Blockchain Traceability for Tea Tree Oil 1

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Blockchain Traceability for Tea Tree Oil

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Foreword

The global demand for pure Australian tea tree oil is under threat from adulterated product. It is estimated that about 30% of tea tree oil (TTO) sold is adulterated product. Traceability of 100% pure Australian TTO to ensure quality of the product for the consumer will deter adulterated TTO sales by exposing it in the marketplace. Up to 95% of Australian TTO is exported for use in cosmetics and pharmaceuticals and as the raw product. Export markets are increasingly demanding proven data sets to show the history and origins of the oil, including tracking it as it is grown on farm, processed, exported and eventually sold in various products to the end user. This research has defined the requirements for a simple blockchain answer to traceability in TTO production in Australia.

The research is important as the first stage in assessing the opportunities that blockchain technology can offer the Australian TTO industry. A workshop run by blockchain protocol company Geora for industry participants investigated the chain of supply, and developed the minimum viable product (MVP) to define the scope of more work to develop the technology in the TTO industry.

The Australian TTO industry stakeholders will benefit from this research as they have gained an understanding of blockchain technology and how it can help them. This understanding will encourage adoption of the technology in their production system. Geora will benefit from this research because they know more about the Australian TTO industry and production processes, from farm to distillation, shipping and transport, to processing user products. They are better able to supply a traceability solution that fits the Australian industry.

The key findings show that the introduction of an MVP blockchain solution will add value to the Australian TTO industry. The solution will be based on a map of the supply chain processes. The most critical data-capture points and technology requirements have been identified, and the recommended implementation phases have been defined to develop blockchain for the industry.

The next stage will involve developing the blockchain solution, implementing it into trial production, transport and market systems, and training for its successful adoption into the Australian industry.

This project was funded from TTO industry revenue to AgriFutures Australia, which is matched by Australian Government funds. Increasing the demand for pure Australian TTO is an objective of the AgriFutures™ Tea Tree Oil Program.

This report for the Tea Tree Oil Program adds to AgriFutures Australia’s diverse range of more than 2,000 research publications. It forms part of our Growing Profitability arena, which aims to enhance the profitability and sustainability of our levied rural industries. Regional communities and the broader Australian economy depend on profitable farms.

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About the author

Tony Larkman is CEO of the Australian Tea Tree Industry Association Ltd (ATTIA). He has more than a decade of experience in delivering outcome-driven foundation projects for the Australian tea tree oil industry.

Acknowledgments

Robert Dyason, Phillip Prather, Dee-Ann Prather and Yannick Castella provided significant input, technical assistance and insight into the complexities of the tea tree oil supply chain when the minimum viable product (MVP) criteria were developed.

The staff of Geora (https://www.geora.io/) provided invaluable guidance and advice on the processes for a cutting-edge technology that seems, to the casual observer, to be complex and unfathomable. Geora’s staff helped the industry’s representative and the ATTIA Board of Directors plumb the depths.

Abbreviations

ATTIA  Australian Tea Tree Industry Association (ATTIA)
CEO    Chief Executive Officer
COP    Code of Practice
AWE    Department of Agriculture, Water and the Environment
DUE    Down Under Enterprises Pty Ltd
ISO    International Standards Organisation
LMU    Levies Management Unit
MCNE   Main Camp Natural Extracts Pty Ltd
MVP    Minimum viable product
QA     Quality assurance
R&D    Research and development
TTO    Tea tree oil
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Executive summary

Adulteration is a fact of life for the TTO industry. The industry must continuously find new ways to minimise its impact on producers and all links in the TTO supply chain, including the end user. To resolve this issue, the Australian TTO industry seeks to gain better traceability along their supply chain. Export markets are now demanding proven data sets to show the history and origins of 100% pure Australian TTO (amongst a wide range of other natural ingredients) including tracking the product as it is grown on farm, processed, exported and eventually sold in various products to the end user.

Blockchain technology could be the solution to full traceability. The TTO industry was introduced to the concept by several providers at the AgriFutures Australia’s evokeAG event in February 2019. Blockchain technology is emerging as the preferred platform, with large chains such as Walmart already using it to trace fresh produce and pharmaceuticals. With Walmart expected to soon turn their attention to cosmetics and personal care products, the Australian TTO industry must be ready to take advantage when it does.

This report is about the first phase (Stage 1) of a project to provide the TTO industry with an introduction to a viable blockchain solution allowing full, inviolable traceability from the leaf to the bottle. Stage 1 involved a two-day Geora workshop for TTO industry representatives to map the processes in the TTO industry supply chain. The representatives also wanted to better understand the blockchain protocol and its potential as a traceability solution.

This report is targeted at TTO industry stakeholders to help them understand the potential for blockchain to allow full, inviolable traceability for 100% pure Australian TTO. This technology aims to minimise the impact of adulteration on producers and the end user.

Where are the relevant industries located in Australia?

Australian producers steam-distil the leaves and twigs of the iconic Australian tea tree (Melaleuca alternifolia). They produce about one million kg of 100% pure Australian TTO annually. Up to 95% is exported and used in TTO-containing cosmetics (about 60%), TTO-containing pharmaceutical products (about 5%), with the balance being sold as 100% pure TTO in bottles ranging in size from 20 to 100 mL.

About 140 producers are serviced by 11 major and many minor distilleries. Most production occurs in northern NSW, in a large area bounded by Port Macquarie in the south, the Tweed River to the north, and as far as the Great Dividing Range to the west. There are several small producers in QLD's southern half on the coastal littoral zone, as well as a significant group in the Dimbulah, Mareeba and Atherton triangle in Far North QLD.

Australia produces quality assured TTO, and are global leaders in both production and quality assurance (QA). Our nearest competitor – a distant second – produces about 10% of Australia's annual production. The majority (over 80%) of Australia's TTO has been certified as produced under the ATTIA strict Code of Practice for best management practices for production, as reported by ATTIA CEO, Tony Larkman.

All producers, distillers and marketers of TTO in Australia would benefit significantly from this project if it leads to the adoption of blockchain technology that reduces adulteration.
Aims/objectives

The objectives of the project are to:

1. Complete a workshop with selected industry participants to map the processes in the tea tree oil industry supply chain.
2. Report to industry on the most critical data capture points and technology requirements to develop blockchain for the Australian tea tree oil industry.
3. Report on the implementation phases recommended to develop blockchain for the Australian tea tree oil industry.

Methods used

After an introduction to block chain technology at EvokeAG 2019 and careful consideration of their experience and security of their system, Geora was selected. Geora (www.geora.io) have worked as a preferred provider with other agricultural industries. They use an open-source Ethereum-based commercial blockchain protocol designed for agriculture.

This project is designed for two main outcomes:

(a) To assess Geora’s capabilities; and

(b) To better understand the processes, software and costs in implementing basic traceability underpinned by blockchain crypto-ledger technology that can be used by any bona fide Australian TTO producer.

In mid-August 2019, four representatives of ATTIA and the Australian TTO industry completed a two-day workshop with Geora to map the processes in the TTO industry supply chain. They needed to better understand the blockchain protocol, and to assess its potential to trace TTO along the supply chain and potentially other agricultural commodities, including other essential oils.

Geora and ATTIA then developed a minimum viable product (MVP) to meet the following use cases:

1. Grower/producer sells to a domestic broker/trader
2. Grower/producer sells to an international broker/trader
3. Grower/producer sells to an end manufacturer
4. Broker/trader sells to an end manufacturer.

These cases are summarised in Figure 1.

Figure 1: High-level overview of the MVP for TTO
**Implications for relevant stakeholders**

A blockchain protocol offers manufacturers and retailers the potential to include on retail products a QR Code that consumers can scan (not in the scope of this project). The scan reveals information and assurance that those products have been inviolably tracked from source to shelf, and are precisely what they claim to be. This process is a win for the industry and consumers.

The potential for this protocol to decrease adulteration and to increase demand for 100% pure Australian TTO is huge. Given the lack of a reliable, readily available determinant of TTO inclusion, it is likely that a high proportion of the TTO consumed globally, as pure product or in TTO-containing products, was either adulterated material masquerading as TTO or blended products. It is hypothesised that the general increase in consumer interest in provenance has reduced this figure somewhat, but it is speculated that TTO from adulterated sources still makes up a proportion of the global market. Any process that can make adulteration more difficult to perpetrate is bound to increase demand for the real product at the expense of fraudulent material.

Another important long-term consideration for the TTO industry is the desired outcome of an output (i.e. a physical report or online access to a blockchain registry) to support the Department of Agriculture, Water and the Environment (AWE) Levies Management Unit (LMU) with auditing and compliance activities. These activities could help the LMU to reduce the cost of collection for the compulsory TTO levy.

**Recommendations**

The main implication of this project is a recommendation to move towards the development, implementation and training stages of the Geora blockchain project. This project contributed towards an understanding of the processes, complexity and benefits to the TTO industry and has given rise to confidence in the application of a very new technology and the recommendation to continue on to the next stages.
Introduction

Australian producers steam-distil the leaves and twigs of the iconic Australian tea tree (*Melaleuca alternifolia*) to make about one million kg of 100% pure Australian TTO annually. Up to 95% of this amount is destined for export markets where it is used to manufacture TTO-containing cosmetics (about 60%), TTO-containing pharmaceutical products (about 5%), with the balance being sold as 100% pure TTO in bottles ranging from 20 mL to 100 mL. Australia produces the best quality TTO and are global leaders in both production and quality assurance (QA). The nearest competitor – a distant second – produces about 10% of Australia’s annual production.

One of the greatest threats to the Australian industry is adulteration, a problem that has plagued the industry for several decades. By fraudulently diluting pure TTO with various components, including industrial waste, competitors severely undercut the market for 100% pure TTO and make a huge profit with minimal downside corporate risk. Historical evidence shows that 50% to 70% of all pure TTO sold to consumers was adulterated; this has been mitigated through a decade-long campaign of testing and education, and it is now estimated that about 30% of TTO sold is adulterated. We do not accurately know the level of adulteration in the TTO-containing cosmetics market.

In 2009, ATTIA Ltd commenced a QA program, the Code of Practice (COP), to ensure uniform manufacturing standards for all compliant producers. This is estimated to be 90% of all TTO produced in Australia, it provides complete traceability from paddock to despatch point, usually to an export destination via a trader, a shipper, and a clearing house.

Once the 100% pure Australian TTO leaves the distillery or COP-accredited traders, there is very limited or no ability to trace, track, and verify the integrity of the shipment through to its destination. While most TTO brokers, traders, and manufacturers do the right thing, there is a consistent minority of players in the TTO market who deliberately ‘shandy’ 100% pure TTO with industrial waste, usually sourced from China.

Another complication is the production, for example in Kenya, of low terpinen-4-ol TTO which, while still technically 100% pure TTO steam-distilled from *M. alternifolia*, is so inferior it fails to meet the minimum standards of the International Standards Organisation (ISO) TTO Standard ISO 4730: 2017. Perpetrators simply add terpinen-4-ol, usually derived from the normalisation of pine or eucalyptus essential oils, to the inferior TTO to meet the minimum standards.

Unfortunately, the material used both for ‘shandying’ and adjusting inferior TTO is sourced from industrial manufacturers with little to no QA control. Because the material is a by-product (i.e. industrial waste), it is almost completely uncontrolled and unregulated. It can often contain harmful compounds, including pesticides, heavy metals, endocrine disruptors, skin irritants, teratogens, and cancer-inducing compounds as well as products degraded by oxidation from the normalisation process (which may also be harmful). Consequently, the sale of these products labelled as “100% pure TTO steam distilled from *M. alternifolia*” cheats producers and consumers, and potentially puts their livelihoods and wellbeing at risk.

**These potentially harmful compounds are never found in 100% pure COP-accredited Australian TTO.**

To resolve this issue, the Australian tea tree industry wants better traceability along their supply chain. Export markets (manufacturers and consumers) are now increasingly demanding proven data sets to show the history and origins of 100% pure Australian TTO, including tracking it as it is grown on farm, processed, exported and eventually sold in various products to the end user.

Blockchain technology could be the solution to full traceability. The TTO industry was introduced to the concept by several providers at the AgriFutures Australia’s EvokeAG event in February 2019. Blockchain is emerging as the preferred platform, with large chains such as Walmart already using it to trace fresh produce and pharmaceuticals. With Walmart expected to soon turn their attention to cosmetics and personal care products, the Australian TTO industry must be ready to take advantage when it does.

After careful consideration, ATTIA chose Geora ([https://www.geora.io/](https://www.geora.io/)) who use an open-source Ethereum-based commercial blockchain protocol designed for agriculture. They have worked as preferred provider with other agricultural industries. This project was designed to assess Geora’s capabilities, and to better understand the processes, software and costs in implementing basic traceability underpinned by blockchain software that can be used by any *bona fide* Australian TTO producer.
Objectives

1. Complete a workshop with selected industry participants to map the processes in the tea tree oil industry supply chain.
2. Report to industry on the most critical data capture points and technology requirements to develop blockchain for the Australian tea tree oil industry.
3. Report on the implementation phases recommended to develop blockchain for the Australian tea tree oil industry.

Methodology

Objective 1

In mid-August 2019, representatives of ATTIA and the Australian TTO industry completed a two-day Geora workshop in Sydney to map the processes in the TTO industry supply chain. As well as gaining a better understanding of the blockchain protocol, they also needed to assess its potential to trace TTO and other potential agricultural commodities, including other essential oils.

Industry representatives:
- Tony Larkman, CEO, ATTIA Ltd
- Yannick Castella, Commercial Manager, Main Camp Natural Extracts Pty Ltd (MCNE)
- Phillip Prather, Head of Marketing & Operations, Down Under Enterprises Pty Ltd (DUE)
- Dee-Ann Prather, Managing Director, Down Under Enterprises Pty Ltd (DUE)
- Robert Dyason, Proprietor, Kilkie Pty Ltd

Objective 2

Process mapping

Geora explained the various stages of the TTO supply chain to ensure industry representatives understood the most critical data capture points and technology requirements.

Through process mapping, the scope of a Minimum Viable Product (MVP) was identified, as well as up to three subsequent phases of roll out. One assurance Geora gave was that during the testing phases of a blockchain solution they will always look towards building commercial systems to ensure any pilot work and testing doesn't need to be ‘turned off’.

**Definition of MVP:** a development technique in which a new product, process or website is developed with sufficient features to satisfy early adopters. The final, complete set of features is designed and developed only after considering feedback from the product’s initial users.
Process mapping requirements:

1. Identify the MVP use case and participants.
   a. Determine the most critical data capture points and key assertions about the tea tree supply chain. These assertions are the most relevant claims or certificates to be tracked and verified.
   b. Scope the various data capture methods along the supply chain, including in production, processing, logistics and packaging, and identify where other applications or devices will need to be implemented.
   c. Assess the user requirement to visualise and interact with the digital supply chain and record. This may include the use of smart packaging or QR code to link the consumer to the on-chain history of the tea tree oil.
2. Outline implementation phases.
   a. Begin with initial use case with selected participants to allow for the initial roll-out and testing of a foundational digital system.
   b. Outlining a number of project phases allows us to incrementally build more robust and complete digital records along the supply chain, as well as accessing secondary innovative solutions that might be made available.

Goals

1. Capture critical information about the production, processing, export and packaging of pure Australian tea tree oil.
2. Link the various datasets to a single and secure digital record of the tea tree oil to create a complete digital history of the product from farm into the final products sold globally.
3. Maintain parity between the digital record and the physical oil as it is transformed along the supply chain, including through growing stages, as a bulk oil asset as well as in unique drums, batches and bottles.
4. Allow participants to visualise and inspect the history of the tea tree oil at various stages along the supply chain in ways that can be shared with both retailers and consumers.

Challenges

Potential challenges identified before the workshop:

1. A lack of existing digital infrastructure, including potential challenges around connectivity.
2. Disparity in digital adoption between the various participants along the supply chain.
3. Creating incentives to engage the different parties involved.
4. Deciding on the technology used in the solution that is particularly relevant because blockchain is still a relatively nascent technology.

Solution requirements

1. Blockchain protocol, including smart contracts to create and update digital records of tea tree oil.
2. Shared dataset that multiple participants can interact with and contribute to.
3. Mobile or web applications, internet of things devices, or other applications to capture data along the supply chain, including integration between the various devices and applications with the blockchain protocol.
4. Interoperability between the core protocol and external software or protocols to allow users to share data stored in the traceability system with external systems and parties. For example, the ability to export data to a Walmart system.
5. An interface to visualise the data and history of the tea tree oil.
Objective 3

This process has been completed. Geora have submitted a report titled *Minimum Viable Product (MVP) Scope Definition, Version 0.1 Draft*, available from [https://pages.qwilr.com/ATTIA-MVP-Scope-Document-zG5ny1ibSwGa](https://pages.qwilr.com/ATTIA-MVP-Scope-Document-zG5ny1ibSwGa) and is reproduced below.

**Minimum viable product (MVP) scope definition**

There are two sections to this document:

1. MVP Project Scope
2. Process Diagrams (MVP “Use Cases”)

At the end of this document, you will see some notes from our workshop meeting that detail what this project may look like ‘Beyond MVP’. They are for inspiration and future planning, so we continue to keep our end goals in mind at these early stages.

Please take the time to go through and let us know of any questions you have.

**MVP project scope**

**Objective**

Provide producers with a system that allows them to verify for an end buyer or retailer that the produce they are supplying is 100% pure, Australian Code of Practice-accredited TTO.

The MVP is the **first iteration** of a system that aims to:

- Prevent the adulteration of TTO through the protection and verification of the TTO mark as managed by ATTIA
- Provide transparent and traceable records of TTO through production, manufacturing and distribution
- Build the foundations for a digital system that can be used by participants in the tea tree industry to differentiate and add value to their products.

**What is involved?**

a) Create a standard format for Digital TTO Records that can be used along the supply chain by various participants.
b) Capture information about the production, manufacturing and distribution of TTO.
c) Integrate the information and datasets in the supply chain back to the TTO record.
d) Allow ATTIA to attach digital certifications of Code of Practice accreditation to the TTO record.
e) Allow the TTO record, both in full and in part, to be shared in a secure and immutable format with other participants along the supply chain, including industry bodies.
f) Provide an interface for participants to visualise and inspect the record and history of the TTO at various stages along the supply chain.
g) Educate both the producers and retailers to highlight the value in adoption and growth of the system.
Minimum viable product

As a first step in this project together, Geora and ATTIA are looking to implement an MVP that meets the following use cases:

1. Grower/producer sells to a domestic broker/trader
2. Grower/producer sells to an international broker/trader
3. Grower/producer sells to an end manufacturer
4. Broker/trader sells to an end manufacturer.

Table 1: Parties involved

<table>
<thead>
<tr>
<th>Party</th>
<th>Role</th>
<th>Responsibilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>ATTIA Ltd</td>
<td>1. Industry representative 2. COP certificate provider</td>
<td>1. Maintain up-to-date registry of all certificates. Provide information on TTO certificates and industry requirements. 2. Roll out of education material for the industry.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MCNE Pty Ltd</td>
<td>1. Producers and traders in the Australian TTO industry 2. First MVP users of the traceability solution</td>
<td>1. Participate in the testing of the MVP solution. 2. Bring in relevant counterparties where needed to test the solution. 3. Provide feedback and requirements to the project group. 4. Have access to internet in order to access the Geora system using standard web browsers.</td>
</tr>
<tr>
<td>DUE Pty Ltd</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kilkie Pty Ltd</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Offco Pty Ltd</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Geora</td>
<td>1. Technology provider</td>
<td>1. Design, develop and test the system for TTO traceability. 2. Ensure ease of access and use for all parties and built-to-purpose system. 3. Produce report on the system and implementation assistance.</td>
</tr>
</tbody>
</table>

Governance

The Project Working Group is made up of executive, and implementation and development experts across ATTIA and Geora.

The executive will govern any and all decisions. The Executive going forward will be ATTIA Workshop Participants as Client Executives and Bridie Ohlsson as Geora Executive, or their nominated representative. Any other participants will be called upon as required.

The implementation of the project will be managed by Bernardo Rivera as Delivery Lead. Geora’s development team will manage the build of all project components.

It is envisaged that the Project Working Group will convene for 30-60 minutes once a week after work has commenced.

Budget

The production of the MVP, if kept within the scope of this project scope, will be as per the costing presented in the Project Proposal on 2 May 2019.
**MVP features**

**Table 2: MVP features**

<table>
<thead>
<tr>
<th>Required</th>
<th>1. A system to track TTO from harvest to manufacturer</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2. Standard TTO Record using Smart Contracts deployed on Geora</td>
</tr>
<tr>
<td></td>
<td>3. Certificate registry of all ATTIA Code of Practice-accredited producers stored and maintained in Geora</td>
</tr>
<tr>
<td></td>
<td>4. Certificates are automatically attached to the TTO record in Geora if the asset is in fact certified</td>
</tr>
<tr>
<td></td>
<td>5. Ability to transact TTO using Smart Contracts deployed on Geora. Includes unit being transacted, parties involved and data of transaction</td>
</tr>
<tr>
<td></td>
<td>6. Web application for various participants to interact with Geora:</td>
</tr>
<tr>
<td></td>
<td>a. Growers, producers and packers can create a TTO record if permissioned</td>
</tr>
<tr>
<td></td>
<td>b. ATTIA can maintain a registry of all Code of Practice-certified producers</td>
</tr>
<tr>
<td></td>
<td>c. Traders and manufacturers can transact TTO if permissioned</td>
</tr>
<tr>
<td></td>
<td>d. All participants can inspect the TTO record and history if it is introduced to them by the owner of the TTO</td>
</tr>
<tr>
<td></td>
<td>7. Standard API layer so that producers can choose to integrate additional applications or devices to add datasets and information to the record if they desire</td>
</tr>
</tbody>
</table>

| Desired                                                                   | 1. Owner can create their own asset; however, permission can be granted to another user to create the asset on their behalf. |
|                                                                         | 2. Ability to show blending of multiple TTO assets. |
|                                                                         | 3. Report output to support Department of Agriculture and Water Resources (AWE) Levies Management Unit (LMU) with auditing and compliance activities. |

| Excluded                                                                  | 1. Direct integration with any Grower/Producer or Distiller or Trader/Manufacturer Systems. |
|                                                                          | 2. Integration with or input from shipping or transport systems. |
|                                                                          | 3. Integration with labels or devices and their readers (QR, barcode, RFID and others) |
|                                                                          | 4. Contracts, payment terms, and setting real dollar value on assets (default price per kg is set). |
|                                                                          | 5. Real-time alerts system tracking certificates and assets. |
Figure 2: Full process diagram

- Please start at blue 'Start' box and follow the arrows
- Each 'swim lane' represents the different actor in the supply chain
- Each box represents a different action by that actor
- Boxes in ORANGE are new MVP Geora experiences
- Text in red needs confirming (can be done as part of implementation)
Questions raised

The ATTIA Board raised some very specific questions, which are listed below with responses:

1. What is the ownership structure, and what is actually owned by each party?

The Geora protocol is owned and operated by Geora. Geora's software is owned and operated by the Geora Foundation. The project costs in delivering the current pilot as agreed upon are the only costs payable until January 2021. This will change only if there is a decision by ATTIA to engage Geora to build extra applications for an additional use case.

Additionally, as part of this pilot, we are building an application layer specifically for the tea tree industry to engage with the Geora protocol. That application layer is the user interface for tea tree owners to create and store records of TTO. It is owned jointly by ATTIA and Geora. ATTIA is free to use and develop further on the application without Geora once the project is complete.

2. Who is responsible for ongoing costs, and what are they estimated to be?

Geora pays all costs for hosting and running the Geora protocol. ATTIA will be able to use the technology stack, which will be managed and run by the Geora team. The only ongoing cost is the Workflow Execution Fee, which is akin to a software licence fee, and is paid monthly.

Until January 2021, the Workflow Execution Fee has been waived to encourage experimentation and testing on the protocol.

From January 2021 onwards, the Workflow Execution Fee will be charged for two specific workflows: 1. verifying a certificate, and 2. Providing payments services. We anticipate that ATTIA will use the certificate verification workflow to manage the TTO certificates. When these certificates are verified within the protocol, a small fee is charged to the verifier. The total fees will depend on adoption of the protocol but it is expected to be $1.20 per certified 'batch', keeping this a low-cost verification and certificate management tool.

If the pilot is successful and continues in operation beyond January 2021, the application users will be responsible for paying the Workflow Execution Fees on an ongoing basis. ATTIA and the TTO industry are to agree as to who carries the ongoing WEF costs for using the protocol. Beyond the details for certificate verification above, the WEF for payments will be a small to very small percentage of the transaction value, depending on traffic, and altogether more cost-effective than yearly licence costs from major application providers.

3. Who is responsible if things go wrong? What if the unbreakable code breaks? Is ATTIA standing behind the product? Is Geora or is it the individual entity?

This is the whole point of a small pilot trial. Geora, industry and participants can assess and decide on the viability of the protocol and whether to proceed or not.

4. Is this potentially the wrong platform, and or operators, are you comfortable around this issue and other leading technology issues?

I think this is the best, most cost effective and least risky of a series of options that I investigated: one with Mr Butlin and Geora with Mr and Mrs Prather as well as at least 2 others independently that either went nowhere or stalled at the outrageous cost at the proposal stage (one was close to $900,000).

I too remain largely at sea with the concept but my reading and research have convinced me this is the best option and quite possibly the next “chiral” for the TTO industry. In addition:

1. I asked my son (a mining & civil engineer) for advice and research; he agrees it is a good (but, as acknowledged several times, risky) concept

2. Feedback from Michael Anderson (ATTIA Producer Member, and ex-purchasing officer at SCU with a personal interest in blockchain) who went through the Geora/ATTIA contract. Apart from a minor amendment to manage IP (Geora used a stock phrase that didn’t fit) which Geora promptly fixed along with my stop/go decision point (where we are right now), Michael was comfortable with the paperwork and the provider (Geora).

I really can’t comment or expand much further on this – the Geora reports say it all. Alternatively, please feel free to contact Bridie Ohlsson of Geora for further discussion.

I was just as much at sea with chiral as I am now with this but if it is built and then Yannick is allowed to try to break it (you are also welcome to do the same) in a virtual world before it is trilled in a real live grower > trader > manufacturer situation (parties in place and ready to go) I am as confident as I can be that I will have a better grasp of its capabilities and can then, assuming it is not a flop, get the word out to the likes of Walmart, Boots, Young Living, Do Terra etc. to see if they are interested in plugging in and giving it a go. I would bet they are.
ATTIA held an Industry Day at Casino, NSW on Thursday 17 October 2019. The 75 attending delegates (members, affiliates or observers) represented at least 90% of all TTO production in Australia.

Lucas Cullen of Geora presented the concept of blockchain to the meeting and answered questions from the floor. No delegate raised any objection to the concept of using blockchain to secure traceability; indeed, the majority of delegates appeared to fully support the concept if it, as is claimed, can reduce adulteration in the TTO supply chain.
Implications

This project provided background knowledge in blockchain systems to industry stakeholders, built the co-operative relationship with Geora, and encouraged a number of TTO producers to be prepared to trial the next stages of development, implementation and training of the blockchain process on their own businesses. This project has grown confidence in a new complex technology among TTO industry members. It is almost impossible to assess the full implications of this project for reducing the adulteration in the TTO industry until Stages 2 to 4 in the Geora Project Proposal provided in May 2019 have been approved and completed.

Rationale

Many other industries and organisations are facing similar adulteration, counterfeiting or theft issues. They are also considering the use of blockchain to manage traceability. Some examples in more recent media reports are:

1. **Tracing food supply:**
   - Walmart
   - The wine industry
   - The ethical palm oil industry
   - The fresh fruit industry
   - Australian rice (CBA blockchain pilot study)

2. **Real estate ownership and mortgages**

3. **Foreign aid delivery**

4. **High-value goods:**
   - Louis Vuitton
   - perfumers

The potential for blockchain to improve traceability for the TTO industry is dependent on the desire and drive of manufacturers and, ultimately, end-users to know that the product(s) they are buying are ethically produced, and are exactly as they claim on the label.

A blockchain protocol has the potential to include on retail products a QR Code that consumers can scan (not in the scope of the next stages of this project if it is approved). The scan reveals information and assurance that those products have been inviolably tracked from source to shelf, and are precisely what they claim to be. This process is a win for the industry and for consumers.

The potential for this technology to reduce adulteration and increase demand for 100% pure Australian TTO is huge. In 2014, it was estimated that more than half of the approximately two million kg of TTO consumed per year globally, either as the pure product or in TTO-containing formulations, used adulterated material masquerading as TTO. Five years of chiral testing and an educational campaign has reduced this figure somewhat, but it is speculated that up to 30% of the total demand (or 600,000 kg) is from adulterated sources. Any process that can make adulteration more difficult to perpetrate is bound to increase demand for the real product at the expense of fraudulent material.

Of course, there will always be adulteration. The industry has accepted that there are consumers who shop only on price; however, it will be more difficult to use fraudulent adulterated material that claims to be 100% pure when full and verified traceability is available from the leaf to the bottle.

Another important long-term consideration for the TTO industry is the desired outcome (i.e. a physical report or online access to a blockchain registry) to support Department of Agriculture and Water Resources Levies Management Unit with auditing and compliance activities. This support might help the unit to reduce the cost of collection for the compulsory TTO levy.
Recommendations

The recommendation of this project is to move towards the development, implementation and training stages of the Geora blockchain project. This project contributed towards an understanding of the processes, complexity and benefits to the TTO industry and has given rise to confidence in the application of a very new technology and the recommendation to continue on to the next stages.
Blockchain Traceability
for Tea Tree Oil 1

by Tony Larkman
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