extra document) French

Annex: D: Consultancy report of the external consultant (see extra document) English

6.6 Regional Technical Center facilities and equipment

Author: **Mamadou Togola**

Organization: CERFITEX, Ségou, Mali

Facilities and equipment

To give the Regional Technical Center the very best chance of success, CERFITEX built a laboratory that meets the recommendations of the WAEMU and UNIDO quality program, and, as a contribution, made it available to the CFC/ICAC/33 Project.

The Regional Technical Center's instrument based classing laboratory is operational and offers the possibility of installing four other Integrated Testing Lines. It is outfitted by the CFC/ICAC/33 Project with the following equipment:

- An Uster HVI 1000 M700 Integrated Testing Line for analyzing samples collected in connection with the intra-bale variability study, coming from cotton companies and research centers for varietal improvement.
- Five shelves measuring 2.85 m in length x 1 m in depth x 1.75m in height are used for spreading out and conditioning the cotton samples before they enter the Uster HVI 1000 M700 Integrated Testing Line.
- The laboratory's air conditioning system composed of an Airwell-type refrigerated unit, an air-handling unit, and accessories to ensure air conditioning of the laboratory 24 hours a day. It has four air intakes or vent ducts and two outtakes.
- One air compressor with a capacity of roughly 10 m^3 air/hour supplies the laboratory equipment with compressed air.
- An array consisting of five temperature and humidity recorders, Testo-type base for continuous recording of temperature and humidity in the classing room. The data from these recordings are stored on an office computer.
- A set of standard cotton boxes are used to calibrate the Uster HVI 1000 M700 Integrated Testing Line.
- Computer equipment with an internet connection (a portable computer, an office computer, a printer, office supplies, etc.) is used to support the work carried out in implementing the project activities.

- One cotton fiber homogenizing or mixing machine for preparing cotton samples destined for inter-laboratory testing at the regional level.
- A Toyota Hilux 4x4 Double Cabin Truck was acquired on September 29, 2008. The double cabin and the truck's wide bed combine the advantages of comfortable travel and the capacity to transport more cotton samples.

Inauguration of the CTRCIC-AOC

Inauguration of the West and Central Africa Regional Technical Center for Instrument Based Cotton Classing (*Centre Technique Régional de Classement Instrumental de Coton d'Afrique de l'Ouest et du Centre*: CTRCIC-AOC) on June 3, 2010. This inauguration provided the opportunity to inform cotton producer associations, cotton companies, varietal research centers, political officials, textile industries, and technical and financial partners about the existence of the Regional Technical Center and how this Center can help improve the competitiveness of the cotton industry.

6.7 Training of experts

Author: **Mamadou Togola**

Organization: CERFITEX, Ségou, Mali

Objective:

The objective of the training of experts was to:

- Acquire necessary knowledge and skills from the project's technical partners
- Ensure a smoothly functioning CTRCIC-AOC, so as to achieve the project's main objective
- Ensure the quality of the analytical results and effective management of the CTRCIC-AOC laboratory

The training included English courses, training on production, ginning, sampling, traditional cotton classing, spinning and textile processes, utilization of the SITC, technical instruction concerning the SITC, utilization of SITC analytical results, laboratory management, technical criteria to be met in the laboratory, laboratory quality management, visual classing of leaf grade and extraneous matter, computer courses on document preparation, data bases, analyses, etc.

Result:

Two experts were trained at each Regional Technical Center (*Centre Technique Régional*: CTR) to ensure proper functioning of the CTRs and smooth implementation of the project. The expert of the project's host organization was assigned the task of bringing the laboratories and project management up to standard.

The experts received in-depth training from international organizations during the four years of the project's existence, as described below:

Training received in 2008

- TRAINING AT GDYNIA COTTON ASSOCIATION, GDANSK, POLAND
- TRAINING AT CIRAD IN FRANCE
- TRAINING AT FIBRE AND BREMER BAUMWOLLBÖRSE IN GERMANY
- TRAINING AT THE UNITED STATES DEPARTMENT OF AGRICULTURE, MEMPHIS, TENNESSEE USA
- TRAINING AT THE TEXAS INTERNATIONAL COTTON SCHOOL, LUBBOCK, USA
- TRAINING AT USTER TECHNOLOGIES-KNOXVILLE, USA
- TRAINING AT PREMIER, INDIA

Training received in 2009

- TRAINING AT CIRAD IN FRANCE
- TRAINING AT FIBRE-BREMEN IN GERMANY
- TRAINING AT THE UNITED STATES DEPARTMENT OF AGRICULTURE, MEMPHIS, TENNESSEE USA

Training received in 2010

- TRAINING AT CIRAD IN FRANCE
- TRAINING AT FIBRE-BREMEN IN GERMANY

Training received in 2011

In 2011, there was combined training of experts and technicians in their respective fields. The objective of these training activities was to enable the experts and technicians to acquire knowledge and skills from the Project's technical partners. The following activities took place:

- TRAINING AT PROCLIMA IN FRANCE
- TRAINING AT CIRAD IN FRANCE
- TRAINING AT FIBRE-BREMEN IN GERMANY
- TRAINING AT THE UNITED STATES DEPARTMENT OF AGRICULTURE, MEMPHIS, TENNESSEE USA
- TRAINING AT THE TEXAS INTERNATIONAL COTTON SCHOOL, USA

Training received in 2012

In 2012 thanks to the extension of the Project a trouble shooting training was held at Uster, Knoxville to pass over to the technicians the required knowledge in order to give 1st level support for problems incurred through the SITC

Conclusion

This important activity enabled CTRCIC-AOC experts to acquire the skills needed to perform their work. 14 training sessions already received by CTRCIC –AOC experts from partner international institutions of the CFC/ICAC/33 Project from 2008 to 2011.

Subsequent to their training, the experts have made use of regional training workshops to pass along the knowledge they acquired to cotton industry stakeholders in West and Central Africa. The following training activities have taken place.

6.8 Trainings for the region

Author: **Mamadou Togola**

Organization: CERFITEX, Ségou, Mali

Trainings for SITC Operators

Theoretical and practical training for SITC operators took place at CERFITEX, Ségou, Mali on December 22-26, 2008.

Objective

The objective of the training of two operators on the Uster HVI 1000 M1000 Integrated Testing Line of CERFITEX was to enable them to:

- Handle the HVI 1000 Line and conduct preventive maintenance operations
- Produce results consistent with international recommendations
- Detect SITC breakdowns and measurement errors

Training contents and program:
The theoretical training focused on the following:

- Information on the CFC/ICAC/33 Project
- Cotton and the technological characteristics of cotton fibers
- Laboratory organization, room requirements and conditioning
- Instrument based testing and measurement principles of Integrated Testing Lines (SITC)
- Factors influencing SITC results
- Inter-laboratory tests and re-testing

The practical training focused on SITC operating instruction, SITC calibration procedures, SITC results and SITC maintenance

Results:

Two operators trained in the analysis of samples from cotton companies and the analysis of samples used in the intra- and inter-bale variability study.

Conclusion:

One training session for operators/technicians were provided by experts in 2008 and four sessions in 2011 with international institutions.

Training of cotton classing laboratory staff

The laboratory staff of cotton companies (chief classers and laboratory officials) received training at least twice a year from CTRCIC-AOC experts.

Objective:

The objective of these training sessions was to transfer knowledge acquired from international partners to the laboratory staff of West and Central African cotton companies and to share experience related to implementation of the project activities.

Results:

The laboratory staff of West and Central African cotton companies acquired knowledge concerning instrument based cotton classing and laboratory management in their respective fields. 4 sessions were conducted

Conclusion

Four training sessions were conducted by Regional Technical Center experts.

The trainings of cotton stakeholders

This training was conducted by CTRCIC-AOC experts for cotton industry stakeholders (producers, commercial managers), with a focus on instrument testing, reliability of the analysis, and its impact on the cotton value chain.

Objective:

The objective of this training was to enable the beneficiaries (commercial managers, cotton producers, cotton companies, etc.) to grasp the following advantages:

- Marketing of cotton fiber based on the results of reliable and comparable testing,
- Reduction of discounts and claims due to unknown properties,
- Improvement of cotton market share for African countries,
- Test results utilized to advantage at all stages of the textile processing chain.

Results:

The beneficiaries (commercial managers, cotton producers, cotton companies, etc.) learned about the importance of instrument based classing as a tool for promoting cotton on the world market.

Conclusion

Two training sessions were conducted by Regional Technical Center experts.

6.9 Laboratory expertise

Author: **Mamadou Togola**

Organization: CERFITEX, Ségou, Mali

The experts visited the analytical laboratories to provide advice and expertise, covering all the technical aspects of cotton classing rooms (equipment, conditioning system, availability of calibration cotton, laboratory environmental control, etc.). These visits take place twice a year.

Objectives

The objectives targeted and achieved during these expert missions were to:

- Present the CSITC dynamic and the CFC/ICAC/33 Project,
- Conduct a quick overview of the region's laboratories,
- Record specific requests related to Regional Technical Center activities,
- Motivate laboratories to participate in CSITC inter-laboratory testing,
- Inform stakeholders of the existence of regional inter-laboratory testing, re-testing in the region and beyond,
- Announce the study of intra-bale variability of technological characteristics of cotton,
- Make recommendations, share experience, propose measures to be taken so laboratories will function properly, provide support and advice.

Results

Detailed expert reports were prepared each time *and made available solely to the experts and the cotton companies,* so as to respect the confidentiality of the information collected. Appropriate, customized responses were given to the laboratories.

Conclusion

More than ten expert appraisal missions were conducted in the cotton classing laboratories of West and Central Africa.

6.10 Regional Cooperation

Author: **Mamadou Togola**

Organization: CERFITEX, Ségou, Mali

- Periodic exchanges on implementation of CFC/ICA/33 Project activities with our partners of East and Southern Africa
- Drafting and transmittal of collaboration agreements with ACA and all the cotton companies targeted by the Project
- Transfer of knowledge between different regions and an annual exchange between experts from different regions
- This activity provided the opportunity to respond to the most frequently asked questions

6.11 **Participation in CSITC Round Trials**

Author: **Mamadou Togola**

Organization: CERFITEX, Ségou, Mali

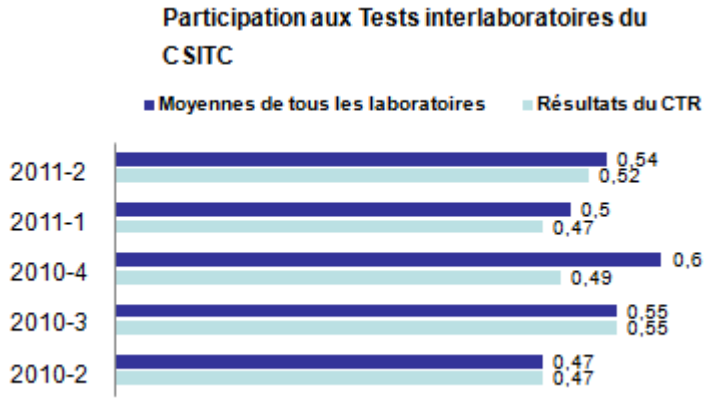
CTRCIC-AOC is participating in the CSITC Round Trials since 2010. In sum, it participated in 5 RoundTrials up to 2011-2

Results:

The results of the participation are indicated in the table below:

Your Instrument	Parameters Tested	Your Instrument No. in the Evaluation Sheets	Your Summary Evaluation of All Properties	Median Evaluation of all Instruments in this Round Trial
Uster HVI 1000 M700	Mic, Str, Len,Unf, Rd,+b	GL102-074-02	**0.47**	**0.47**
Uster HVI 1000 M700	Mic, Str, Len,Unf, Rd,+b	GL103-008-02	**0.55**	**0.55**
Uster HVI 1000 M700	Mic, Str, Len,Unf, Rd,+b	GL104-022-02	**0.49**	**0.60**
Uster HVI 1000 M700	Mic, Str, Len,Unf, Rd,+b	GL111-085-02	**0.47**	**0.50**
Uster HVI 1000 M700	Mic, Str, Len,Unf, Rd,+b	GL112-025-02	**0.52**	**0.54**

Results of participation in the CSITC Round Trials: These results clearly indicate the performance of the Regional Technical Center laboratory in the five inter-laboratory tests already conducted since 2010.



6.12 **Regional round trials**

Author: **Mamadou Togola**

Organization: CERFITEX, Ségou, Mali

Objective:

The objective of an inter-laboratory test is to examine the precision and accuracy of periodically reviewed laboratory results and to verify satisfactory performance. Regional inter-laboratory testing made it possible to draw comparisons based on cottons that are usually tested in the laboratories instead of cottons from other continents.

CTRCIC organized the inter-laboratory tests, starting with four inter-laboratory tests per year.

Results:

Variations in the results of the participating laboratories were insignificant. These tests were well received by the laboratories (see number of participating laboratories in the table below).

Your Instrument	Your Serial Number	Parameters Tested	Your Instrument No. in the Evaluation Sheets	Participating laboratories
Uster HVI 1000 M700	810110	Mic, Str, Len,Unf, Rd,+b	CSITC RTW 2010-1 RTC West	**5**
Uster HVI 1000 M700	810110	Mic, Str, Len,Unf, Rd,+b	CSITC RTW 2010-2 RTC West	**6**
Uster HVI 1000 M700	810110	Mic, Str, Len,Unf, Rd,+b	CSITC RTW 2010-3 RTC West	**7**
Uster HVI 1000 M700	810110	Mic, Str, Len,Unf, Rd,+b	CSITC RTW 2010-4 RTC West	**6**
Uster HVI 1000 M700	810110	Mic, Str, Len,Unf, Rd,+b	CSITC RTW 2011-1 RTC West	**6**
Uster HVI 1000 M700	810110	Mic, Str, Len,Unf, Rd,+b	CSITC RTW 2011-2 RTC West	**7**

Table 6-2: Participating instruments in the Inter laboratory tests

Conclusion:

6 inter-laboratory tests already conducted since 2010 on cottons produced in the region.

6.13 **Additional activities**

Author: **Mamadou Togola**

Organization: CERFITEX, Ségou, Mali

Verification tests or re-testing

Re-verification of testing is a way to monitor the daily performance of laboratories in the sub region and their capacity to produce precise and accurate test results within the context of their commercial activities.

This activity should be organized in addition to inter-laboratory testing. CTRCIC-AOC should re-test a predetermined proportion of samples tested by the laboratories in order to prove the reliability of their daily analyses. However, this activity could not be carried out because of numerous constraints (timely transport of samples from the cotton classing rooms to the CTRCIC-AOC laboratory, lack of a conditioning system in certain laboratories, etc.). Nevertheless, procedures were developed by the experts for this purpose (see 6.1 Annex C).

Analysis of samples for cotton companies

- 3,934 cotton samples already analyzed for cotton companies, as follows:
  - 885 samples for SOFITEX in 2010,
  - 1,007 samples for CMDT in 2011,
  - 2,042 samples for CMDT from January 5, 2012 until now.

Study in progress concerning the intra-bale variability of technological characteristics of cotton fibers

- *17,091 cotton samples* already tested at the Regional Technical Center, as follows:
  - 9,952 samples in 2009,
  - 6,047 samples in 2010,
  - 1,092 samples in 2011.

Capacity building: Gathering and dissemination of technical information

Exchanges of technical information: All technical information related to the activities carried out under the CFC/ICAC/33 Project is available at www.csitc.org.

Services offered to cotton companies

In addition to actions aimed at building the technical capacities of the laboratories of the region's cotton companies, the latter can benefit from the following specific support:

- Support services from CTRCIC-AOC as part of an approach to validate the results of traditional (manual and visual) classing, and
- Monitoring of ginning operations.

Since the stated objective of most of the cotton companies is to move gradually toward classing 5 to 10 percent of production through instrument testing, CTRCIC-AOC will serve as a back-up structure. As such, the Center offers the following services:

- Training of laboratory staff of West and Central African cotton companies, all categories: 4 sessions per year
- Training of cotton industry stakeholders: 2 sessions per year

- Laboratory expert appraisals: 10 expert appraisal missions to be conducted per year in the cotton classing laboratories of West and Central Africa
- Commercial classing of cotton for cotton companies with the potential to analyze more than 60,000 samples per year
- Verification tests (re-testing) with the potential to analyze more than 17,000 samples per year

The conditions for delivering these services are set forth in the future collaboration agreement. The framework for this collaboration will be determined by mutual agreement with ACA and the partner cotton companies of the West and Central Africa Regional Technical Center.

6.14 Summary table

Author: **Mamadou Togola**

Organization: CERFITEX, Ségou, Mali

Table 6-3 Results of CFC/ICAC/33 Project Implementation in West and Central Africa

Results	Responsible Entity	Beneficiaries
1. Laboratory construction Construction of a new referral laboratory for instrument based classing of cotton	CERFITEX	Cotton industry stakeholders (cotton companies, varietal improvement research stations, textile businesses, etc.)
2. Staff An 8-person team was formed and made available to the Project	CERFITEX	CFC/ICAC/33 Project
3. Equipment Equipment for the referral laboratory (Uster HVI 1000 M700 Integrated Testing Line, air conditioning system, five devices for measuring and controlling temperature and humidity, cotton homogenizing unit, computer equipment)	CFC/ICAC/33 Project	Cotton industry stakeholders (cotton companies, varietal improvement research stations, textile businesses, etc.)
4. Training activities Training of: ▶ 2 experts from 2008 until now ▶ 2 Integrated Testing Line (CMI) operators in 2008 ▶ 2 laboratory technicians in the instrument based classing of cotton ▶ 25 chief classers from cotton classing laboratories (8 chief classers in 2009 and 17 chief classers in 2010) ▶ 32 classing laboratory managers (12 managers in 2009 and 20 in 2010)	CFC/ICAC/33 Project	Staff of cotton fiber marketing companies, gin operators, and producers

Results	Responsible Entity	Beneficiaries
▶ 15 cotton industry stakeholders (10 producers in 2009 and 5 commercial managers of cotton companies in 2010)		
5. Expert appraisal of classing laboratories Expert appraisal of 10 West and Central African cotton classing laboratories from 2008 to 2010	CFC/ICAC/33 Project	Laboratories of cotton companies
6. Inter-laboratory tests Participation in 7 CTRCIC-AOC Regional Round Trials, 9 Bremen Round Trials, and 10 CSITC Round Trials	CFC/ICAC/33 Project	Laboratories of cotton companies
7. Organization of inter-laboratory tests at the regional level Organization of inter-laboratory tests at the regional level: in effect since 2009 (7 Round Trials already conducted)	CFC/ICAC/33 Project	Laboratories of cotton companies
8. Organization of verification tests Organization of verification tests or re-testing (activity started late 2009, 200 samples tested)	CFC/ICAC/33 Project	Laboratories of cotton companies
9. Analysis of samples Analysis of 2,223 samples for cotton companies (885 for SOFITEX in 2010 and 1,338 for CMDT in 2011)	CFC/ICAC/33 Project	Cotton companies
10. Support for laboratories ▶ Four boxes of calibration cotton for length/tenacity and micronaire made available to the laboratories of Sonapra/AIC (Benin), CMDT-OCC (Mali), Sodefitex (Senegal), and NSCT (Togo) ▶ Five laboratories equipped with devices to measure and control temperature and humidity	CFC/ICAC/33 Project	Laboratories of cotton companies
11. Inter-regional cooperation Organization of 6 exchange meetings between CTRCIC-West and Central Africa and CTRCIC-East and Southern Africa	CFC/ICAC/33 Project	Regional Technical Centers
12. Study of variability Study of intra-bale variability (17,091 samples tested: 9,952 in 2009, 6,047 in 2010, and 1,092 in 2011)	CFC/ICAC/33 Project	Cotton companies
13. Collaboration agreements ▶ Signing of the collaboration agreement with Sodefitex (Senegal) ▶ Development and transmittal through ACA of draft agreements for collaboration to all the cotton companies targeted by the project	CERFITEX / SOFITEX	Cotton companies

7
Cotton testing in Africa: Other regions / Extra Fine Cotton Round Trials

Author: **Axel Drieling**

Organization**:** Faserinstitut Bremen e.V. (FIBRE), Bremen, Germany

Summary

Regional Technical Centers (RTCs) have been installed in Mali for the West/Central African region and in Tanzania for the Eastern/Southern African region. Nevertheless, it is not possible to cover the whole of Africa with these two RTCs. For this reason, activities were considered for those countries, where the full RTC support could not be given. Additionally, most of Africa is producing Upland type cotton (gossypium hirsutum), and cotton testing is strongly depending on the type of cotton. Hence, extra fine cottons (gossypium barbadense), produced in Egypt and Sudan, were one focus of these additional activities.

Round Trials on extra fine cotton samples

As testing, calibration and measurement uncertainties differ from Upland type and extra fine cottons, it is not possible to include extra fine cotton samples in the CSITC Round Trials or the RTC regional round trials. Hence, specific extra fine cotton round trials were started and conducted in the project, fully independently from the CSITC Round Trials, but with comparable prerequisites. The aim was to support cotton testing in the extra fine production in Egypt and Sudan.

From 2009 to 2011, in sum six Extra Fine Round Trials (XFRT) with 24 samples have been conducted, solely basing on gossypium barbadense samples (from Egypt, Sudan, USA, Spain). Up to 12 participants were given from Egypt, Sudan, project partners and from some non-African extra fine cotton producing countries. In average, 10 instruments participated per round trial.

In contrary to the CSITC Round Trials, laboratories were asked to calibrate with the typical calibration for extra fine cottons: HVICCS Upland Short/Weak and HVICCS Pima Long/Strong calibration standards. Other prerequisites like 30 tests per sample on 5 days were kept similar to the CSITC Round Trials. With the given manual data entry, only the sample

result averages were evaluated, so that result variations between instruments could be evaluated solely based on the given averages, but not on the single data.

The results of the round trials are given in Table 7-1, described as standard deviations between instruments based each on the average of 30 tests per sample. In comparison, the related results for Upland samples from the CSITC Round Trials are given.

Although the results cannot be directly compared by reason of the different prerequisites (different laboratories, different samples and sample preparation), the first analysis shows only a slight increase in inter-instrument result variation despite the typically higher variation of the test data. This is, as a first estimate, caused in the high number of tests per sample.

Table 7-1: Inter-instrument standard deviations for Upland- (based on the CSITC RT) and extra fine samples (based on the XFRT)

Property / Parameter	**US Upland SD inter-instrument (30)**	**Extra Fine SD inter-instrument (30)**
Micronaire	0.07	0.08
Strength, g/tex	1.06	1.2
UHML, Inches	0.012	0.013
Uniformity Index	0.53	0.71
Color Rd	1.09	1.07
Color +b	0.37	0.42

Future prospects:

With the end of the project, the extra fine round trials were stopped. Several laboratories explained their interest in continuing these round trials based on participation fees. The CSITC Round Trial database (see chapter 3) allows including additional round trials like the extra fine round trials. Using this, more information can be obtained from the round tests and given to the laboratories, and the procedures will be aligned to those of the CSITC Round Trials.

Other activities for other regions

Besides the extra fine round trials, several other activities have been conducted for the countries that are not directly covered by the Regional Technical Centers:

- The laboratories in Egypt and Sudan were visited for expertise by FIBRE
- The laboratories were included in the trainings conducted in the RTCs
- Re-tests were conducted for one laboratory that explained interest
- Technical information was provided and is available on csitc.org

Additionally five meetings were conducted for coordinating between the activities of the regional technical centers and the other countries.

8
Technical developments for instrument testing

8.1 Cotton test method

Authors: **Axel Drieling (1) / Jean-Paul Gourlot (2)**

Organizations: (1) Faserinstitut Bremen e.V. (FIBRE), Bremen, Germany
(2) CIRAD, UPR SCA, F-34398, Montpellier, France

Summary

For standardized instrument testing of cotton it is necessary to have

a) a defined test method, which is given with ASTM D5867 in its latest version,

b) suitable best practice information in addition to the test method, which will be covered in this chapter,

c) valid calibration material, which is given with the Universal Calibration Materials provided by USDA-AMS,

d) suitable inter-laboratory comparisons, which are given with the newly installed CSITC Round Trials.

The best practice information should contain all relevant recommendations for testing and harmonised test results including sampling, calibration, testing conditions and testing. It should be based on the ASTM Standard Test Method as well as given guidelines and latest findings, and should combine this knowledge into one comprehensive guideline, valid for all commercially testing laboratories.

As part of the CFC/ICAC/33 project, an according guideline, the

Guideline for Standardized Instrument Testing of Cotton (CSITC Guideline)

was created under the auspices of and approved by

- the ICAC Task Force on Commercial Standardization of Instrument Testing of Cotton (CSITC Task Force) on March 21, 2012, in Bremen, Germany

- the ITMF International Committee on Cotton Testing Methods (ICCTM) on March 20, 2012, in Bremen, Germany

The guideline is currently translated to all ICAC languages (Arab, English, French, Russian, Spanish) as well as Chinese, and is published by ITMF as well as ICAC. The latest version is always available via www.icac.org, www.itmf.org and www.csitc.org websites.

For being short and comprehensive and at the same time giving full information, the Guideline is given in two versions. Whereas the long version (44 pages) is giving all information, requirements and recommendations, the short version (18 pages) is reduced to the minimum requirements.

Editors and contributors

The guideline was edited by:

- Axel Drieling, Faserinstitut Bremen e.V. (FIBRE) / ICA Bremen, Bremen, Germany
- Jean-Paul Gourlot, CIRAD-LTC, Montpellier, France
- James Knowlton, USDA-AMS, Memphis, TN, USA

Additional contributors to the text were:

- Lawrance Hunter, CSIR and Nelson Mandela Metropolitan University, Port Elizabeth, South Africa
- Philipp Lehne, Faserinstitut Bremen e.V. (FIBRE), Bremen, Germany
- Andrew Macdonald, AMCON Consulting, Sao Paulo, Brazil
- Greg Parle, Auscott, Sydney, Australia
- Mona Qaud, Rieter, Switzerland / ITMF ICCTM HVI Working Group
- Anja Schleth, Uster Technologies Inc., Knoxville, TN, USA
- Ralph Schulzé, Consultant, Narrabri, Australia
- René van der Sluijs, CSIRO, Materials,Science and Engineering, Geelong, Australia
- V. Srinivasan, Premier Evolvics, Coimbatore, India

Sources

The guideline is based on

- ASTM D5867 in its current version (2005) as well as its draft for a modified version (2011)
- The ITMF Standard Procedures for HVI Calibration and Operation for Testing Cotton (HVI User Guide), version 2001 – this guideline will be replaced by the CSITC Guideline
- The USDA-AMS: Guidelines for HVI Testing, version June 2005 – this guideline is possibly being replaced by the CSITC Guideline, too
- Instrument manufacturers' guides
- Additional test related information
- Findings from the CFC/ICAC/33 project – technical developments for instrument testing.

Content

Currently the Guideline is including the following chapters:

- Preamble; Introduction; Acknowledgements
- Necessary Basic Documents; Definitions; CSITC Requirements for Cotton Testing
- Sampling
- Laboratory Environment, including Electrical, Compressed air, Space
- Atmospheric Conditions / Conditioning, including Standard Temperature, Standard Humidity and Monitoring/Recording, Building / Laboratory Design, Ambient Air Management System and its Design, Passive Conditioning of the Samples, Rapid or Active Conditioning of the Samples, Instrument Correction for Moisture
- Sample Handling in the Laboratory
- Standardized Instruments for Testing of Cotton (SITC), including General Aspects, Instrument Preparation / Maintenance, Operation / Testing with the Micronaire Module, Length/Strength Module, Color/Trash Module
- Calibration, including Calibration Standards, Internal Check Material, Calibration / Calibration Check
- Variability of Data / Measurement Uncertainty
- Round Trials / Reproducibility Check
- Data Recording / Reporting / Export
- Commercial Use of the Data
- Personnel
- Laboratory Management

With these chapters, already now topics are included, which were not addressed in previous guides. Examples for this are i.a. recommendations for a laboratory construction/installation. With the continuous updates, additional topics like other cotton testing instruments will be added.

Discussion / Conclusions

The CSITC Guideline is approved by both international cotton testing related organizations, CSITC Task Force and ITMF ICCTM. With the inclusion of the CSITC Task Force as well as the ITMF ICCTM and USDA-AMS, a worldwide utilization can be attained. A continuous update will assure its usability in future.

The Guideline is currently used to create a cotton testing specific ICA Bremen Certification, assuring that certified laboratories will fulfill all testing requirements.

Literature / Publications during the project time

DRIELING A., GOURLOT J.-P. and KNOWLTON J., Scientific Editors, 2012, Guideline for Commercial Standardized Instrument Testing of Cotton, Version 1.1, ICAC Task Force on Commercial Standardization of Instrument Testing of Cotton and ITMF International Committee on Cotton Testing Methods, Short version, www.icac.org, www.itmf.org and www.csitc.org websites

DRIELING A., GOURLOT J.-P. and KNOWLTON J., Scientific Editors, 2012, Guideline for Commercial Standardized Instrument Testing of Cotton, Version 1.1, ICAC Task Force on Commercial Standardization of Instrument Testing of Cotton and ITMF International Committee on Cotton Testing Methods, Long version, www.icac.org, www.itmf.org and www.csitc.org websites

Annexes

Annex A: DRIELING A., GOURLOT J.-P. and KNOWLTON J., Scientific Editors, 2012, Guideline for Commercial Standardized Instrument Testing of Cotton, Version 1.1, ICAC Task Force on Commercial Standardization of Instrument Testing of Cotton and ITMF International Committee on Cotton Testing Methods, Short version, (see extra document)

Annex B: DRIELING A., GOURLOT J.-P. and KNOWLTON J., Scientific Editors, 2012, Guideline for Commercial Standardized Instrument Testing of Cotton, Version 1.1, ICAC Task Force on Commercial Standardization of Instrument Testing of Cotton and ITMF International Committee on Cotton Testing Methods, Long version, (see extra document)

8.2 **Improvement of SITC testing (Basic study)**

Author: **Axel Drieling**

Organization: Faserinstitut Bremen e.V. (FIBRE), Bremen, Germany

Summary

The basic development of SITC instruments is belonging to the instrument manufacturers, so any activities in direct improvements in instrument technology were excluded from this project. Nevertheless, the instrument is the center of instrument testing, and hence most improvements in test result reliability are located close to the instrument.

Aims

Currently the SITC is just an independent tool, and several other, independent steps have to be taken in order to assure reliable data. In contrast to this, many instrument operators are only looking at the instrument and not on the overall quality requirements. Hence, integration of quality related steps into the instrument should allow for improvements of the data reliability. Already now some steps are included in some instrument types.

Findings

Generally, the instrument's software, which is currently solely regarding the instrument operation, should be complemented by a System Quality Tool (SQT). This tool should be including quality related steps as mentioned below. The total tool should be optional, and every single step should be optional, too, as well as all settings should be free for choice, based on reasonable defaults. If it cannot be adapted to the specific purposes of the single laboratories, it will not be used. The SQT should be active prior to testing as well as parallel to testing.

The instruments are subject to seasonal/annual service and several maintenance steps. Proposition: The SQT should document these steps, should notice the time and the number of tests since the last maintenance/service, and should, with starting its daily operation or testing on a set of samples, warn the operator prior to testing. Examples are:

- Service interval: inform about the date for the next service.
- Maintenance: document maintenance steps.
- Warn on replacement of wearing parts (like light bulbs for color testing).
- Cleaning: instruct on emptying the waste-box prior to the first test on each day, or after a fixed number of tests.
- Balance check: instruct on checking the balance with a fixed balance weight prior to testing.
- Color/trash window: recommendation for a check with a white paper in a fixed period.

Currently several sensors are given for checking the system. The number of sensors could be widened for e.g. checking typical problematic instrument locations, like clean strength clamps and L/S system optics, or the pressure during brushing.

An extremely important aspect for testing is the temperature/humidity of the laboratory, and based on this, the moisture content of the conditioned samples. New SITC instruments include a moisture measurement device. When exceeding the allowed sample moisture limits, the instrument should warn the operator and get approval for continued testing.

Temperature/humidity recording is usually done separately from the testing instrument, and it will be difficult to include it in the instrument. Nevertheless, the instrument should either

contain a calibrated T/rH sensor (outside of the instrument, but in a reasonable distance to the testing area), or import the according data from a given T/rH monitoring system. With this, the operator should be warned as soon as the temperature or humidity is exceeding the allowed limits.

Instrument calibration is currently done in a separate software module, independently from testing. The SQT should monitor the temperature/ humidity/ moisture content during calibration, and alert the operator as soon as the actual conditions during testing deviate too far from the conditions during calibration.

The SQT should monitor the calibrations in order to check how often calibration constants had to be changed or if systematic changes are given with the time.

The SQT should include a database for the calibration checks on the given reference materials in order to check the stability of all test results over time (not only those that are calibrated with that material). For this, it would be advisable to switch to calibration checks in system testing mode instead of module testing mode.

The SQT could instruct to do single additional checktests with the calibration material during the testing day on random intervals, with an automated evaluation. This is e.g. done for quality management at the USDA-AMS laboratories.

For linking to external quality checks, the SQT could choose random samples for an external re-test, and store the data specifically for this purpose.

Discussions and Conclusions

For the laboratories it is important to consider all necessary steps for assuring reliable test results. With including some of these steps into the instrument, instrument manufacturers will be able to support this.

8.3 **Power supply (Technical development study)**

Author: **Jean-Paul Gourlot**

Organizations: CIRAD, UPR SCA, F-34398, Montpellier, France

Summary

One basic and key requirement for a laboratory is to access to a permanent, stable electricity supply to run its equipments. However, local electricity generators are often used in many locations, and these devices were mainly installed to produce power for ginning plants that require a lot of power, but not in specific requirements that are needed for laboratories and their equipments (instrument, conditioning systems, balances …). The aim is to form a basis for the development of a simple and universal system based on given technology to improve the reliability of the electricity supply for SITC instruments." […/…]

Aims

During expertise tours in the laboratories, it appeared clear that laboratories do not always benefit from a stable, permanent and safe power supply for their equipments.

Consequently, electric devices and or electronic boards can be / are damaged and laboratories have to face to higher maintenance costs and losses in operational capacities driving into delays for the classification of their productions.

The purpose of this activity is then to provide some practical advises to better set a proper power supply to laboratories.

Material and Methods

After giving some definition, a categorization of the possible electrical situations in which laboratories could live in was made. From this categorization, several paths of solutions were studied and exposed.

Results

In fact, four various situations were studied depending on the presence or absence of the grid and of power generators. For each of these situations, a electrical wiring schematic was designed as well as a sketch of events to perform in case of power failure in order to protect the installed electrical items (such as instruments, ambient air management systems, compressors, …)

Discussions and Conclusions

This information is good basis to install or to refurbish a laboratory for a better protection of the installed equipments in a classification laboratory. As first advice, taking care of the electrical assembly from its source is the best warranty that all the instruments and connected devices will not suffer from any electrical chock. As second advice, taking care on how the protection work together with the way the measuring devices should be stopped / restarted could insure a longer life for them. Finally, calculating all protection elements is to be done by experts in this domain to insure a safe use of the proposed assembly and of the sketch of events to stop / start connected items.

Literature

GOURLOT J-P., GALLET P. and PAYET L., 2010, Rapport "Activity D.1.2.: Development of a list of requirements for an integrated power supply system for laboratories", Project CFC/ICAC/33, 19 p.

Annexes

Annex A: Report_D-1-2_PowerSupply_V2 (see extra document)

8.4 Climate control (Technical development study)

Author: **Jean-Paul Gourlot**

Organizations: CIRAD, UPR SCA, F-34398, Montpellier, France

Summary

At each time we visit a lab, people are confident in the equipment they use for ambient air management while these equipments are not able to respect the basic rules/standards required for cotton testing. In fact, there are missing technical information describing what is and should be any laboratory system able to regulate both temperature and relative humidity in the air in the worldwide agreed tolerances.

This system is very complex while some traders can argue that they are able to make it easily, and at the final step, the laboratory is challenged for its results. To counter this, we wish to make a full description of the system with all its components including the regulations rules so that anyone will know what is necessary in his lab and know what to ask when a tender is launched for installing / improving a laboratory.

Aims

Expertise tours in the laboratories revealed some lack of hindsight when using their air management system. The basic standards required for cotton testing are sometimes not completely respected. Besides, the system is very complex and laboratories should be careful that their manufacturer does not miss any technical information about how to regulate both temperature and relative humidity of the air in approved tolerances. The purpose of this activity is then to provide a full description of the system with all its components including the regulations rules to laboratories.

In this activity, we focus on drawing up a list of technical requirements and recommendations in order to help recognising the classing laboratories using SITC at the international level in terms of air management.

Material and Methods

A definition of the targeted conditions is given as well as some theory to explain the difficulty to maintain normal ambient conditions in laboratories.

We then give a list of specific requirements that must be fulfilled to respect standards dealing with textiles testing. Additional experiments must be carried on by the laboratories to check that every requirement is effectively fulfilled for installing, improving or controlling the equipment. With this knowledge, laboratories should be able to prove their capacity for maintaining their climate control system within the worldwide agreed tolerances.

Results

Explanations are given to show the complexity of maintaining both temperature and the relative humidity jointly at given values. A schematic has been designed to show all required items should compose any efficient ambient air management system for cotton laboratories.

A key point in the system is the regulation system that controls and drives both temperature and relative humidity into very limited ranges.

Discussions and Conclusions

For a complete satisfaction of the Air Management System, power supply must be correctly adapted upstream and maintenance shall be performed regularly. A full description of these two complementary requirements is covered in different chapters.

With the full description of the Air Management System in this part, providing technical requirements and recommendations, laboratories using SITC should now be able to:

- ✓ respect completely the basic standards required for cotton testing,
- ✓ evaluate the ability of a manufacturer/subcontractor willing to install new equipment to regulate both temperature and relative humidity of the air,
- ✓ modify their climate system if necessary,
- ✓ prove their ability to maintain atmospheric condition within the worldwide agreed tolerances whenever the equipment is newly installed or for a periodic verification.

Nevertheless, if the laboratory needs to improve its AMS, it is highly recommended that a fully detailed diagnosis is realized by a specialist in air conditioning engineering, with expertise in cotton classing conditioned laboratories.

Literature

PAYET L., GOURLOT J-P., 2010, Rapport “D.1.3. Development of a list of requirements and basic principle drawings for a simple and efficient integrated climate control system”, Project CFC/ICAC/33, 23 p.

Annexes,

Annex A: Report_D-1-3_ClimateControl_V4 (see extra document)

8.5 Handling variable laboratory conditions (Technical development study)

Author: **Axel Drieling**

Organization: Faserinstitut Bremen e.V. (FIBRE), Bremen, Germany

Summary

Temperature and relative humidity of the air show a significant influence on the measured properties of given cotton samples. Especially strength, but in addition length and also Micronaire are affected. It is in particular the relative humidity with the most explicit influence. But unfortunately the temperature does influence the humidity, so that it has to be regarded, too.

Temperature and humidity typically show long term and short term variations. With some series of measurements, the effects of mainly the humidity were elaborated. And, more important, possible measures for handling variable humidity were examined.

Summarzing, definitely no kind of corrective action can replace the necessary investments in a proper air conditioning, as any measure to cope with non conform conditions shows its problems.

Introduction

The valid standard method for conditioning samples for testing is ASTM D-1776, fixing 21°C (+/- 1°C) and 65% relative humidity (+/-2%). Problems are:

- It is difficult to keep the relative humidity constant.
- The relative humidity (rh) influences the cotton sample equilibrium moisture to a level of usually 6.75 to 8.25% (dry basis) at 65% rh, but the exact level of the moisture varies with the samples, so that there is no fixed value for a standard sample moisture.
- Sample conditioning from the dry and from the wet side result in different moisture contents despite the same humidity.

The aim of this study was to analyze the effects of the humidity on test results, and to analyze the effects of different corrective measures on the results and the according measurement uncertainty.

Possible corrective measures are:

- Test result correction based on the measured relative humidity
- Test result correction based on the measured sample moisture content
- No test result correction, but frequent instrument calibration with cotton standard material, as the standard material does adapt to the varied humidity, and thereby reduces its effect.

Material and Methods

Test results at FIBRE for 12 African and non-African cotton samples show the influence of the humidity / moisture on the cotton properties.

Additionally, in a test series the humidity in the laboratory was modified systematically in order to identify the effect of long and short term humidity variations on the results.

Finally, the results were taken to analyze the influence of corrections.

Results of deviating humidity / moisture content

With the given 65% relative humidity, the equilibrium moisture content of the samples is, based on literature, usually in a range of 6.75 to 8.25%, although immature and extra fine cottons tend to show lower moisture contents. So a variation of at least 1.5% moisture content has to be considered for the same relative humidity.

In the range between 40 and 70% relative humidity, an average increase of 1% moisture content[3] per 10% of relative humidity was found.

Strength results vary in average by 2 g/tex per 10% of humidity (or per 1% of moisture content). Unfortunately this increase is not constant, but a range of 0.12 to 0.24 was observed.

Length results vary in average by 0.02 inch or 0.4mm per 10% of humidity (or per 1% of moisture content).

Moisture contents from adsorption and from desorption differ in average by 1.2% for the same relative humidity of 65%.

Conclusions

An extremely important influence is the difference between adsorption and desorption, or between conditioning from the dry and from the wet side. With in average 1.2% difference in moisture content from adsorption to desorption, the influence on strength is approximately 2.5 g/tex, and on length 0.025 inch. This impact cannot be reduced by any of the named corrective measures, but must be regarded with the start of each sample conditioning: samples MUST be conditioned from the dry side.

A correction based on the measured relative humidity is difficult to achieve and is usually not offered by the instrument manufacturers. One important difficulty is that the current humidity is affecting the cotton with a time lag, so that the actual conditions of the cotton samples are not known.

A correction based on the measured moisture content (7.5% moisture instead of 65% rh), which is offered by the instrument manufacturers, is on the one side reducing the effect of strongly deviating moisture contents. On the other side, a considerable error in correction is added, as the correction does not consider the true equilibrium moisture content of the samples at 65% rh. By assuming a standardized 7.5% moisture content instead of the given 6.75 to 8.25%, the actual samples are corrected for a moisture content that differs up to +/- 0.75% from their equilibrium moisture content. With this, the added error is +/- 1.5 g/tex and 0.015 inch. Hence this correction will only reduce the negative effect of a wrong relative humidity in case that the error induced by the humidity is clearly higher than 1.5 g/tex and 0.015 inch, or +/- 7.5 % of relative humidity.

Additionally the error that this correction is adding is not a random error, but it is systematically biasing the results up to 3 g/tex and 0.03 inch between two cottons with differing equilibrium moisture contents.

A second problem is given, as the increase of strength and length per 10% of humidity or 1% of moisture is not the same for all cotton samples. Although in average a slope of 2 g/tex is given, the single cottons showed a slope of 1.2 to 2.4 g/tex. With this, a correction gets less sure with a higher deviation in the given humidity. An assumed difference of 0.5 g/tex slope

[3] As the data is used for estimating the influence of humidity and corrective calculations, only approximate/rounded results are given, not suitable for an actual correction.

between the correction and the actual cotton will result in 1 g/tex result difference for a humidity deviation of 20%.

Considering the reliability demanded for laboratories for instrument cotton classification, it can be seen that a moisture based correction is not suitable. Nevertheless it may help for laboratories with poor conditions or no conditioning to improve result reliability.

Frequent instrument calibration with cotton standard material instead of a moisture based correction does avoid any added error due to different equilibrium moisture contents, and should therefore be preferred to a moisture based correction. Nevertheless, a difference in strength slope has the same negative effect as described above. Therefore a high deviation from the standard humidity must be avoided, too.

Results of long and short term variations in humidity

Assuming typical daily variations in humidity for example with the daily influence of the outside temperature or the influence of changing outside weather, frequent instrument calibration is suitable for reducing the effect of these long term fluctuations of the relative humidity. Certainly short term fluctuations cannot be solved with this measure.

A question to be answered is: how fast does a changing relative humidity affect the samples in a laboratory? In fact, the air management systems typically show a cyclical behavior with cycle times of 5 to 20 minutes. For this, a test series was conducted, modifying the humidity and monitoring the evolving changes in strength. Figure 8.5-1 shows the results of a period with a cycle time of 10 minutes. Although the single data points are scattering, a moving average, averaging 4 minutes of strength results, shows a distinct correlation between the humidity and strength results. This implies that even short term fluctuations must be taken into account.

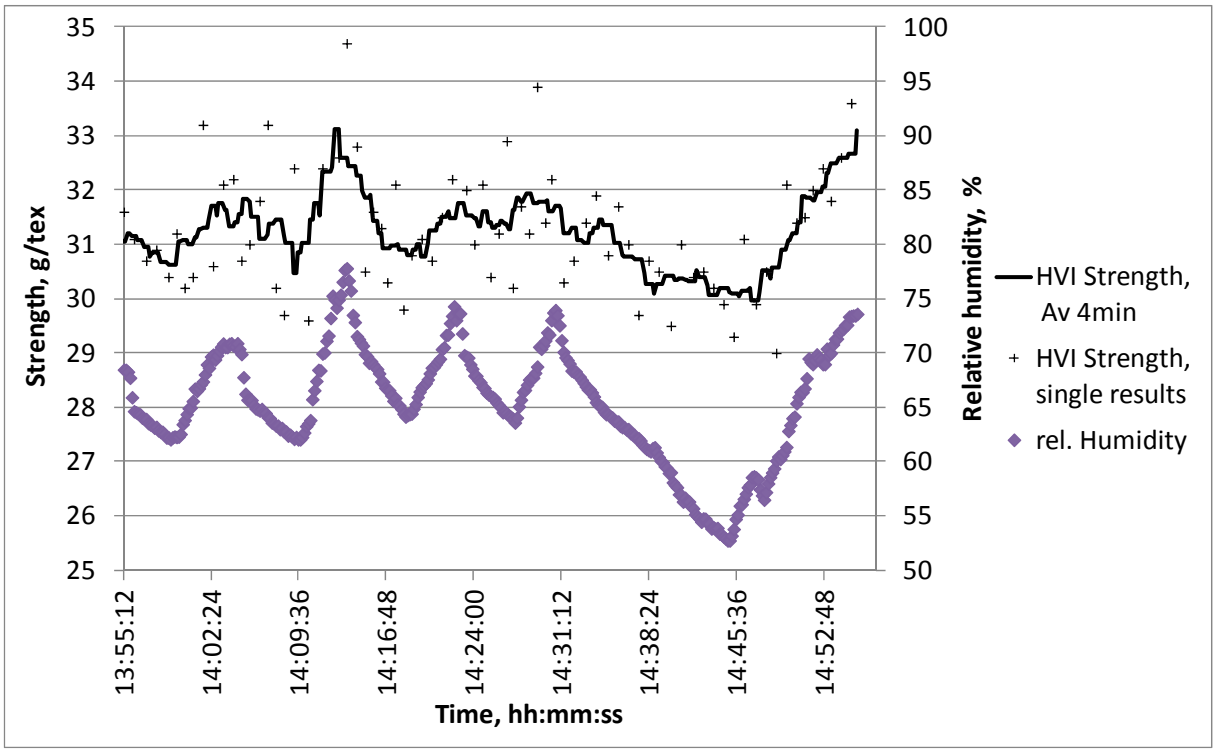


Figure 8.5-1 Influence of short-term variations in relative humidity on the strength results: Single data and a moving average (averaging 4 minutes)

Discussions and Conclusions

There is no kind of corrective action that can replace the necessary investments in a proper air conditioning, as any measure to cope with non conform conditions shows its problems.

As a moisture based correction is adding a systematic error, this should be avoided in cotton classification laboratories, although it might help for laboratories with poor conditions or no conditioning to improve result reliability. Instead, intense instrument calibration may reduce the effect of a slightly wrong humidity level and long-term fluctuations.

Additionally short-term fluctuations must be taken into account. Calibration will not improve this kind of influence on test results. A moisture based correction might be able to reduce the effect, but should nevertheless not be taken based on the reasons named above.

Finally, the impact of conditioning from the dry or from the wet side cannot be reduced by any of the named corrective measures, but must be regarded by always conditioning from the dry side.

Literature

Presentations for the ITMF CSITC Task Force as well as for the ITMF International Committee on Cotton Testing Methods are under preparation.

8.6 **Cotton homogenizer**

Author: **Jean-Paul Gourlot**

Organizations: CIRAD, UPR SCA, F-34398, Montpellier, France

Summary

Another key to success is the organization of round test organized by the RTC and at the attention of the laboratories in the region. In order to only compare laboratories, the cotton samples (a large mass of cotton) sent out by the RTC to the laboratories for testing should be very homogeneous. It is then required to take profit of a cotton homogenizing device to be developed first (on Cirad and CFC funding) and then copied to the 2 RTCs (paid by CFC). The user institute will then be the RTCs (with an exemplary of the machine) and the laboratories as they will be confident in the round test to adjust their results at the proper level. […/…]

Another key to success is the organization of round test organized by the RTC and at the attention of the laboratories in the region. In order to only compare laboratories, the **cotton samples** (a large mass of cotton) sent out by the RTC to the laboratories for testing **should be very homogeneous**. It is then required to take profit of a cotton homogenizing device to be developed first (on Cirad and CFC funding) and then copied to the 2 RTCs (paid by CFC). The user institute will then be the RTCs (with an exemplary of the machine) and the laboratories as they will be confident in the round test to adjust their results at the proper level. " […/…]

Aims

It was proposed to improve the homogeneity of the material using a laboratory mixing/homogenizing machines, which was designed in the frame of this project. This device insures: a gentle processing (mean characteristic values remaining unchanged) and a decrease in the within-cotton sample variability. This has to be associated to an easy processing and an easy sampling of cotton fibre masses to be sent to every participating laboratory.

Material and Methods

A set of three mixing/homogenizing machines were produced to prepare the samples to be sent to the laboratories for the regional round-test action.

The overall approach was:

- to develop a prototype having a large flexibility in major instrument settings: pressure, speed, drawing constants;
- to test this prototype in order to find two or three set of best settings according to the types of cottons to be mixed (some cottons are easy to "open" and to homogenize, while others can be very difficult);
- to produce simplified copies of the machine for the African conditions;
- to test these simplified machines;
- to deliver these simplified machine to RTCs.

Results

A prototype machine was developed, produced by October 2008 and tested for finding better settings for the machines to be sent to the RTCs.

Two simplified copies were manufactured, tested and sent to the RTCs early 2010 allowing them to prepare homogeneous samples for the regional round-tests they perform every quarter for the surrounding laboratories in their respective regions.

Actual limitations of the study

As the mixing/homogenizing machines are based on a drafting system, they are sensitive to the same limiting factors such as stickiness, seeds in the fibres … Cottons containing those contaminants should be avoided for any participation in round-tests.
Those instruments require a large amount of compressed air for proper running. Advice is given to have a separate air compressor for running this actual version of equipment (possibly ready for further improvements).

Discussions and Conclusions

It is essential that the raw material is homogenous before sending samples to laboratories. Establishing a homogenizing process is therefore necessary to reduce the variability of cotton which is going to be tested in different laboratories.

For CSITC Regional Round Tests in Africa, it is difficult to select homogeneous cotton bales. The results of the study showed that this can be solved by using the homogenizing machine in association with an easy doubling process. Indeed it ensures a decrease in within-cotton characteristics variability while mean values are stable: 4 kg of cotton fiber can easily be homogeneously sampled for participating laboratories.

Comparison of targets and fulfillment

Three devices were created and distributed to RTCs. All their maintenance and operating method were documented as well. Those equipments are in use in the RTCs

A document was developed with specialist in air treatment for fully respecting ASTM and ISO standards. A full application has to be applied to bring corrections or additions in the actual content if any.

Discussions are ongoing for finding a manufacturer for this equipment if any interest in the cotton supply chain[4].

Literature

PAYET L., GOURLOT J-P., 2011, Rapport “D.2.2. Development of a prototype of homogenizing machine, and production of simplified copies for RTCs, Public information”, Project CFC/ICAC/33, 38 p.

Annexes

Annex A: D.2.2_Prototype_V3_&copies_PublicInformation (see extra document)

[4] Voir CIRAD – CFC for follow-up on that one

9
Evaluation of cotton variability

9.1 Variability study of the cotton fibers technological characteristics as measured by Standardized Instrument Testing Devices (SITC)

Authors: **Jean-Paul Gourlot (1) / Modeste Aboe (2, 3) / Everina Lukonge (4)**

Organizations: (1) CIRAD, UPR SCA, F-34398 Montpellier, France
Mulhouse, France

(2) Université de Haute Alsace, LPMT-EAC 7189 CNRS-UHA,

(3) Association Interprofessionnelle du Coton, Parakou, Bénin

(4) LZARDI, Mwanza, Tanzania

Executive Summary:

In appreciation of the technical and technological developments during the last decades, the international commerce of cotton is gradually moving from the manual and visual classification to classification based on results from instrumental testing.

Now, going from one technique to the next requires studying their respective modalities and possibilities of application. Thus, commercial practices based on manual and visual classing came out onto the use of an arbitration process and onto the of arbitral tolerances allowing the settlement of possible litigations between sellers and buyers. It is then necessary to do the same for instrumental classing data, in particular in the cotton production conditions in Africa.

The variability study of the fiber technological characteristics is a crucial step forward in the definition of the conditions of good realization of instrumental testing in order to limit the litigation risk between cotton producers in Africa and their international customers. It is also required to be more specific and to adapt the actual arbitral procedures to the instrumental classing.

To perform these within-bale and between bales variability studies, Dr. Everina LUKONGE, post-doc employee, in Eastern and South-Eastern Africa, and Modeste ABOE, at that time a PhD student, in West and Central Africa were involved. These two persons were taking hundreds of samples in several ginning mills per country in fourteen African countries, while

the same ginning mills were continuing to sample bales on the long-run during two crop seasons. All collected samples were tested in the laboratories of the respective Regional Technical Centers (RTCs) in Tanzania and in Mali.

Thousands of results of samples tests from SITC were and are statistically looked at. The objective is to define operating methods for bale sampling and for testing collected cotton samples in order to warrant gained results and thus to limit the litigation risk between seller and buyer of the produced fibres. These instructions / recommendations are adding up to the ones which were given by the RTCs during the training sessions according to the best laboratory practices during the CFC/ICAC/33 Project duration (2007-2012).

Reminder of the CFC/ICAC/33 Project objectives

From: "PROJECT DOCUMENT, Commercial Standardisation of Instrument Testing of Cotton for the Cotton Producing Developing Countries in Africa"

Testing cottons for reliable and commercial purposes in accordance with the USA way can lead to claims as the production of US cotton is very different from the African one. This causes different levels of within bale variability of the measured characteristics. It is therefore essential to study the within-bale variability in several African conditions to ensure that the way of testing the cotton will ensure no claim due to cotton quality characterisation.

This activity will be mainly undertaken in the RTCs with the support from CIRAD. PhD students from the region will be included to cover this task.

Outputs:

This component is designed to bring specific tools that are necessary to properly run a laboratory in Africa. The outputs will be: Ranking of the problems according to their influence on the test results

Evaluation of an optimized number of necessary SITC tests per sample and samples per bale, based on specific variability studies for the regions included in the project to insure a good reproducibility and repeatability of African data,

The training of two persons that can serve as experts in the RTCs later on

Generalities

At the initiation of the CFC/ICAC/33 Project, a proposal for engaging two 'PhD Students' from Africa was posted and advertized in Africa through the Regional Technical Centers (RTCs) based in Tanzania and Mali. In fact, it took one year to select and involve:

Dr Everina LUKONGE in a postdoc position in the frame of a contract between LZARDI, TBS and CIRAD with the support of the '*Université de Haute Alsace, Laboratoire de Physique et de mécanique textile, Ecole Nationale Supérieure d'Ingénieurs Sud Alsace*'. Dr. LUKONGE has been in charge of running the 'variability study' in Eastern and South-Eastern Africa.

Ms Ing. Modeste ABOE in a PhD process (Science for the Engineer diploma) in a contract between AIC, CERFITEX and CIRAD with the support of the '*Université de Haute Alsace, Laboratoire de Physique et de mécanique textile, Ecole Nationale Supérieure d'Ingénieurs Sud Alsace*'. M. ABOE has been in charge of running the 'variability study' in Western and Central Africa.

Annexes

Annex A: Gourlot, J.-P. and Drieling, A. (Scientific Editors), 2012. Final report about the within and between-bales variability studies conducted in Africa - *Rapport*

final des études de variabilité intra et inter-balles en Afrique, CFC/ICAC/33 Project, 'CSITC Project', book under preparation (see extra document)

9.2 Within bale variability study of the cotton fibers technological characteristics as measured by Standardized Instrument Testing Devices (SITC)

Authors: **Jean-Paul Gourlot (1) / Modeste Aboe (2, 3) / Everina Lukonge (4)**

Organizations: (1) CIRAD, UPR SCA, F-34398 Montpellier, France
Mulhouse, France

(2) Université de Haute Alsace, LPMT-EAC 7189 CNRS-UHA,

(3) Association Interprofessionnelle du Coton, Parakou, Bénin

(4) LZARDI, Mwanza, Tanzania

Introduction

Cotton is produced in Africa on a surface area of more than three million hectares giving a production of more than one million tons of fibre in 2009/2010 (ICAC, 2010). The fourteen cotton producing African countries in this study (Benin, Burkina Faso, Cameroun, Chad, Ivory Coast, Mali, Mozambique, Senegal, Sudan, Tanzania, Togo, Uganda, Zambia and Zimbabwe) represent around 76% of the African production in 2009/2010. These countries export almost their entire cotton fiber production. In all of these countries, fiber quality is mainly evaluated manually and visually in the classification process; the challenge now being to achieve an instrumental classing of the productions. More than four million bales will then be classed thanks to instrumental data and the sampling and testing methodologies should now be defined.

Objectives

It is important to define characterization methods and procedures for African production conditions that could warrant the reliability of the results in agreed worldwide tolerances. This definition requires a good evaluation of the within (and between bale variability later on) levels for the six technological characteristics defined hereafter and which are those recommended by the Commercial Standardization of Instrument Testing of Cotton Task Force of the International Cotton Advisory Committee (ICAC-CSITC): Micronaire (Mic; Micronaire unit); Upper Half Mean Length (UHML, mm); Length Uniformity Index (UI, %); Strength (Str, g/tex ≈ 0.981 cN/tex); Reflectance (Rd, %); Yellowness (+b, Yellowness unit).

Material and Methods

In several ginning mills per country and in 14 countries in Africa (altogether 63 ginning mills), samples were taken from several bales (10 bales in 2009 and 5 in season 2010) produced on a same day of production at the ginning mill level. These 10 or 5 bales were taken at 20 bales distances to insure that the processed seed-cotton came from various seed-cotton trucks, thus to allow a better representativity of the local productions.

One sample of fibers was taken from each of eight equidistant layers from the selected bales, in order to evaluate the existing variability of fiber characteristics within the bales. Each collected sample was tested twice (2 replicates) tested in the RTCs laboratories in the regions,

ie in Tanzania and in Mali. Testing protocols in both RTCs were designed to include the periodic test of known reference materials (every 20 tested samples) in order to check any bias or drift during the testing seasons.

Altogether, 425 bales were sampled for a total of 3639 samples collected. The corresponding dataset contains 7278 lines for the bales tested to which 1602 lines were added for the reference materials which were tested at periodical times during sample testing.

Results and discussion

From the data set, the within-bale variability was evaluated in all selected ginning mills. From the observed variability levels, it has been possible to deduce a sampling and testing procedure to match with the following technical and financial objectives:

Respect the international trade tolerances which are set for trading cotton on the bias of instrumental testing data;

Respect a litigation risk set at 10 % between the seller and the buyer of fibers according to these measured characteristics;

Minimize the cost of sampling and at testing to feasible technical and financial possibilities.

In summary, for saw ginned cottons, we found that African cotton can be sampled and tested in a comparable procedure to the one used in the USA (see Table 9-1). For roller ginned cotton, a future publication will propose a sampling and testing procedure.

Table 9-1: Table of comparison of testing procedures for saw ginned cottons: number of measurements per bale (for one line of data per bale) in the USA and in our proposal for Africa modes (Aboé, M., J.-P. Gourlot, E. Gozé, P. Hublé and A. Sinoiméri (2011). New findings on within bale repeatability of standardized instruments for testing cotton measurements on cotton fiber produced in West and Central Africa. Textile Research Journal (Sous presse): 42 p.)

Characteristic	Nb of samples per bale	Type of sampling	Nb of replicates	Nb of measurements per sample	Total Nb of measurements per bale
	USA				
Micronaire	2	Composite	1	1	1*
UHML	2	Cluster	1	1	2*
UI	2	Cluster	1	1	2*
STR	2	Cluster	1	1	2*
Rd	2	Cluster	1	2	4*
+b	2	Cluster	1	2	4*
	Proposition for Africa (saw ginned cottons)				
Micronaire	2	Composite	1	1	1
UHML	2	Cluster	1	2	4
UI	2	Cluster	1	2	4
STR	2	Cluster	1	2	4
Rd	2	Composite	1	2	2
+b	2	Composite	1	2	2

*: Provided by M. James KNOWLTON, USDA-AMS, Memphis.

Conclusion

Classing using instrument test results is technically feasible having fairly similar conditions in Africa (small mostly manual farms), rather than in the United States of America (large mechanized farms).

Dr. Modeste ABOE defended his PhD on March 5, 2012 with great success. Dr. Everina LUKONGE will get her Postdoc certificate by the end of 2012.

9.3 Between bales variability study of the cotton fibers technological characteristics as measured by Standardized Instrument Testing Devices (SITC)

Authors: **Jean-Paul Gourlot (1) / Modeste Aboe (2, 3) / Everina Lukonge (4)**

Organizations: (1) CIRAD, UPR SCA, F-34398 Montpellier, France
Mulhouse, France
(2) Université de Haute Alsace, LPMT-EAC 7189 CNRS-UHA,
(3) Association Interprofessionnelle du Coton, Parakou, Bénin
(4) LZARDI, Mwanza, Tanzania

Introduction

The between-bale variability is also important to assist in setting up sampling and testing procedures. In the chapter above, we have seen that the within-bale variability of the cotton fibers technological characteristics are an essential part of the known possible variability sources to determine the sampling and the testing operating methods for getting and testing cotton samples from bales in order to provide both reliable results and a low level in litigation risk between seller and buyer. However, the between-bale variability is also essential; indeed, when cotton is marketed, it is sold in lots of bales of equivalent cotton 'quality', each lot containing up to hundreds of bales. Therefore, it is also important to check if the cotton bales have the same 'quality' within every lot to satisfy the spinner and its requirements.

The present chapter explains the methods used to measure the between-bales variability and its incidence on any pre-set sampling and testing procedures.

Objectives

The objective is to run SITC tests on samples taken from lots of bales in the fourteen African producing countries for the two cropping seasons in order to measure the "typical between bales variance" taking care of the major causes of variability (from seed-cotton management to the according bales). This experiment was conducted for two season crops (2008-2009-2010 and 2009-2010-2011 according to the hemisphere).

This study is not about looking after the sorting of the bales for shipment according to their measured 'quality' and is not about looking after any method to arrange the bales in lots for getting homogeneous lots in terms of 'quality'.

Material and Methods

In the same situations for the ginning mills as above (14 countries and 63 ginning mills), samples were taken from every consecutive bale produced on a same day of production at the ginning mill level, which is here considered as a raw lot. In this case, the ginning of seed-cotton coming in a row from various trucks was ginned and fibers were packed into consecutive bales from which one cotton sample was taken per bale. Two hundred bales were sampled in crop season one, while one hundred bales were sampled in crop season 2 (Experiment B). More than 9 000 samples were collected and tested twice in a randomized order in a laboratory respecting the recommendations of ICAC-CSITC Task Force and international standards.

In addition, ginners were involved to take two samples per bale (top and bottom layers of the produced bales) from twenty consecutive bales every week of the ginning season; this experiments dealt with the measurement of between bales variability over long time in a season (Experiment C). More than 1 500 samples (among 4 000 expected) were collected and tested in the same conditions as above.

All samples were tested in the RTCs laboratories for the regions, *ie* in Tanzania and in Mali. Testing protocols in both RTCs were designed to include the periodic test of known reference materials (every 20 tested samples) in order to check any bias or drift during the testing seasons.

Results and discussion

From these experiments B and C, various cases were observed: in the best situations, the fibre characteristics of the consecutive bales are quite homogeneous (Figure 9.3-1); in the worst situations, the fibre characteristics may strongly vary from one bale to the next (Figure 9.3-2).

In most of the situations, it could be possible to simplify the sampling and testing procedures as we could use the statistic method called “krigging” for averaging results from bales before and/or after the one being evaluated as displayed in Figure 9.3-3 (Dx are coefficients applied to bale values $\overline{M_x}$ at distance $_x$). At anytime, it will then be by agreement between provider and customer that the value of a bale n could be calculated using the data from a given number of surrounding bales.

In addition, the experiment C gives indications about the evolution of the averages of within-bale variability (Figure 9.3-4) and of between bales along the season in one situation (Figure 9.3-5). Figure 9.3-4 represents the averaged within-bale variances for a given situation where decreasing trends can be observed for both UHML and UI. In Figure 9.3-5, the between bales variances also decrease along the season for UHML (nothing clear for UI).

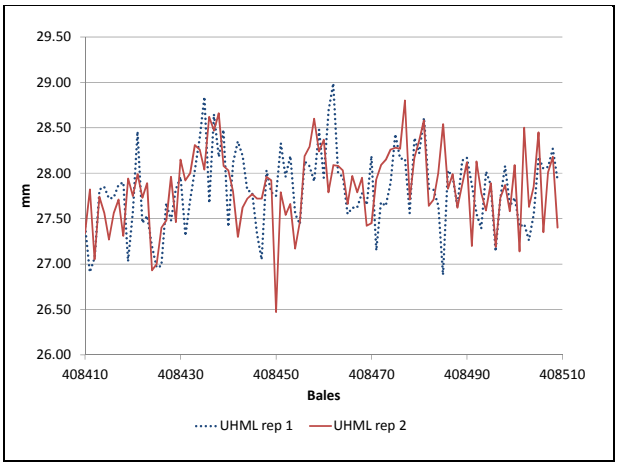


Figure 9.3-1: Example of UHML readings (mm) in replicate 1 and in replicate 2 for 100 consecutive bales in one situation. UHML is quite stable along the bales.

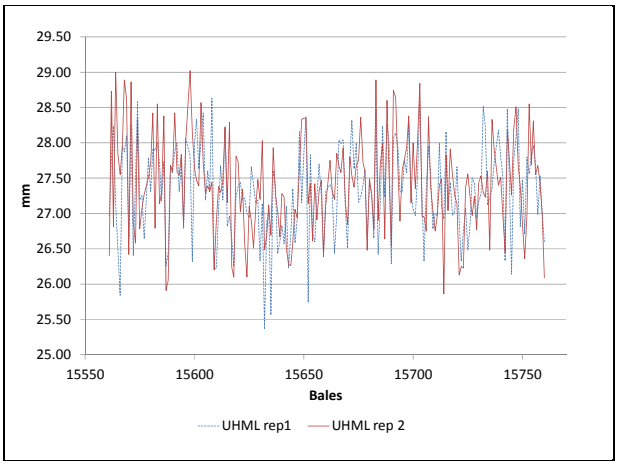


Figure 9.3-2: Example of UHML readings (mm) in replicate 1 and in replicate 2 for 200 consecutive bales in one situation. UHML is not stable along the bales.

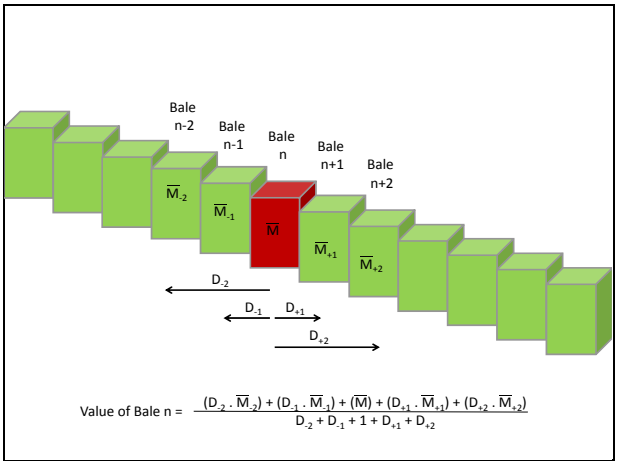


Figure 9.3-3: Example of 'averaging' calculation for giving the value of bale n for each characteristic.

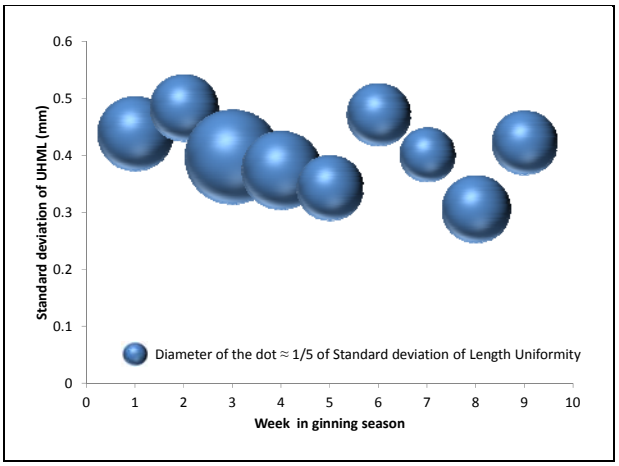


Figure 9.3-4: Evolution of the within-bale standard deviations of UHML (mm) on Y axis and of Uniformity Index (diameter of the dots, in %) along the ginning season in one situation.

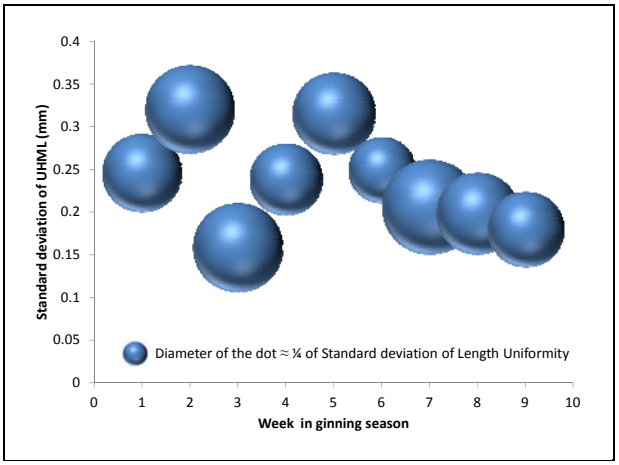


Figure 9.3-5: Evolution of the between bales standard deviations of UHML (mm) on Y axis and of Uniformity Index (diameter of the dots, in %) along the ginning season in one situation.

Conclusion

Classing using instrument test results is technically feasible having fairly similar conditions in Africa (small mostly manual farms) rather than in the United States of America (large mechanized farms). 'Bale averaging' can also be made to improve the measurement precisions and accuracy as well as decreasing the cost of sampling and testing.

9.4 General conclusion and comparison between objectives and achievements

Authors: **Jean-Paul Gourlot (1) / Modeste Aboe (2, 3) / Everina Lukonge (4)**

Organizations: (1) CIRAD, UPR SCA, F-34398 Montpellier, France
Mulhouse, France
(2) Université de Haute Alsace, LPMT-EAC 7189 CNRS-UHA,
(3) Association Interprofessionnelle du Coton, Parakou, Bénin
(4) LZARDI, Mwanza, Tanzania

General conclusion

While a larger variability in African productions was nearly always assumed to be existent, these studies demonstrated that, in the contrary, within-bale and between bales variability levels of African cotton bales are maintained at reasonable levels. These reasonable levels allow the possibility of using instrument testing with almost the same procedures as in mechanized cotton production systems, and allow the respect of the same international tolerances while respecting a low litigation risk between seller and buyer.

Not all results are given in this technical report as a full research report will be available on line while keeping sensitive information confidential. In order to improve the situation even more, this report will also be sent to all participants with detailed diagnostic information under a confidential agreement.

Comparison between objectives and achievements

The activity D.2.2. of the Project was included in the CFC/ICAC/33 Project as a key component for insuring instrument testing results in Africa, with a strong scientific basis. The work was rendered possible thanks to Dr. Modeste ABOE and Dr. Everina LUKONGE, Dr. Eric GOZÉ, Pr. Artan SINOIMERI, and Dr. Jean-Paul GOURLOT being general organizer and scientific coordinator of this activity.

Scientific publications were submitted to Journals having editorial boards and scientific reviewers in order to insure a scientific caution to the work done. This Project allowed Dr. Modeste ABOE to graduate his PhD on one side, and Dr. Everina LUKONGE to graduate a postdoc during the Project time on the other side. This result is thus conforming to the initial objectives.

On the technical side, the Project results are in the form of proposals for sampling and testing procedures to the classification services of Africa, and of recommendations in terms of seed-cotton management to the participating ginning mills in the experiments (see 9.1 Annex A). This result is thus conforming to the initial objectives.

The time and funds allocated for this Project did not allow all required research activities. Indeed, at its end, the international Project partners transferred all required knowledge for properly running a laboratory and for providing reliable testing results to the cotton market. Then, the Regional Technical Centers transferred and will continue to transfer that knowledge to the classing laboratories in the Regions. However, the following research actions remain to be done, probably within other research project(s), in order to:

- check the sampling and testing procedures in real life and modify them if required (to fix possible year effects),

- apply them in cotton trading and check their 'commercial validity',
- with the cotton testing results, cotton companies are now able to improve the quality of the produced cotton, by improving seed-cotton management from the farm gate to ginning mill as well as by improving cotton production by initiating new varietal improvements or by developing new agronomic practices.

10
Technical evaluation and dissemination

10.1 Impact assessment of the CFC/ICAC/33 project

Authors: **Axel Drieling (1) / Jean-Paul Gourlot (2) / David Wheeler (1)**

Organizations: (1) Faserinstitut Bremen e.V. (FIBRE), Bremen, Germany
(2) CIRAD, UPR SCA, F-34398, Montpellier, France

Summary

The impact assessment study of the CFC/ICAC/33 Project has been planned to measure the adoption of instrument testing and its requirements by cotton stakeholders, both worldwide and in Africa. Several criteria were used for recording information along the duration of the Project, as well as a questionnaire specially designed for this Project.

Results show that the results from the international activities of the Project are well perceived and that they will continue carrying results on the long run. According to the African specific activities, some activities already brought their impact while other activities, requiring large investments and/or adaptations in the countries will only bring their impact in a few years' time.

Introduction

When a Project comes to its end, it is always useful to evaluate its impact. In our case, the Project is very wide in its approach and its activities. Some activities require fundamental and deep changes in the way how cotton is marketed that would require much time to implement; their results may not be seen during this Project lifetime.

Material and Methods

From the beginning of the Project, records were made on the actual situation in the African regions according to cotton classing, conditions of classing and about the 'quality' of gained results. In addition, a questionnaire was sent to all people that were invited to the final seminar of the Project in Arusha (see Annex A).

Results and discussion

Seeing a low number of answers to the designed questionnaire, we decided to study the impact of the Project activities by looking at answers given during the Final Seminar, at gathered information as well as at the answers given to the questionnaires.

Criteria to be looked at are – partly treated in the other sections of the present Technical Report:

- Training sessions
- Expertise visits
- Round-test (international, regional)
- Documentation
- Retest
- Variability studies
- Number of instruments (before, during and after the Project)
- Number of new labs or better equipped laboratory rooms than before the Project
- Number of AAMS in better shape than before the Project
- Number of uses of instrument (actual, planned …) based on Arusha results
- Number and type of equipment provided, actual use of those
- Number of persons / organizations better aware of the instrumental classification and its needs
- Number of organizations using instrument testing for cotton trading (for what benefit)
- Factors / partner affecting the adoption
- Reactions / comments (political, market, associations, cotton companies…) of cotton stakeholders according to the Project progress or results.

For the international activities

- CSITC Task Force
- CSITC inter-laboratory round test preparation and routine implementation
- CSITC Guideline

the benefits are clearly identified and congratulated by all cotton stakeholders worldwide. All these activities will be continuing after the end of the project, and are beneficial to the African laboratories as well.

The overall benefits of the Africa related activities can be seen looking at the current situation, the current and strived developments in the single countries in the regions, grouped together in the table that has been updated during the Arusha Final Seminar, and presented in chapter 4-1.

- At least eight countries in the Eastern / Southern Africa and five in the West / Central Africa undertook intense developments during the project duration in order to achieve an instrument based classification system for their cotton production. New laboratories have been erected and instruments installed.
- The CFC/ICAC/33 project enhanced awareness about instrument classing of cotton. Countries took initiatives and the responsible organizations started improving on their own. The project assisted the self initiatives to fulfill their objectives.
- Laboratories from nine African cotton producing countries participated in the CSITC Round Trials in 2011 and therefore were evaluated in comparison to instruments in 80

laboratories worldwide. The evaluation of the participating laboratories improved significantly.

Several trainings have been executed in West/Central as well as in Eastern/Southern Africa (see chapters 5 and 6), and have been well accepted by the trainees. Additional knowledge was mainly stressed for laboratory organization, use of the instruments, calibration, maintenance, as well as use of the testing data, and much of the gathered knowledge has been applied in the laboratories afterwards.

More direct support was given with the expertise visits to each laboratory, usually with one or two visits during the project duration. The quality and the impact were rated very high / positive.

With the variability study and the related visits to the single gins it was possible to get into direct contact related to daily practice. The gins are getting a specific report on the cotton and test result variability of their cotton.

One specific point is made for the technical developments, including the 'variability studies', the potential benefit is that the false idea of African cotton within-bale variability can now be canceled. Therefore, unless for some cases, the protocol of sampling and of testing cotton is now designed for cotton classification purpose using instrument data. Gins / laboratories now know what means, skills, equipment etc. are required for insuring good sampling and laboratory practices and reliable results for trading cotton.

The routine activities of Regional Technical Centers (RTCs) have started (see chapters 5 and 6) with for example regional round trials, trainings, laboratory visits, testing for the variability study or distribution of information. Unfortunately several problems hindered the implementation of the re-tests, which is an important step towards result verification. Testing samples for the regional cotton production has started in both regions with contact to several cotton organizations, which is one of the steps towards financial sustainability.

The most difficult point has been the embedding of the RTCs in their region through the definition of a suitable regional legal and structural organization for each RTC/region, and the adoption of these by the national cotton companies/organizations. A special mention should be given to the fact that much investment in equipment has to be done in Africa for moving toward the full adoption of instrument testing in cotton classification; this requires more time than the Project duration, and the final impact will only be seen in a few years. Nevertheless, the RTCs have to continue their efforts to form their regional status, and to include the cotton organizations of the countries in the region into their activities.

Overall, a good awareness for the project and mainly for the importance of instrument testing was achieved during the project duration, based on the seminars, the trainings, visits and finally the final seminar. The necessity and benefit of instrument testing was unanimously highlighted by the participants of the final seminar.

Some factors are given, which negatively impact the adoption of instrumental data for cotton trading, which are, besides others, the initial costs for instrument testing as well as necessary changes in the habits of persons involved in cotton marketing. The future prospect is to foster the use of the African cotton testing structure with its test results for improving cotton marketing.

Annexes

Annex A: Questionnaire for the Cotton Organizations according to the impact of the CFC/ICAC/33 project (English/French)

10.2 **Project workshops**

Author: **Axel Drieling, David Wheeler**

Organizations: Faserinstitut Bremen e.V. (FIBRE), Bremen, Germany

Summary

For the project, in sum five official workshops have been conducted in addition to the training sessions and the presentations of the project and its findings at several conferences. These were two starting/awareness seminars in 2008, two inauguration seminars in 2010, and a final seminar in 2012 (see next chapter).

Opening seminars

The starting/awareness seminar about the CSITC Cotton Project to various cotton stakeholders was held from 21-22 April, 2008 at the Kempinski Kilimanjaro Hotel in Dar es Salaam-Tanzania. The seminar was graced by the Permanent Secretary from the Ministry of Industry, Trade and Marketing and was closed by the Permanent Secretary from the Ministry of Agriculture, Food Security and Cooperative (see annex A).

The starting/awareness seminar for RTC West/Central Africa was held on 08th May 2008 in Segou, Mal. The objective of this seminar, which drew broad participation from representatives of cotton companies and cotton sector stakeholders of the West and Central Africa region, was to provide the project's technical and financial partners with the opportunity to emphasize the importance of the project for Africa as a whole (see Annex B).

The RTC for Eastern/Southern Africa was officially inaugurated on 08th and 09th of April 2010. A workshop for cotton stakeholders was conducted in parallel with the Chief Executives Meeting held at Blue Pearl Hotel in Dar es Salaam-Tanzania. The laboratory was inaugurated by the Minister for Industry and Trade of the United Republic of Tanzania (see Annex C).

The inauguration for the RTC Western/Southern Africa took place from May 31 to June 4 at the RTC in Segou, Mali, including the inauguration as well as trainings for the chief classers and the regional stakeholders.

Annexes

Annex A: Starting/Awareness Seminar East Africa 2008 - Report (see extra document)

Annex B: Starting/Awareness Seminar West Africa 2008 - Report (see extra document)

Annex C: RTC Eastern/Southern Africa inauguration (see extra document)

Annex D: RTC West/Central Africa inauguration (see extra document)

10.3 **The final seminar**

Author: **Axel Drieling, David Wheeler**

Organizations: Faserinstitut Bremen e.V. (FIBRE), Bremen, Germany

Summary

The Project Final Seminar took place near the foot of mount Kilimanjaro at the Naura Springs Hotel, Arusha, Tanzania on the 18th and 19th January 2012 with global and eager participation from high ranking officials from the cotton industry as well as cotton and funding organizations.

The positive attendance from members of the sub Sahara cotton producing regions visualized the importance of the Project and the results that have been achieved.

Aims

The aims of the Project Final Seminar were

- To show the benefits of instrument testing for all stakeholders from the cotton production to its utilization, especially highlighting the benefits for the African cotton production.
- To show the achievements of the Project and disseminate the obtained information
- To envisage and project the sustainability of the RTC´s after the end of the project
- To discuss the concrete developments in the countries of Africa towards instrument testing of cotton.

The contents of the seminar

The Project Final Seminar was split into 7 sessions including the welcome and closure.

In the opening address from the Managing Director of the Common Fund for Commodities, Ambassador Ali Mchumo supported by the following address from Mr. Pierre Berthelot, Head, COS-Coton Secretariat, Coordination Unit of the EU-funded AAACP Programme made emphasis on the financial sustainability of the RTC´s subsequently laying the responsibility for the development of business plans and the securing of support from partners on their shoulders.

Session 2 was based on the Benefits of instrument testing of cotton with presentations from Mr. Axel Drieling, FIBRE, Bremen; Mr. James Knowlton, USDA-AMS; Mr. John Lupton, Consultant; Ms. Priscilla Mutembwa, CARGILL, Zimbabwe; Mr. Walter Simeoni, Consultant and ITMF past president; and Mr. Werner Bieri, Buhler Quality Yarns,

All of the session 2 Presentations brought forth the same results, that the instrument testing of cotton reaps benefits, whether it is the key to competitiveness or for the global harmonisation of qualities. All presenters also brought forth the importance of the participation in the CSITC Round Trials to guarantee accuracy and precision.

Session 3 was intended to present the activities provided by RTCs to the Cotton Companies in their Region so as to get their approval and support for the future.

Both RTC Managers, Mr. Charles Eckelege and his team for RTC East, Dr. Moumine Traore and his team for RTC West, presented the way they included the RTC activities into their host

institution. They also explained how the activities were running during the Project 'CSITC' up to now. They finally presented their view according to their future:

For RTC East, Mr. Dominic Mwakangale made it clear that the Tanzania Government will insure the close future of the RTC across the support of the activities of the Center through TBS during the time to find agreements with the Cotton Companies in the Region through Memorandum of Understanding and Memorandum of Association.

For RTC West, the future is envisaged to be worked out together with the African Cotton Association (ACA) and together with the Cotton Companies in the Region through Memorandum of Association and service-based activities. A drafting committee, including RTC West and the Metrology Committee of the ACA, is currently preparing the Memorandum of Association. A finalization of this work is planned during February (Mali) for a final signature during the ACA meeting in March 2012 (Zimbabwe).

Session 4 was as follow up to session 3 in the form of a panel discussion where the attendees were able to specifically question the managers of the RTC´s but also included a marvellous presentation from Mr. John Lupton who has assisted as a consultant during the Project.

Mr. Luptons presentation visualized the possibilities to achieve financial sustainability with a loan based support.

The object of Session 5 was to present the Project achievements and to describe the study of within bale variability and how this can be achieved. Dr. Jean-Paul Gourlot summarised the session with a presentation of technical requirements and their importance for instrument testing laboratories, including stable power, insulation, various laboratory specifications, AAMS integrated to control both temperature and humidity, and preventative maintenance.

Session 6 went into the development of instrument testing in the regions. Mr. Anthony Muriithi an agricultural economist working as a Technical Manager for planning with the Cotton Development Authority Kenya (CODA) highlighted the objective of the CFC/ICAC/44 Kenya / Mozambique Project. Mr. Gabriel Paposecco the Vice President of IAM Mozambique described the proven deficits caused by manual classification and implied that the government is modernizing 3 laboratories for Instrumental classification.

In the same session, Axel Drieling described the current situation for instrument testing in each country and its developments during the last 5 years. With this, he asked for input on the perspectives in each country.

With the closing session it was again emphasized that the most important and most challenging activity is the proper realization of the regional structure, regional ownership and the regional work of the Regional Technical Centers. With the project, the Common Fund for Commodities and the European Union initiated made a promising start of this important activity, but the final steps for the regional ownership and support will still have to be done.

Discussion / Conclusions

The Project Final Seminar was deemed by all participants and attendees as a success emphasised by the following citation from Dr. Moumine Traoré

"The CFC/ICAC/33 project has undoubtedly contributed to the strengthening of our regional cooperation relationship", "The activities carried out within the framework of the implementation of this project contributed to the achievement of the objectives of the WAEMU agenda for the competitiveness of the cotton textile sector".

The agenda and participants are given in annex A. The complete workshop with all its presentations were distributed as CD and can be read over the CSITC website at www.csitc.org.

Annexes

Annex A: Final Seminar, Agenda and Participants

11
Final conclusions

Authors: **Axel Drieling (1) / Jean-Paul Gourlot (2)**

Organizations: (1) Faserinstitut Bremen e.V. (FIBRE), Bremen, Germany
(2) CIRAD, UPR SCA, F-34398, Montpellier, France

The CFC/ICAC/33 project made significant contributions to the work of the ICAC Task Force on Commercial Standardization of Cotton: The Instrument Testing Guideline provides an internationally approved helpful tool for advising cotton testing facilities. The summarizing evaluation results from the CSITC Round Trials allow the participating laboratories to compare their performance to the performance of other laboratories worldwide in one summarized parameter, as well as get detailed analysis on their Round Trial results for improving their performance.

In Africa, the cotton producing countries are considerably moving towards instrument testing. The CFC/ICAC/33 supported the laboratories directly with expertise and material support. But the main assistance was initiated in creating two Regional Technical Centers, one in Mali and one in Tanzania. These Centers are planned for continuing their support after the end of the project, giving information, providing trainings and expertise visits, and forming a regional reference with regional round trials and re-tests. Based on the global and regional project activities, significant and provable improvements in laboratory performance were obtained.

Intense result variability studies analyzed the given cotton test result variation for 14 countries and 63 ginning mills in Africa, and concluded in adapted test operating methods for respecting suitable litigation risks. The future prospect is to foster the use of the African cotton testing structure with its test results for improving cotton marketing.

Overall, a good awareness for the project and mainly for the importance of instrument testing was achieved during the project duration, based on several publications and presentations, on seminars, trainings, visits and finally based on the final seminar. The necessity and benefit of instrument testing was unanimously highlighted by the participants of the final seminar, coming from the majority of the cotton producing countries in Africa.

The most important and difficult topic of the project has been the embedding of the RTCs in their region through the definition of a suitable regional legal and structural organization for each RTC/region, and the adoption of these by the national cotton companies/organizations.

The future prospect is to finally achieve the organizational and financial sustainability of the Regional Technical Centers, based on the prerequisites given with this project, and driven by the Regional Technical Centers in close cooperation with the national cotton organizations in the regions.

The more general future prospect is to make full use of the chances given with instrument testing for

- production overviews
- breeding/improving varieties
- quality conscious seed cotton procurement/processing, finally resulting in quality related premiums for the farmers
- ginning for process optimization
- trading: pricing, assorting of homogenous lots, direct marketing, settling of claims – depending on the organization of the cotton supply chain
- processing: settings and optimized bale laydowns.

Quality related marketing of cotton, based on objective quality information, remains the final goal to be achieved.

Annexes

Available on csitc.org

2.1 Annex A: CSITC: Documentation of Structure and Duties – Short (English)

2.1 Annex B: CSITC: Documentation of Structure and Duties, Incl. Detailed Tasks (Engl.)

3.1- Annex A: General Evaluation GL121 (English)

3.1- Annex B: Example Certificate (English)

3.1- Annex C: Instrument Evaluation (English)

4.1 Annex A: Overview of Laboratory Development in the Regions (English)

4.2 Annex A: Direct support to the laboratories, full text (English)

5.2 Annex A: Business plan for the RTC East (English)

5.2 Annex B: Consultancy report (English)

5.2 Annex C: Income and expenditures (English)

5.3 Annex A: Retest procedure (English)

5.3 Annex B: Round Trial Procedure (English)

5.3 Annex C: Round Trial Results Evaluation Procedure (English)

5.5 Annex A: Premier service training at the RTC-East (English)

5.5 Annex B: Uster service training at the RTC-East (English)

6.1 Annex A: Rapport de résultat du Projet V2 (French)

6.1 Annex B: Report of the project results (English)

6.5 Annex A: Protocole d'accord ACA-CERFITEX (French)

6.5 Annex B: Convention de Collaboration CERFITEX Soc. Cotonnières (French)

6.5 Annex C: Procedures (French)

6.5 Annex D: Consultancy report (English)

8.1 Annex A: CSITC Guideline v1-1 short (English)

8.1 Annex B: CSITC Guideline v1-1 long (English)

8.3 Annex A: Report_D-1-2_PowerSupply_V2 (English)

8.4 Annex A: Report_D-1-3_ClimateControl_V4 (English)

8.6 Annex A: ActivityReport_D.2.2_Prototype_V3_&copies_PublicInformation (English)

9.1 Annex A: Gourlot, J.-P. and Drieling, A. (Scientific Editors), 2012. Final report about the within and between-bales variability studies conducted in Africa (English/French)

10.1 Annex A: Questionnaire for the Cotton Organizations according to the impact of the CFC/ICAC/33 project (English/French)

10.2 Annex A: Starting/Awareness Seminar East Africa 2008 - Report (English)

10.2 Annex B: Starting/Awareness Seminar West Africa 2008 – Report (En/Fr)

10.2 Annex C: RTC Eastern/Southern Africa inauguration (English)

10.2 Annex D: RTC West/Central Africa inauguration (French)

10.3 Annex A: Project final seminar (English)

Publications based on the Project (Extract)

- DRIELING, A., KNOWLTON, J., 2007: Development of a Regular CSITC Round Trial. Beltwide Cotton Conferences, New Orleans, LA, USA, Cotton Quality Measurements Conference, Jan 9-12, 2007. Proceedings: National Cotton Council of America.
- GOURLOT, J.P., DRIELING, A., 2007: CSITC Activities for Assuring the Reliability of Cotton Instrument Testing in Africa. Beltwide Cotton Conferences, New Orleans, LA, USA, Cotton Quality Measurements Conference, Jan 9-12, 2007. Proceedings: National Cotton Council of America.
- DRIELING A., 2008: Results of the first year of implementation of the CSITC Round Trial. 29th International Cotton Conference Bremen, April 4, 2008. Conference Proceedings: Bremer Baumwollbörse / Faserinstitut Bremen e.V., p. 186-201
- DRIELING, A., 2009: Technical Measures for the Commercial Standardization of Instrument Testing of Cotton. Cotton Bangladesh (Magazine), April 2009
- DRIELING, A., 2010: High Volume Testing Result Variation – Results from the CSITC Round Trials. Beltwide Cotton Conferences, New Orleans, LA, USA, Cotton Quality Measurements Conference, Jan 4-7, 2010. Proceedings: National Cotton Council of America.
- DRIELING, A., 2010: CSITC Round Trials: 3 Years of Results. 30th International Cotton Conference Bremen, March 24-27, 2010. Poster. Proceedings: Bremer Baumwollbörse / Faserinstitut Bremen e.V.
- DRIELING, A. / GOURLOT, J.P., 2010: Cotton/Worldwide Harmonisation. Chapter 17 in Müssig, J. (Ed.): Industrial Applications of Natural Fibres — Structure, Properties and Technical Applications. Wiley-VCH, Weinheim, April 2010, p. 353-370. ISBN 978-0-470-69508-1.
- GOURLOT J-P., GALLET P. and PAYET L., 2010, Rapport "Activity D.1.2.: Development of a list of requirements for an integrated power supply system for laboratories", Project CFC/ICAC/33, 19 p.
- PAYET L., GOURLOT J-P., 2010, Rapport "D.1.3. Development of a list of requirements and basic principle drawings for a simple and efficient integrated climate control system", Project CFC/ICAC/33, 23 p.
- DRIELING, A., 2011: Commercial Standardization of Instrument Testing of Cotton – Results from over 4 years of International Round Trials. World Cotton Research Conference WCRC5, Mumbai November 7-11, 2011. Proceedings published by ICAC, Washington, DC.
- PAYET L., GOURLOT J-P., 2011, Rapport "D.2.2. Development of a prototype of homogenizing machine, and production of simplified copies for RTCs, Public information", Project CFC/ICAC/33, 38 p.
- Aboé, M., Gourlot J.-P., Gozé E., Hublé P. and Sinoiméri A. (2011). New findings on within bale repeatability of standardized instruments for testing cotton measurements on cotton fiber produced in West and Central Africa. Textile Research Journal (in print): 42 p.

- DRIELING A., 2012: ICA Bremen Certification of Laboratories: Technical prerequisites and according CSITC Round Trial Data. 31st International Cotton Conference Bremen, March 24-27, 2012. Conference Proceedings: Bremer Baumwollbörse / Faserinstitut Bremen e.V., p. 83-92
- DRIELING A., GOURLOT J.-P. and KNOWLTON J., Scientific Editors, 2012, Guideline for Commercial Standardized Instrument Testing of Cotton, Version 1.1, ICAC Task Force on Commercial Standardization of Instrument Testing of Cotton and ITMF International Committee on Cotton Testing Methods, Short version, www.icac.org, www.itmf.org and www.csitc.org websites
- DRIELING A., GOURLOT J.-P. and KNOWLTON J., Scientific Editors, 2012, Guideline for Commercial Standardized Instrument Testing of Cotton, Version 1.1, ICAC Task Force on Commercial Standardization of Instrument Testing of Cotton and ITMF International Committee on Cotton Testing Methods, Long version, www.icac.org, www.itmf.org and www.csitc.org websites. Available in English, Arabic, Chinese, French, Portuguese, Russian, Spanish
- Gourlot, J.-P. and Drieling, A. (Scientific Editors), 2012. Final report about the within and between-bales variability studies conducted in Africa, CFC/ICAC/33 Project, 'CSITC Project', book under preparation.
- Drieling, A. and Gourlot, J. -P. 2012: Commercial Standardization of Instrument Testing of Cotton for the Cotton Producing Developing Countries in Africa (CFC/ICAC/33). ICAC Recorder, September 2012. International Cotton Advisory Committee, Washington, DC, USA (in print)
- Drieling, A. and Gourlot, J. -P. 2012: Commercial Standardization of Instrument Testing of Cotton with particular consideration of Africa. CFC Technical Paper No. 60 / Final Technical Report of the Project CFC/ICAC/33. Common Fund for Commodities and International Cotton Advisory Committee, June 2012.

Additional presentations related to the project

- ACA Annual Congress
    - Accra, Ghana, 2007: Andrew Macdonald
    - Arusha, Tanzania, 2009: Axel Drieling
    - Khartoum, Sudan, 2011: Terry Townsend, Jean-Paul Gourlot, Modeste Aboé, Axel Drieling
- Presentations at the CSITC Task Force Meetings:
    - Izmir, Turkey 2007
    - Bremen, Germany 2008
    - Ouagadougou, Burkina Faso 2008
    - Washington, DC, USA 2009
    - Cape Town, South Africa 2009
    - Bremen, Germany 2010
    - Lubbock, TX, USA 2010
    - Washington, DC, USA 2011

    - Buenos Aires, Argentina 2011
    - Bremen, Germany 2012
- Africa – EU Partnership Seminar on Cotton in Africa: Trends, Incentives and Institutions. Arusha, Tanzania, September 5 to 8, 2007: Axel Drieling
- Presentations at the starting/awareness seminar, Dar es Salaam, Tanzania, April 2008
- Presentations at the starting/awareness seminar, Segou, Mali, May 2008
- Presentations at the Inauguration, Dar es Salaam, Tanzania, April 2010
- Presentations at the Inauguration, Segou, Mali, June 2010
- Presentations at the Project Final Seminar, Arusha, Tanzania, Jan. 18-19, 2012
- Presentations at the training sessions given for the RTC experts
- Presentations at the training sessions conducted by RTC Eastern/Southern Africa
- Presentations at the training sessions conducted by RTC West/Central Africa