

Pilot project document

Pilot #1 Implementing a blockchain technology for traceability and due diligence in the cotton value chain in support of a circular economy

Version of 20-11-2020

1. Background¹

Improving transparency and traceability has become a priority for the garment and footwear industry in order to increase its ability to manage its value chains more effectively; identify, mitigate and address labour and human rights and sustainability impacts; combat counterfeits; and manage operational and reputational risks.

Today, many companies have a limited view of the network of business partners within their value chain. Most can identify and track their immediate (tier 1) suppliers, but information is often lost about the suppliers of their suppliers – a UNECE study demonstrates that only around 34% of fashion companies implement tracking and tracing in their supply chain – and most of these reach Tier 1 only (UNECE study, 2019).

Nonetheless, the implementation of traceability in supply chains is a complex issue because it requires the collaboration of all stakeholders and the deployment of shared, reliable technical solutions. The global fragmentation of production is a key feature of the fashion industry which is further complicated by the prevalence of subcontracting and informal work, especially in lower supplier tiers. As a result, it has been difficult to provide consumers with information about product provenance

Advanced technologies (distributed ledgers such as blockchains, AI, machine learning, Internet of Things) can enable fashion industry actors to improve supply chain transparency across a variety of ecosystems by making available all information about product origin in a transparent and trustworthy manner by notably assigning a digital identity to the product.

Cotton is a key fibre for the textile and garment industry because it is the world's most widely used natural fibre, with an approximate yearly global production of 20 million metric tonnes (mt). It is a vital industry and a critical source of economic growth which contributes to the livelihoods of more than 350 million people, mainly smallholder farmers in developing countries. Nonetheless, cotton production coming from farmers without a sustainability program can have substantial environmental

¹ Source: Background note UNECE 2017 / Textile Exchange, 2025 Sustainable Cotton Challenge First Annual Report 2018

and social impacts which are increasingly interconnected and trickle down to negatively impact cotton producers.

Cotton production represents 6 percent of global pesticide use and can be correlated with pervasive land degradation and important water consumption. One t-shirt requires around 2,700 liters of water so cotton-clothing production on a massive scale contributes to the depletion and pollution of local water sources. The overuse of petroleum-based fertilizers has a highly negative impact on Cotton farmers' occupational health and safety as reflected in growing rates of chemical poisoning. In addition, the volatility of market prices and the uncertainty stemming from current purchasing practices have put cotton farmers into precarious situations which result in widespread poverty, child labour and excessive indebtedness.

Many companies have already engaged with global cotton sustainability programmes and have started to shift from the use of conventionally grown to organically-farmed cotton or other well-known sustainability programmes. In this context, and in connection with the UNECE project for advancing transparency and traceability of sustainable value chains in the garment and footwear sector, a first pilot will focus on a blockchain solution in cotton value chains.

The pilot will be implemented in collaboration with experts from brands, manufacturers, raw material providers, standard-setting bodies and technology providers. It will cover all the production steps of the value chain along with relevant business data and sustainability data elements identified in a mapping conducted by UNECE and UN/CEFACT experts, and a selection of certificates linked to specific hotspots of the cotton value chain (i.e. certificate of origin, certificate of organic cotton, and the zero discharge and hazardous chemicals substances self-assessment tool), to ensure the traceability of a product type (i.e: a shirt/a suit, TBC) and assess the pilot's scalability to other textile fibres.

2. Contribution to the UNECE project

This project directly contributes to UNECE project "Enhancing transparency and traceability of sustainable value chains in the garment and footwear industry" which is jointly implemented with ITC, in collaboration with the ILO, and is financially supported by the European Commission. In particular, this activity supports project Activity A2.1, "Pilot the use of the transparency and traceability policy framework, standard and guidelines for one country and 4 companies".

This pilot aims at providing the industry with a scalable proof-of-concept for traceability, transparency and due diligence using blockchain technology. The pilot will test the application of the UN/CEFACT data model building upon existing standards for information exchange in the industry. The purpose is not to create a software or a commercial solution, but to provide an open-source solution available free of charge to all industry actors.

The project will be led by UNECE and involving the following partners:

- | | |
|---------------------|-------|
| ▪ Hugo Boss | Brand |
| ▪ Stella McCartney | Brand |
| ▪ Vivienne Westwood | Brand |
| ▪ Burberry | Brand |

- | | |
|---|---|
| ▪ Weba | Manufacturer (Spinning, Fibre Processing, Dyeing, Weaving, Assembling, Finishing) |
| ▪ Albini | Manufacturer (Spinning, Dyeing, Weaving) |
| ▪ Filmar | Manufacturer (Farming, Spinning, Fibre processing) |
| ▪ Global Organic Textile Standards | Certification body |
| ▪ OEKO-TEX | Certification body |
| ▪ Zero Discharge of Hazardous Chemicals | Self-assessment tool |

And in collaboration with the following entities:

- Organic Cotton Accelerator
- Textile Exchange
- Cittadellarte Fashion B.E.S.T
- The Italian Ministry of Economic Development
- UNIDO (the Egyptian cotton project)

3. Overall Objective

OO: To enhance the traceability and due diligence in the cotton value chain through the implementation of blockchain technology, to support a circular economy approach

4. Expected accomplishments

EA1: Proof the possibility of increased connectivity and cost-efficiency based upon the use of blockchain technology and strengthened capacity to source more sustainably for retailers, brands and manufacturers along the cotton value chain

EA2: Demonstrate the capacity of companies operating in the cotton value chain to take risk-informed decisions and use a set of internationally agreed traceability and sustainability standards

5. Indicators of achievement

IA2.1 A Proof-of-Concept (PoC) for a transparency and traceability blockchain-based system for sustainable cotton value chains, covering all the production steps from garment to final consumer with relevant business and sustainability data elements. in line with the OECD due diligence guidelines (for selected KPIs), is completed by the end of 2020;

IA2.2 At least two project documents for undertaking additional PoCs in other plant-based, animal-based, synthetic, man-made fibre, linen or leather supply chains are developed by the end of 2020;

IA2.3 At least one technical solution to address the issue of accessing data on sustainability performance is identified as part of the PoC by the end of 2020, with the overall aim of significantly reducing the paperwork burden from a cost-effective and time-saving perspective for the project partners involved.

IA1.1 At least 1 brand and 4 manufacturers/farmers participate in the pilot project and fully test the blockchain-based system developed by the project by the end of 2020;

IA1.2 At least 30 stakeholders (including brands, manufacturers and farmers) are trained in the use of the blockchain system developed by the project by the end of 2020.

6. Activities

A1.1 Definition of the value chain and data model: mapping of the value chain, parties involved, with identification of the sustainability hotspots, and B2B transactions to be covered from seeds to consumers, selection of the information entities/data/ KPIs/ relevant standards and certificates that will be uploaded and exchanged through the blockchain (e.g. certificate of origin, certificate of organic cotton);

A1.2 Definition of the technology model and the traceability systems for the physical assets: including the definition of the digital twin to be used for the product/parts/components (e.g. DNA markers, HELIXA, RFIDs) and the necessary functions to be implemented;

A1.3 Analysis of the legal aspects of the blockchain pilot implementation (e.g. GDPR);

A1.4 Design of the IT data model, definition of data to be stored on- or/and off-chain, development of smart contracts, access concept to third party data bases (e.g. Oeko-Tex STeP), API and Web development including the Front-End and User-Interface development (mock-up) and the integration into supply chain partners existing websites (certificates and products);

A1.5 Parallel testing of blockchain modules developed, integration test for partner certification and necessary KPI's stored on blockchain (off – and on-chain), supply chain testing from end to end (seed to product), going live with real data entry and testing of the application in project pilot countries (e.g. Egypt for seeds (GMO free), farming and ginning, Italy and Switzerland and different countries in the value chain). Pilot feedback with an immediate error fixing for road blocking problems and an after pilot fine tuning of the blockchain concept and IT adaptation

A1.6 Summarisation of pilot project results in a project pilot report/case study presenting results achieved, challenges and lessons learned and, by the end of 2020, the development of project documents for replicating the results in at least two additional fashion supply chains (for example, other plant-based, animal-based, synthetic, man-made fibers, leather).

A2.1 Identification and mapping of key stakeholders and possible beneficiaries for the project pilot and coordination with identified stakeholders and beneficiaries;

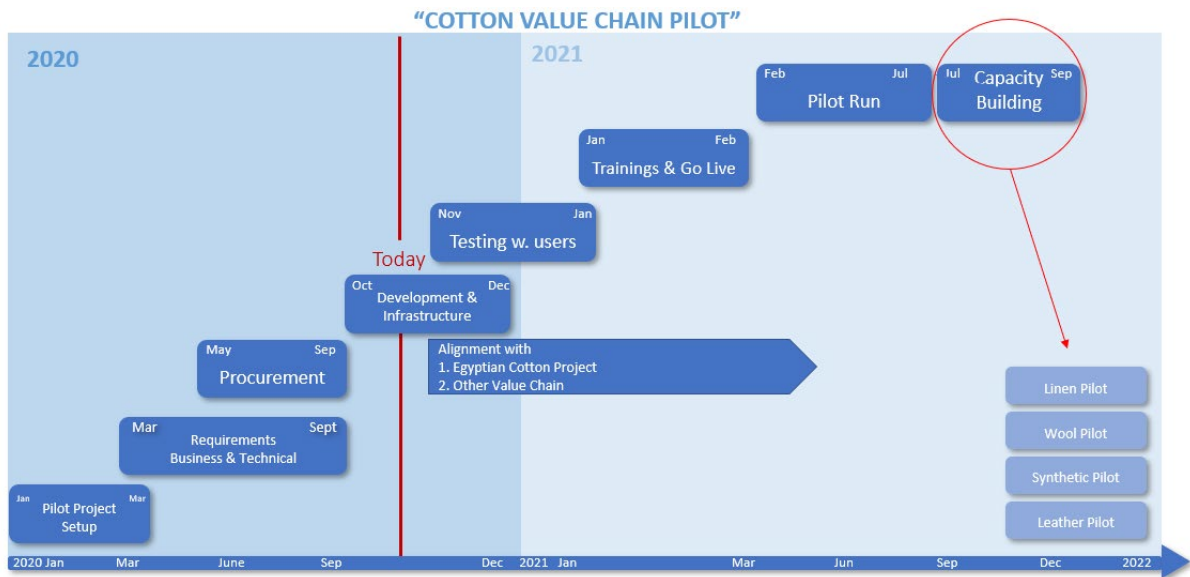
A2.2 Selection of brands, manufacturers and farms to participate in the pilot project and support to these companies throughout the implementation of the pilot project;

A2.3 Development training materials targeting potential end-users, including for webinars and online tutorials;

A2.4 Training of at least 30 experts (brands, manufacturers and farmers, standards/certification entities) including managers, technical staff and end users, on the key components of a blockchain system for traceability and due diligence in cotton value chains through a workshop (2-day workshop) and online tutorials/webinars;

A2.4 Organization of a concluding conference (half-day) to present and disseminate the project pilot results (e.g. in connection with the OECD Due Diligence or Blockchain Forums).

7. Implementation timeframe for the activities



8. Key events to present pilot progress in 2019-2020-2021

- UN/CEFACT Forum, Multi-stakeholder Policy Dialogue 30-31 October 2019 (London)
- OECD Due Diligence Forum 11-13 February 2020 (Paris)
- 2nd Multi-stakeholder Policy Dialogue: Accelerating action for Sustainable and Circular Value Chains in Garment & Footwear 27-28 April 2020 (virtual)
- 3rd Multi-stakeholder Policy Dialogue: Accelerating action for Sustainable and Circular Value Chains in Garment & Footwear 23-24 November 2020 (virtual)
- OECD Due Diligence Forum 3-4 February 2021 (virtual)

physical markers not only prove the origin and authenticate products, but they also prevent false product claims and detect blending by ensuring the connection between the physical and the digital assets. Due diligence achieved by traceability and certification through digitization has proven to be a cost-effective and key competitive factor. The blockchain system can enable an immutable and secured exchange of information/documents between partners in mass markets and smart contracts can entail the appropriate supply chain visibility and automatize B2B information exchange.

Scoping the pilot: questionnaire (Feb-2020)

In February 2020, the project team put together a questionnaire which was discussed with the group in order to get experts' views on the scope of the cotton blockchain pilot (Section 1) and on lessons learned from blockchain projects already implemented (Section 2). The purpose of the questionnaire was also to support the development of the business and technical requirements to be set out in the ToRs for procurement of the technology solution.

The secretariat collected 16 questionnaires from key industry players and actors. The findings from the questionnaire were presented to the group at the end of February and highlights are featured in the Annexes. The review of the questionnaires supported the project team for the definition of the pilot's scope, targets, stakeholders, organization and timeline.

Pilot's scope, targets and organization (Mar-2020)

It has been agreed by the experts that the supply chain phases covered for the pilot are cotton field to brand/retailer and their key partners (farmers/cooperatives, suppliers, producers, brands/retailers, auditing and certification bodies). The consumer phase is likely to be simulated to keep the pilot's complexity low. The key B2B transactions to be covered are auditing and sustainability/certification. In order to allow best possible uptake and implementation, the blockchain solution characteristics feature a hybrid solution, open-source that allows permissioned but does not exclude permissionless for certain interoperability issues, which enable to define clearly who can see what, eventually going public at a later stage. The open-source approach for the blockchain is also a basic requirement to guarantee full transparency of the blockchain solution developed for the pilot.

Targets

1. End-to-end traceability in line with relevant norms and standards for sustainability;
2. A scalable pilot that can be used in the whole textile sector and for any kind of sustainability claim;
3. Multi – claim solution able to validate a wide range of sustainability claims (social, health, security, environment, animal welfare) for specific supply chain partners but also for the whole value chain;
4. A stand-alone pilot, able to function independently and without a link to other projects or software;
5. Technological effectiveness and reliability;
6. Good understanding of the modelling required to build a blockchain application;
7. Good understanding of on-the-ground operating environments and constraints;
8. Data collection points within the supply-chain are clearly identified;
9. Testing of scenarios and hypotheses during the roll out;

The project team together with partners will define measurable / quantitative KPIs.

Stakeholders and organization

The secretariat coordinates and facilitates three layers of work as follows:

1. Strategic: Project Team & Experts Sub-Group 4
2. Services: technology solution provider, certifications, legal, technical, product tracking, auditing, education, training.
3. Operational: piloting partners

Highlights from experts³

1. Focus on traceability and the granularity of traceability
2. Flexible certification uploading e.g. audit, certificate, questionnaire
3. Separate sustainability layers: production versus processing
4. Distinct layers: traceability layer versus certification layer
5. Product's characteristics definition for fiber integrity and traceability e.g. a yarn, finished fabric, garment item
6. Solution access designed by the technology solution provider based on pre-defined performance parameters.
7. Scalable and flexible solution (i.e. mass markets)

ToRs for procurement (Mar-2020)

In March, the project team under the supervision of the secretariat, has put together the draft TORs for the procurement of the technology solution along with the evaluation matrix of criteria. The ToRs is currently being reviewed by UNECE/UNOG procurement department. The TORs describe the assignment description, the timeline, the business and technical requirements for this pilot and list of deliverables. The solution is requested to be open-source (although in the initial phase it will be a permissioned blockchain) for use after the Proof-of-Concept, hence it should also be scalable and extendable right after to support business purposes. The request for quotations is to be published online in May 2020. The secretariat will inform the experts on the publication of the request for quotations.

Alignment of piloting partners

In March, the secretariat organized an alignment meeting with the partners involved to present the business process analysis methodology required to capture key data elements for traceability and a detailed supply chain analysis for individual product types in the cotton value chain. The inputs collected from the partners, from April to early May, over the business process descriptions will support the project team to understand how the supply chain works to structure the value chain and data model, and to identify the data entities to be entered in the blockchain system. The pilot team will look at the linkage between products and sustainability criteria.

User stories (Apr-Sept 2020)

The purpose of the user stories is to identify the information (data, documents, certificates) which needs to be collected to enable transparency and traceability in a blockchain system, considering also the sustainability certificates and auditing reports, whose purpose is to achieve due diligence in the

³ Kindly refer to the minutes of the monthly calls for further information

value chain. This exercise was grounded upon the business process analysis of the cotton value chain undertaken in parallel (see the [Explanatory note for Business Process Analysis for the value chain and data model for traceability of information exchange](#)). The 72 user stories have been defined by the partners involved throughout the value chain from cotton cultivation to retailing against their core business and priorities, with the support of the pilot team during bilateral meetings. The user stories are critical for the technology solution provider as they facilitate the definition of the solution requirements in order to meet the needs and expectations of the industry. The secretariat developed a compilation of the user stories which was shared with the subgroup of experts and available on the CUE space to get a more concrete vision of the needs and goals identified by the industry.

The pilot's team identified a preliminary list of minimum sustainability claims out of the user stories identified to create transparency. The purpose is identifying priority claims for this proof-of-concept, and capturing the information which contributes to achieving due diligence goals and is exchanged throughout the value chain on a B2B level and which will be integrated into the blockchain system. The secretariat, the pilot's team and partners aligned on the following claims to be tested under this first pilot:

- Origin
- Fibre content (e.g. organic, recycled cotton)
- Chemicals use
- Product quality/safety
- Social and environmental aspects (OECD due diligence requirements⁴)

The pilot's "red thread": the story running behind the pilot (Sept-2020)

The pilot's red thread is a document shared with the subgroup of experts which aims at

- i) Describing the story running behind the pilot with the value chain actors involved, their roles and activity in the cotton value chain;
- ii) Integrating the user stories developed with the partners;
- iii) Identifying the information (e.g. documents, certificates) which need to be exchanged and registered in the blockchain system to enable transparency and traceability;
- iv) Supporting communication purposes at a later stage.

Solution procurement (Sept-2020)

Following the publication of the request for quotations on the United Nations Global Marketplace on the 01/07/2020, seven bids were received and evaluated over two phase (i) technical evaluation (United Nations staff, UN/CEFACT project experts) (ii) commercial evaluation (United Nations Office in Geneva procurement department and UNECE) to assess the best proposal and lowest financial offer. The technical evaluation assessed bidders' alignment against nine criteria (years of experience; English proficiency; international projects' experience, distributed ledger technologies' experience, pilot supporting capacity; IT architecture and infrastructure; mass balance and book & claim systems availability). The selected vendor, SUPSI (University of Applied Sciences and Arts of Italian Switzerland) passed all the technical criteria.

Legal aspects

⁴ OECD (2018), OECD Due Diligence Guidance for Responsible Supply Chains in the Garment and Footwear Sector, OECD Publishing, Paris. <http://dx.doi.org/10.1787/9789264290587-en>

The pilot team started to identify the main legal aspects stemming from the development of the blockchain solution. These aspects range from governing law and jurisdiction, governance framework (e.g. participants' rights and obligations, access, decentralized control, decision, transactions' verification, exit and data, smart contracts to ensure data reliability), intellectual property rights, open source software, liability, data protection and data privacy (e.g. personal data in an off-chain database, EU GDPR; consumer data; "privacy by design"). To avoid legal uncertainty, a "common law" shall be designed by a legal expert in line with the parties involved. All these aspects will be strongly considered and addressed in due time for each activity related to the solution's development.

Solution Development Phase (Oct-Nov 2020)

Workshop

The pilot team has finalized the solution's requirements and the solution provider has started to develop the infrastructure of the blockchain system, which is to take place from October to December 2020. The kick-off workshop blockchain solution "concept alignment" was held on the 15.10.2020 with the partners.

The purpose was to initiate the solution's development phase by

- allowing the technology provider to better understand the business requirements
- allowing the pilot team to get an overview of the blockchain platform
- finalizing the user stories against the sustainability claims for further implementation

Bilateral meetings

The pilot team undertook a round of bilateral meetings with the partners involved in order to support them to capture the data which will be integrated in the blockchain system (EPCIS model). The information collected will enable traceability by tracking and tracing upstream and downstream the value chain, the business processes for selected products, against five sustainability claims (origin, fibre content e.g. organic, chemicals use, product quality, social and environmental aspects against OECD Due Diligence requirements).

The information to collect is distributed across the 5Ws for traceability WHO, WHAT, WHERE, WHY, WHEN and HOW (see in the Guidelines of the Policy Recommendation Enhancing Transparency and Traceability for Sustainable Value Chains in the Garment and Footwear industry under public review⁵). The testing of the solution with the users will start from December 2020 onwards.

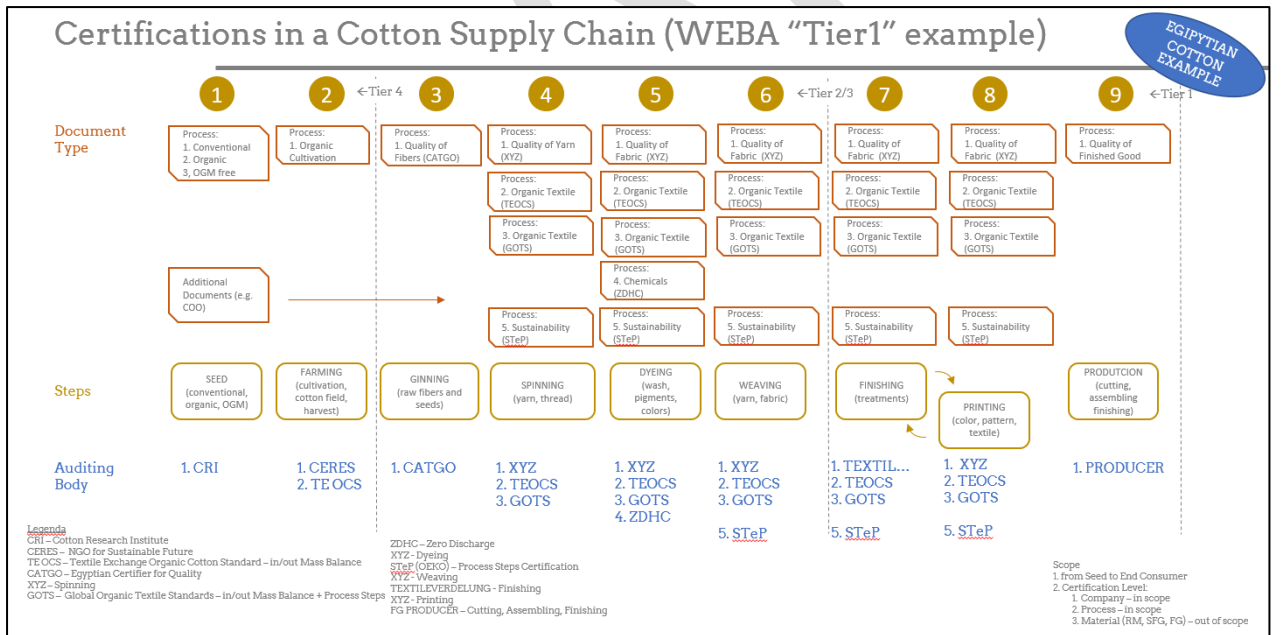
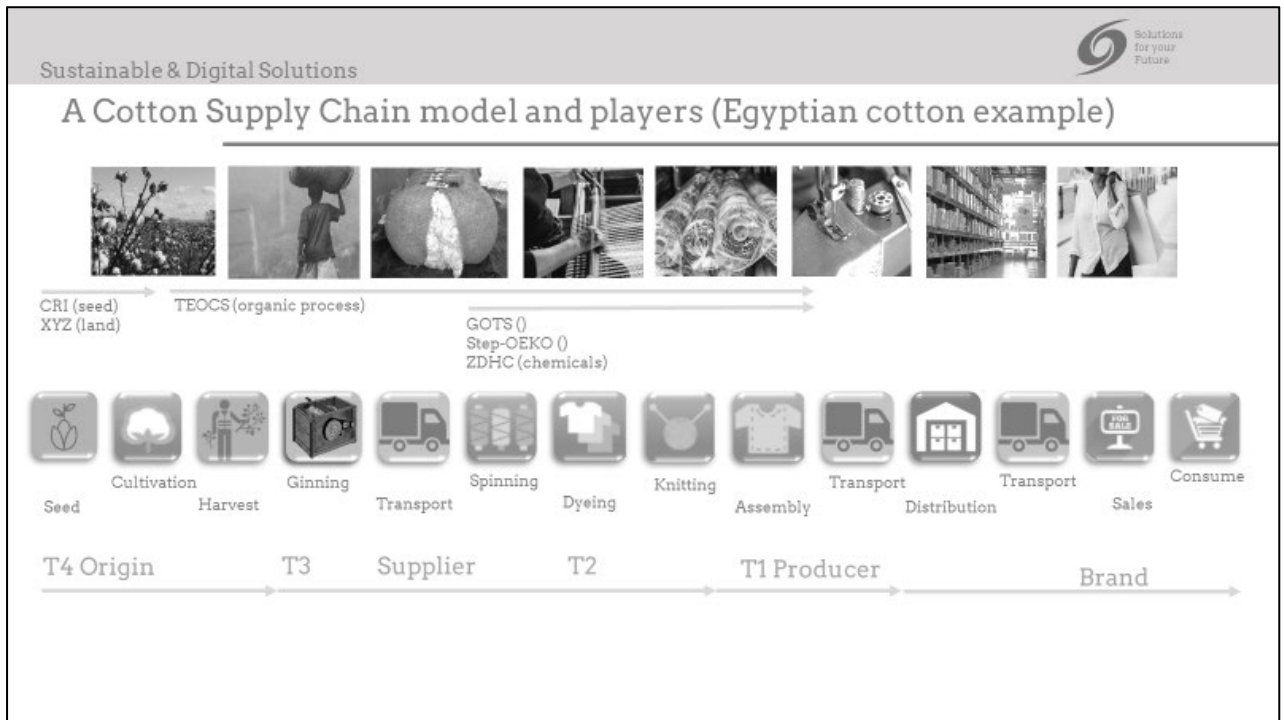
Methodology to build claims

The pilot team developed a tool for the partners to build claims. It comprises the main components of a sustainability claim (objective, requirements, traceable asset, proposed claim and verification criteria), minimum criteria to be met by the claims, key questions to consider in order to develop the claims and samples of claims. This work has been developed considering widely existing research and literature on the topic of product claim. The methodology is aligned with the Guidelines of the Policy Recommendation Enhancing Transparency and Traceability for Sustainable Value Chains in the Garment and Footwear industry (see footnote below).

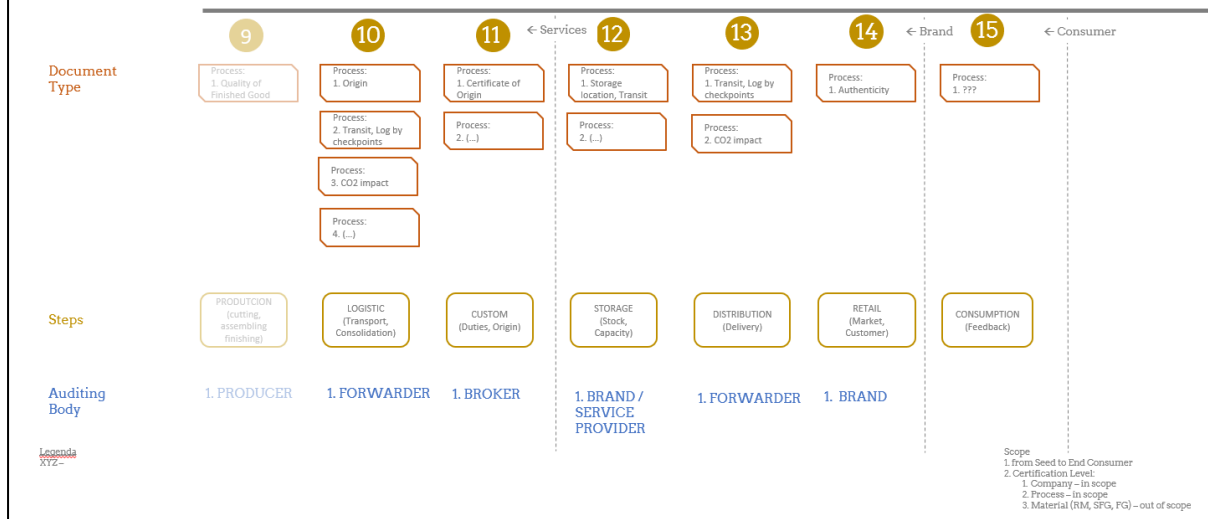
Contacts: For any additional information, please contact Maria Teresa Pisani, Economic Cooperation and Trade Division, UNECE at maria-teresa.pisani@un.org ; olivia.chassot@un.org

⁵<https://uncefact.unece.org/display/uncefactpublicreview/Public+review%3A+Enhancing+transparency+and+traceability+for+sustainable+garment+and+footwear+-+Policy+Recommendation>

11. Annex



Certifications in a Cotton Value Chain (general)



2. Pilot scope and Targets

Pilot #1 - Implementing a blockchain technology for traceability and due diligence in the cotton value chain in support of a circular economy

MAIN RESULTS FROM QUESTIONNAIRES – PRESENTATION AND DISCUSSION

IN SCOPE

- Traceability and proof of source should be the sole focus.
- Core components are: Smart Contracts and off-chain systems used (databases, IPFS, ...)
- Development of open source UI interfaces to interact with items and company profiles
- I would recommend Ethereum Virtual Machine
- It is thus very important to involve as many possible intermediaries in the production chain, including the logistics companies if possible.
- in the production chain, it could be possible to only track the product at the entry point or exit point of these steps, to simplify the pilot.
- the pilot has to have the basic information and trace the basic steps of the process. In a second step it could be enhanced and further implemented.
- to explore the reduction of bureaucracy among the participants.
- to understand the cost-benefit of this traceable process via blockchain.

OUT OF SCOPE

- Trade finance and other financial matters
- Advanced and detailed steps of the supply chain process
- All the processing activities like sales, consumption, disposal and post-consumption

FOR DISCUSSION

- The larger blockchain setup, e.g. consortium or public chain
- Transparency and traceability have to be put in place in the real process.
- In the fashion industry, the real manufacturing process is quite complicated and if we want to trace everything from the beginning to the end, I think it will take an enormous effort and a lot of time.



MAIN RESULTS FROM QUESTIONNAIRES – PRESENTATION AND DISCUSSION

IN SCOPE

- establishing the viability of the deployment of traceability tech into the supply chain
- It should be considered to include a training concept in the project so that the assigned staff is capable of working with the technology
- the essential supply-chain with a wide enough sample range to be able to draw viable conclusions
- narrow down the scope as much as possible
- It should focus on the minimum set of data needed to ensure traceability
- put cotton transparency in question (not the whole chain)

OUT OF SCOPE

- Customs processes and regulations from different countries.

FOR DISCUSSION

- utilising blockchain to integrate NSOP (National Standards of Organic Production, e.g. APEDA, USDA, EU standards) to the International Production standards (e.g. OCS and GOTS). Because that is something not happening yet and is bit of a mystery black box in the supply chain.

MAIN RESULTS FROM QUESTIONNAIRES – PRESENTATION AND DISCUSSION

KEY PARTNERS

- Farmers, Mills + Manufacturers, Retailers and the Technology providers
- One farmer, a spinner, a dyeing, a weaver, a finisher (if not inside the weaver), a garment maker, a brand and one auditor
- On-the-ground training and certification bodies, and the communities and cooperatives that will be participating in the pilot
- the entire textile production chain (Production of Fibres; Spinning-, Weaving-, Knitting Mills; Finishing Facilities; Manufacturers of ready-made Clothes), Standard Bodies, Retailers
- Certifying and auditing organisations

NOT RELEVANT

- Consumer, Disposal and Recycler

FOR DISCUSSION

- see later key players of the supply chain in example (as a reference)

MAIN RESULTS FROM QUESTIONNAIRES – PRESENTATION AND DISCUSSION

PROCESSING ACTIVITIES

NOT RELEVANT

FOR DISCUSSION

- Seed to Assembling should only be tracked through reputational certification
- A few processes, could be tried out in more details
- Cultivation to Distribution
- Cultivation, Spinning, Dyeing, Weaving, Finishing, Garment manufacturing, sales
- from the farm to the store
- We could track everyone, but the important thing is that we start tracking something and we can add more stages as the pilot progresses
- Harvest to Sales

- Consumption, Disposal and Post-Consumption

MAIN RESULTS FROM QUESTIONNAIRES – PRESENTATION AND DISCUSSION

BLOCKCHAIN CHARACTERISTICS

NOT RELEVANT

FOR DISCUSSION

- Open-Source software
- Public
- Permissioned
- For a pilot phase, a permissioned blockchain is an appropriate place to start until the concept is proven
- A mix of open-source software and proprietary software can be used.
- All blockchain software and smart contracts should be open source.
- A permissioned blockchain can later be made public while the opposite is not true.
- A public blockchain increases visibility and could create some buzz around the project
- For the initial limited scope project could be hybrid approach
- Open-source is important for the nature of the pilots developed by UNECE and the future of its development in different applications
- We don't want proprietary out-of-the-box software

- Proprietary Software

- Hybrid public and permissioned
- The setup of the blockchain, depends use cases and the level of transparency. For the initial pilot a permissioned chain is probably the better fit. But plans should be in place for an actual world wide supply chain system, using a public more decentralized approach

MAIN RESULTS FROM QUESTIONNAIRES – PRESENTATION AND DISCUSSION

B2B TRANSACTIONS

- Auditing and Sustainability and certification
- Financial transactions/value exchange
- In order to not defocus, we should limit the pilot to looking at sustainability and certification

NOT RELEVANT

- Not standardisable transactions

FOR DISCUSSION

- Contracts, material purchase order, order management, material quality management, product process management
- Customs transactions

MAIN RESULTS FROM QUESTIONNAIRES SECTION 2 LESSONS LEARNED – PRESENTATION AND DISCUSSION

1. Missing stakeholders:

- Raw material suppliers
- Suppliers beyond tier 2 (e.g. spinners, cooperatives)
- Product and engineering actors
- Retailers
- Government bodies
- Transporters/traders
- Financial flow actors
- Certifications bodies

2. Technology importance:

- Is instrumental, a tool for impactful processes and incentives
- Benefits: digitization, data collection, process modernization
- Blockchain: transparent and tamper proof time-stamped records of events
- For a seamless process flow and information

3. Awareness-raising/Education:

- Functionality of blockchain
- Differences in public versus private / permissioned systems
- Review key technology concepts (workshop)
- Good understanding: data collection and use in the blockchain, data trust

4. Legislation:

- Consider privacy protection legislation i.e. GDPR compliance
- Regulatory bodies to facilitate blockchain solutions:
 - accountability issues
 - consumer information
 - reliable sustainability claims

5. Governance:

- Clear governance all along is critical
- Aligning incentives and stakeholders
- Stimulate partners' eagerness to participate

6. Data Security:

- Data security and protection is a key topic
- Data immutability and user management
- Easier to manage from a permissioned blockchain
- T&C's, NDA, internal protocols, ...

MAIN RESULTS FROM QUESTIONNAIRES SECTION 2 LESSONS LEARNED— PRESENTATION AND DISCUSSION

7. Existing blockchain standard:

- No specific blockchain standard identified to date
- Seldom defined
- Create a standard under this pilot for easy uptake for all companies (i.e. including with limited resources)

8. User-friendly software:

- Good UX software is a critical successful criterion for adoption and good use
- User experience: simplified front end users applications (minimal buttons and fields, visual and tactile feedback)
- Have a user tech testing survey beforehand to test user experience on interface and design

9. Workload:

- Automated as much as possible
- Roles to be defined from the very beginning with piloting partners for good engagement: will entail additional work at the early stages to be balanced as the project yield cost and time savings

10. Risk-assessment exercise:

- Experts agree on running this exercise prior to the starting of the project, potentially throughout

11. Data reliability versus proof of the process:

- Experts agree that the focus is more important on the proof of the process rather than on data reliability (granularity tbd)

12. Onboarding and educating partners:

- Crucial all along the project to have everyone efforts aligned
- User interface to support partners willingness to achieving their goals (working group, user interviews, training sessions, demos)
- Ensure the technology can be used after the initial field tests for deployment

MAIN RESULTS FROM QUESTIONNAIRES SECTION 2 LESSONS LEARNED— PRESENTATION AND DISCUSSION

13. Complexity level for a scalable and replicable result

- Start simple and grow complex, keeping the data required as simple as possible (foster partners engagement)
- Additional data to be requested at a later stage
- Focus on the actual business solution to develop modular solutions which can be substituted if standards evolve
- Depends on the relationship with direct suppliers and level of trust
- ERP systems could be used to narrow down the data scope with partners

14. Standardized master data:

- Experts agree that standardization is key
- Important to leave room for more input and explanations still.
- Standard identifier to ensure the common understanding of the outcome
- Rather than facing companies' resistance, it is better to collect first data companies are willing to give and use analytics on what is consensual.

MAIN RESULTS FROM QUESTIONNAIRES SECTION 2 LESSONS LEARNED – PRESENTATION AND DISCUSSION

1. Demonstrating **end-to-end traceability** and prove the product certifications
2. **Scalability** of the pilot
3. Open **communication and alignment** between the piloting partners (scope, expectations, roles and responsibilities)
4. **Good understanding** of the process to model on a blockchain in the requirements
5. Rolling out several test scenarios
6. Keeping the **pilot focused** (without attempt to combine it with other IT initiatives)
7. **Technology** effectiveness and reliability
8. Understanding the on-the-ground **operating environments**
9. Breaking the project into progressive phases with **measurable goals**
10. Identify the important **data collection points** (e.g. site visits to key supplier chain members)

MAIN RESULTS FROM QUESTIONNAIRES SECTION 2 LESSONS LEARNED – PRESENTATION AND DISCUSSION

- **H1** Identify the incorrect sustainability claims
- **H2** Provide high visibility to all supply chain stakeholders with the traceability system developed
- **H3** The digital platform for blockchain developed will enable easy access and participation
- **H4** The solution can be operated by value chain actors without relying on external assistance
- **H5** Reduced administration processing time
- **H6** The origin of goods can be tracked across all tiers and end-to-end process definition
- **H7** Volume reconciliation is achievable from the farm to gin segment and then to later segments
- **H8** Gain knowledge about the different permission steps to be used in a permissioned blockchain

OTHER HYPOTHESES:

- **H:** Video-training is sufficient to onboard supply chain participants (majority of cases)
- **H:** The inclusion of anonymous worker reports can help identifying supply chain incidents which are not identified in third-party assessment.