Impact Tokenization and Innovative Financial Models for Responsible Agricultural Supply Chains

June 24, 2021

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Agenda

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02 – Event Tokenization & Impact Measurement & Verification in the Agricultural Supply Chain

03 – Monetizing Tokenized Impact as an Investment

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Purpose of Paper

Purpose of Research Paper

This research paper examines how new forms of impact measurement, verification, and tokenization can be leveraged to test innovative financial models that incentivize more responsible agricultural supply chains.

Key Research Findings from Expert interviews

Key Research Findings from Expert Interviews

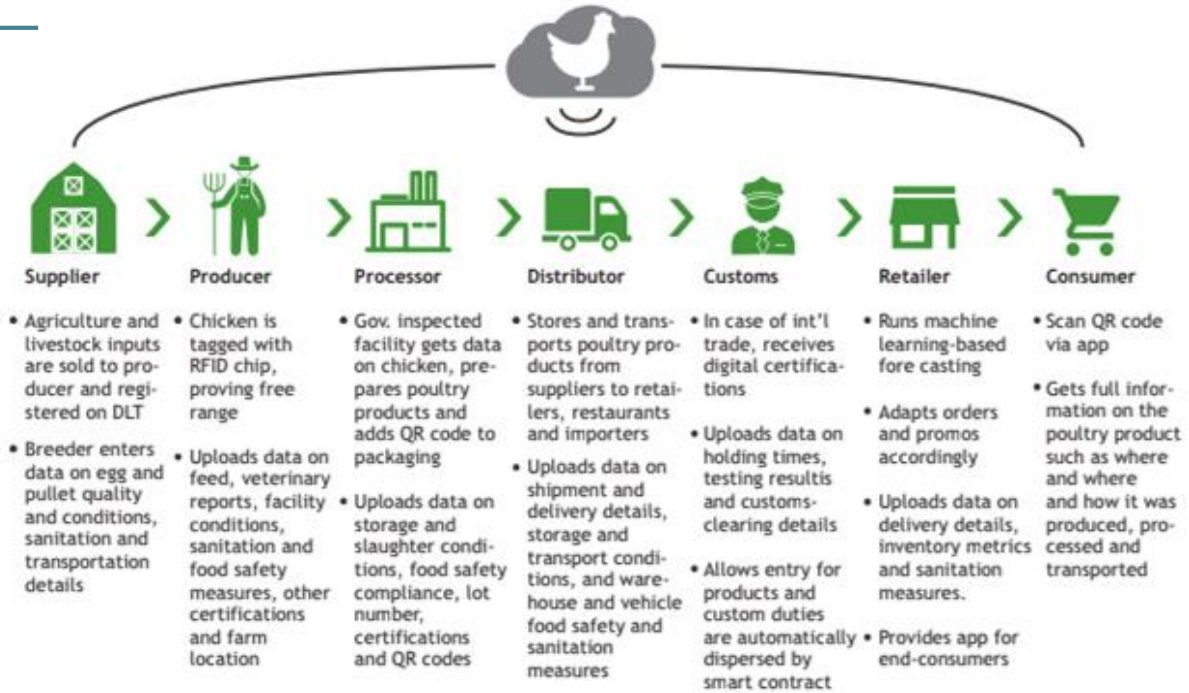
1. **Performance-based financial models** -- where payments are dependent on measurable impact targets -- provide significant opportunity to generate both impact and financial return for investors and can attract a larger pool of impact-first investors

2. Advancements in technology have allowed for **real-time, scalable impact measurement and verification** in agricultural supply chains, which can unlock innovative performance-based financial models

3. Ideal blockchain-based agricultural supply chain solutions are those that **fit into existing financial frameworks,** complimenting current free market incentive structures, and are managed with strong governance practices

Event Tokenization & Impact Measurement & Verification in the Agricultural Supply Chain

Event Tokenization & Impact Measurement & Verification in the Agricultural Supply Chain



Source: Tripoli, M. & Schmidhuber, J. 2018. Emerging Opportunities for the Application of Blockchain in the Agri-food Industry. FAO and ICTSD: Rome and Geneva. Licence: CC BY-NC-SA 3.0 IGO - http://www.fao.org/3/CA1335EN/ca1335en.pdf

DLT and blockchain provide the technical foundation for tokenization of singular events

Distributed ledger technologies (DLT) and blockchain allow for:

- data tokenization
- storage of verified impact data
- securitization and new business and financing models

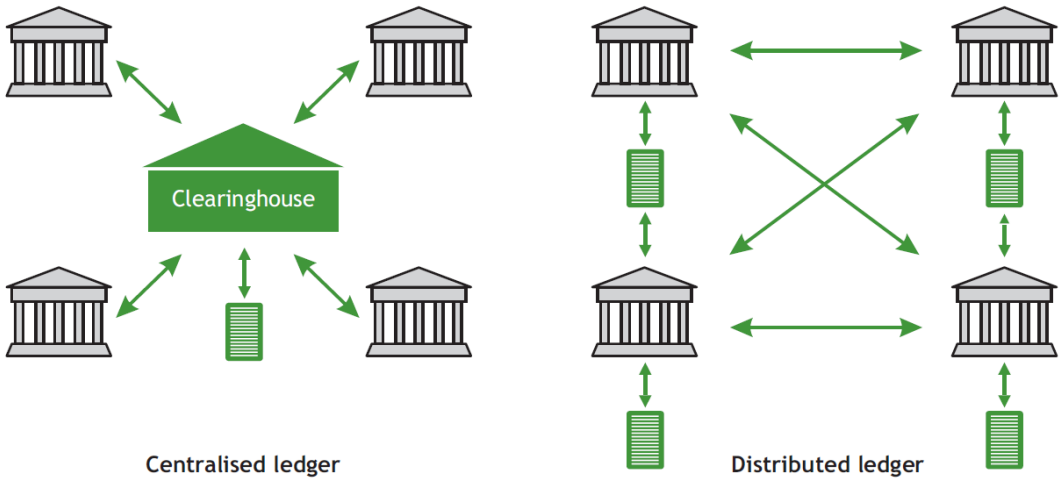


Figure: Traditional centralized ledger and a distributed ledger

Tokenization on individual event level provides the foundation for innovative financing models

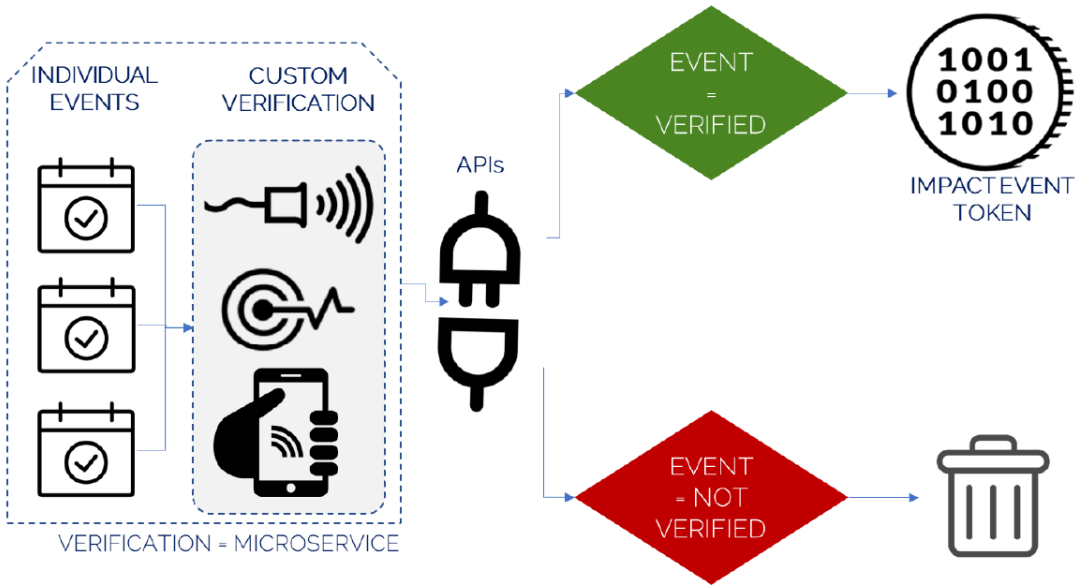


Figure: The minting of impact tokens: Each event has a custom verification model

Source: Proof of Impact Whitepaper (2019)

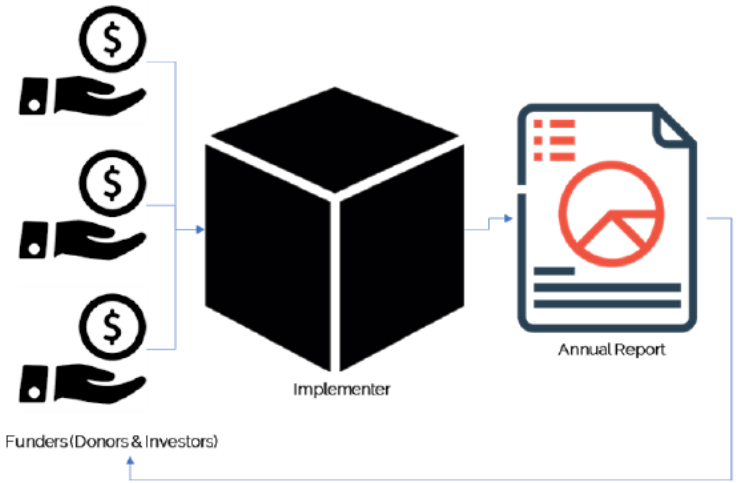
Event triggered performance based token function on smart contracts

Figure: Event-triggered performance-based token

Source: Proof of Impact Whitepaper (2019)

DLT allows for new forms of impact investing, linking directly to outcome

Traditional impact financing



Impact Financing with 100% impact attribution

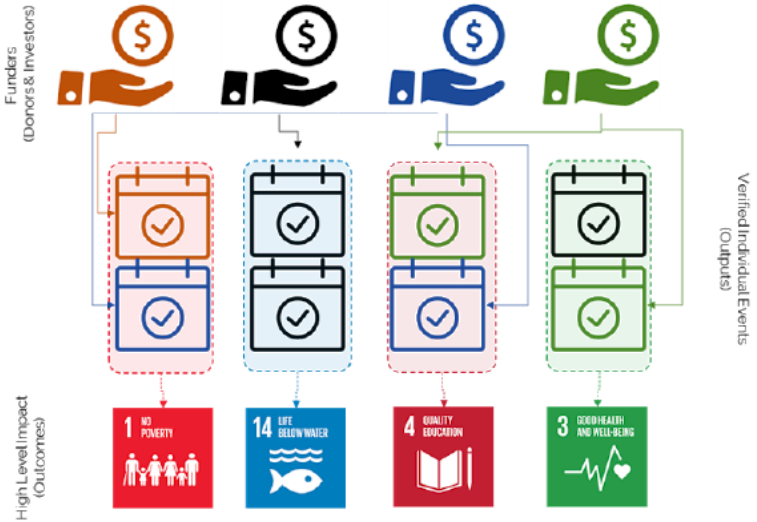
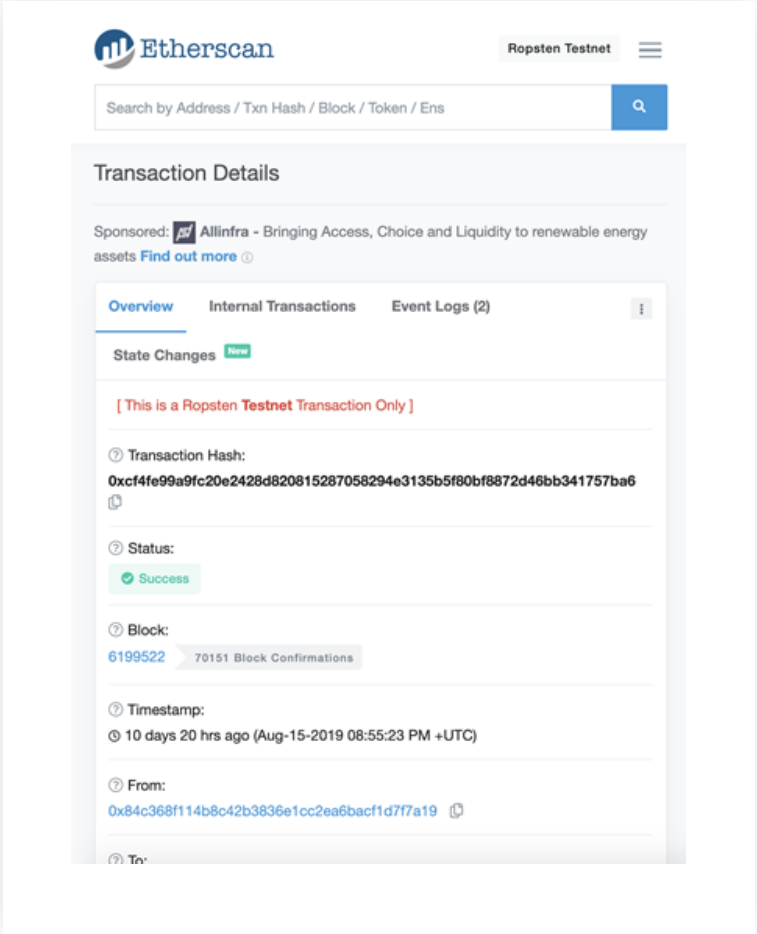


Figure: Comparison between traditional impact financing and output-event based financing

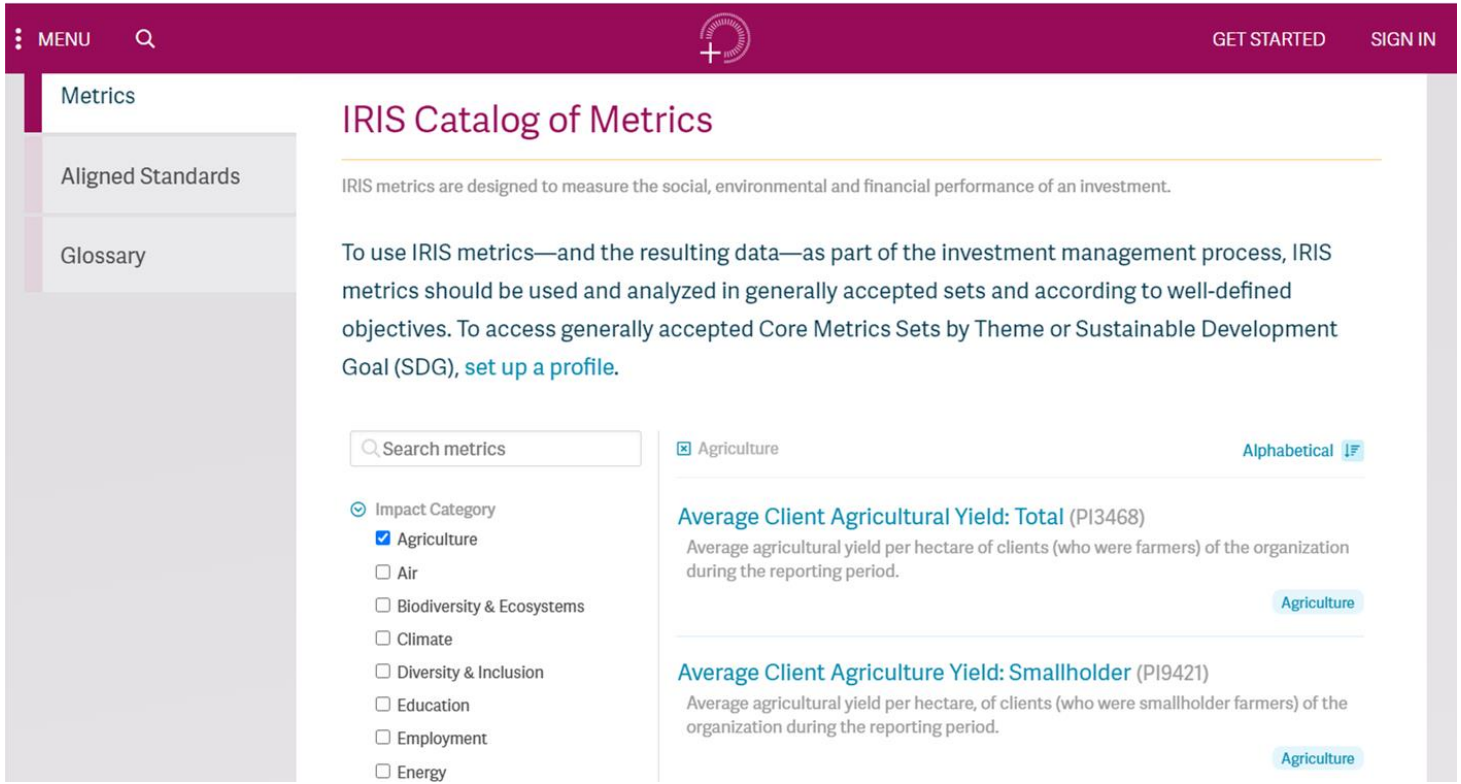
Source: Proof of Impact Whitepaper (2019)

Blockchain as a Tool for Tracking & Verification

- **Transparency:** All relevant data (e.g., location, date, photos, confirmation codes) are publicly available.
- **Immutability**: The data cannot be manipulated unless the community agrees and the change is made public.
- **Attribution**: Each token with the associated data is assigned to one owner -- the person or organization who funded it.



Meaningful Output Measures for Impact



Data as Proof of Impact

Over-humanized data is data coming from multiple human-controlled mobile devices or consensus among multiple participants on the ground. An example of this is mobile app data pulled in real time from multiple workers to confirm location.

Dehumanized data
Is objective data coming directly from non-human sources. Examples include IoT data, satellite imagery of farms, and automated sensor data.

Methods for Technology-Based Data Collection

Spectrum from basic technology to advanced technology (especially with regards to agricultural supply chain)

- Photos/videos from smartphones
- Drones
- Satellites
- IOT/ Machine generated data
- Cross referencing different data sources

Figure: Types of verification in reverse order of reliability

Source: Proof of Impact Whitepaper (2019)

Technology-Based Data Collection

IoT Supply Chain – Farm to Shelf

1

On the farm

- Soil moisture monitoring
- Water consumption
- Leak detection
- Tracking of farm equipment
- Live stock tracking

2

Farm to Warehouse

- Temperature monitoring
- Humidity monitoring
- Light exposure
- Location of truck

3

Smart Warehousing

- Tracking of equipment
- Water metering
- Service buttons
- Temperature and humidity
- Motion detection

4

Optimising Distribution

- Route optimisation
- Temperature monitoring
- Location of produce
- On-time delivery notification

5

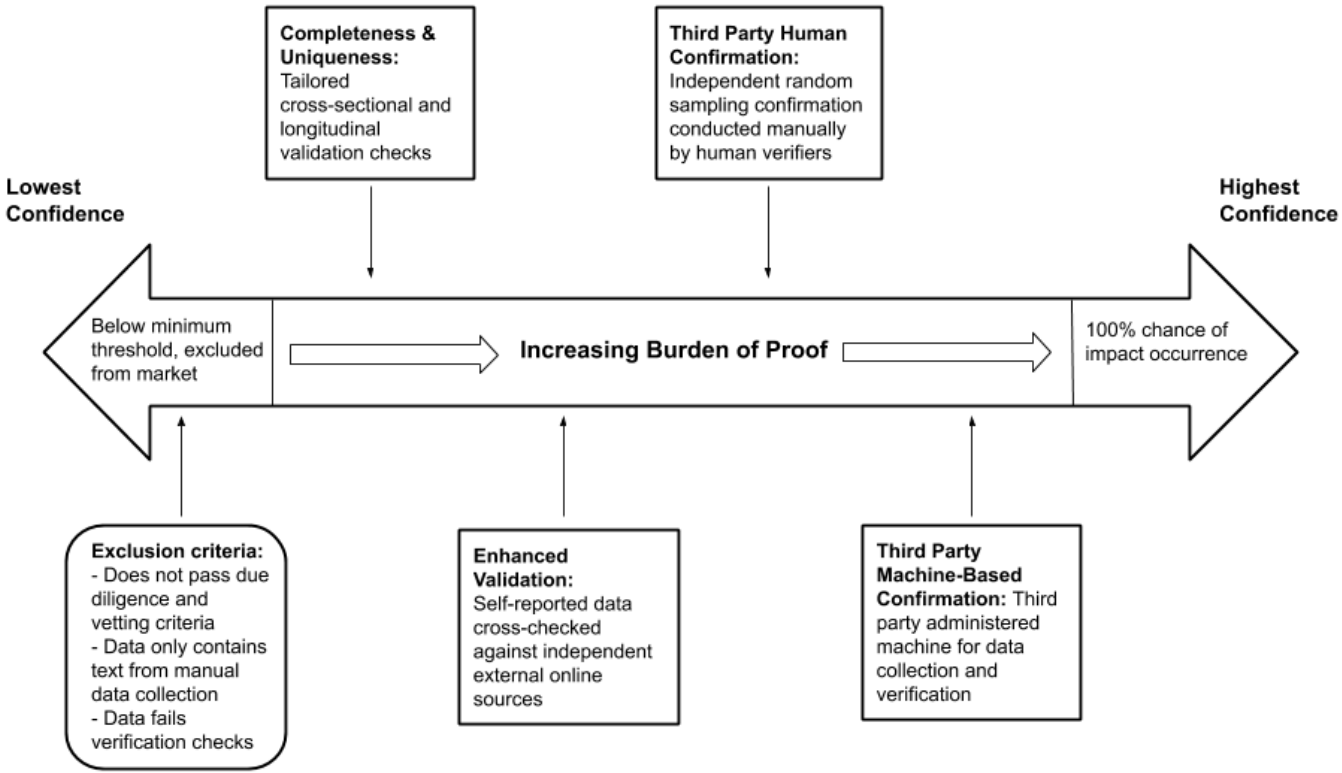
A Satisfied Customer

- Less empty shelves due to late stock
- Maintain optimal temperature
- Monitor fridge power
- Customer satisfaction buttons

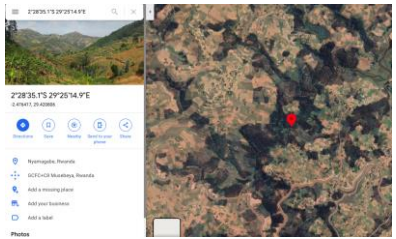
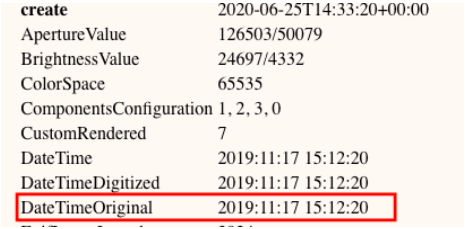
Technology-Based Data Collection (cont'd)

Key Opportunities	Key Challenges
➔ Real-time information ➔ More granular data ➔ Increased reliability and validity of data ➔ Can lower costs over time and increase efficiency	➔ Expensive (in the short-run) ➔ Requires training ➔ Requires workflow adjustments ➔ May require existing infrastructure (e.g., Internet access)

Impact Verification

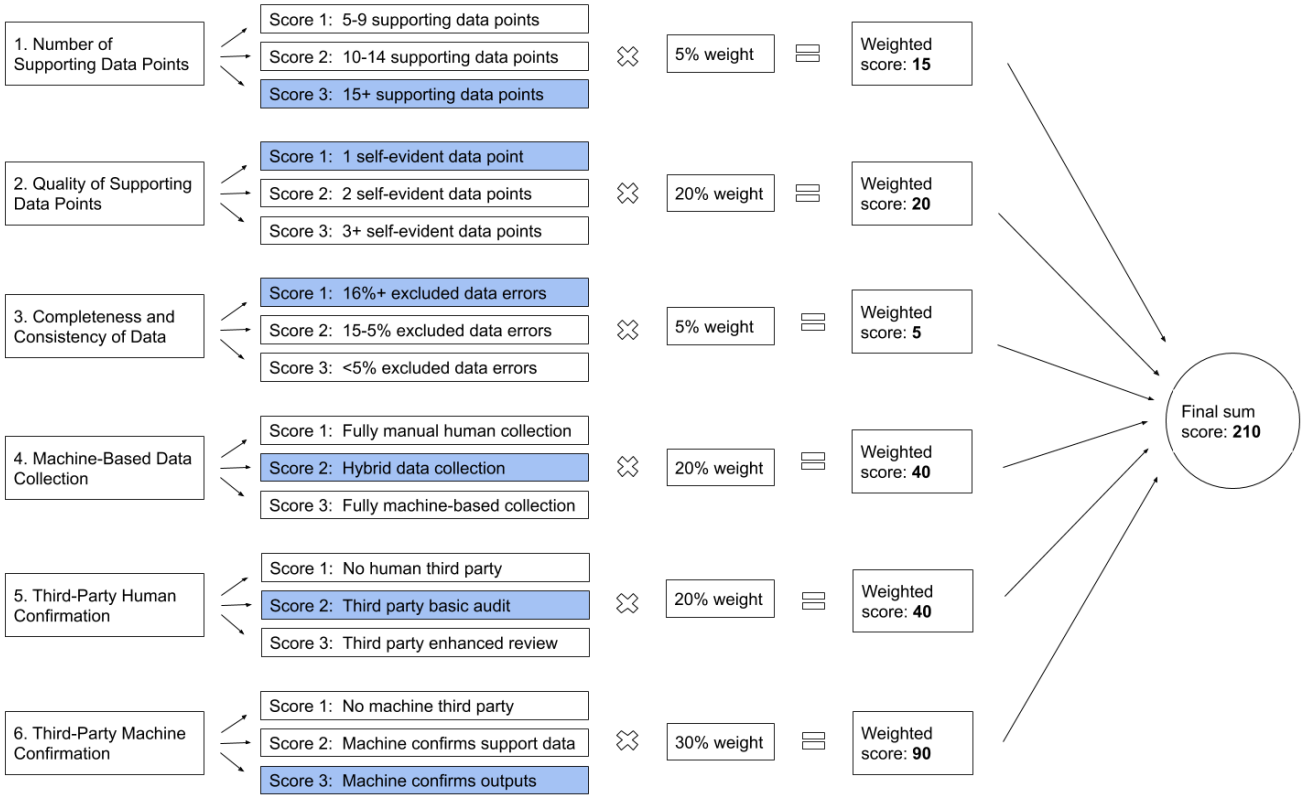


Impact Validation Examples

Validation Check	Example Data Point	Validation Result
Background in photo matches landscape of location on Google Maps	Image with supporting background that matches google map: 	Google map zoom in on the matching background: 
EXIF metadata of the photo matches date of the impact occurrence	Date of impact in image (Nov. 17, 2019): 	Screenshot of EXIF metadata: 

create	2020-06-25T14:33:20+00:00
ApertureValue	126503/50079
BrightnessValue	24697/4332
ColorSpace	65535
ComponentsConfiguration	1, 2, 3, 0
CustomRendered	7
DateTime	2019:11:17 15:12:20
DateTimeDigitized	2019:11:17 15:12:20
DateTimeOriginal	2019:11:17 15:12:20

Impact Verification Confidence Scoring



Case Study: Incentivized Sustainable Supply Chain

Three stakeholders:

1. **Bamboozled**: Furniture brand, specializes in the retail sale of sustainably produced bamboo furniture
2. **Sustain Chain**: Bamboo furniture supplier, needs upfront investment (i.e., loans) for working capital
3. **Sustainable Agrifund**: Impact investor, provides upfront investment capital to Sustain Chain at 7% interest

Goal: Sustain Chain gets rewarded for sustainable production, Bamboozled promotes impact to customers and minimizes risk in supply chain, and Sustainable Agrifund makes financial return while investing in impact

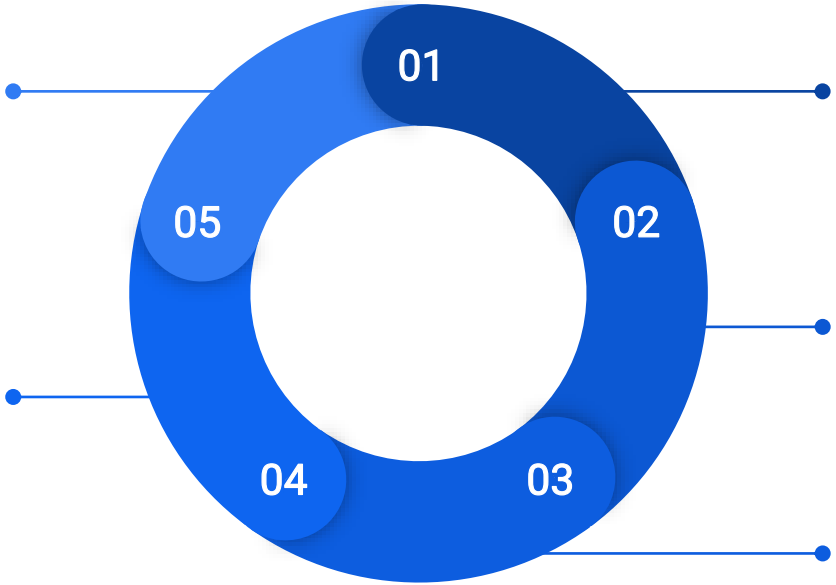
Case Study: Incentivized Sustainable Supply Chain

Incentives for Impact

Sustain Chain hits its targets, Bamboozled continues its purchase orders, and Sustainable Agrifund reduces the interest rate on the loan.

Impact Verification

A third party verifier vets the data to verify achievement of impact targets, then tokenizing the data on a blockchain.



Impact Metric Selection

Sustain Chain identifies meaningful output metrics: fair wages, work hours, work conditions, sustainable packaging, etc.

Data as Proof of Impact

For each metric, Sustain Chain collects proof data: dates, locations, photos, receipts, contracts, HR/payroll records, etc.

Collection via Technology

Sustain Chain pulls data from an its payroll system, CRM, security cameras, bank statements, and utilities for verification.

Monetizing Tokenized Impact as an Investment

Different financial models exist and impact investment is suitable for this use-case

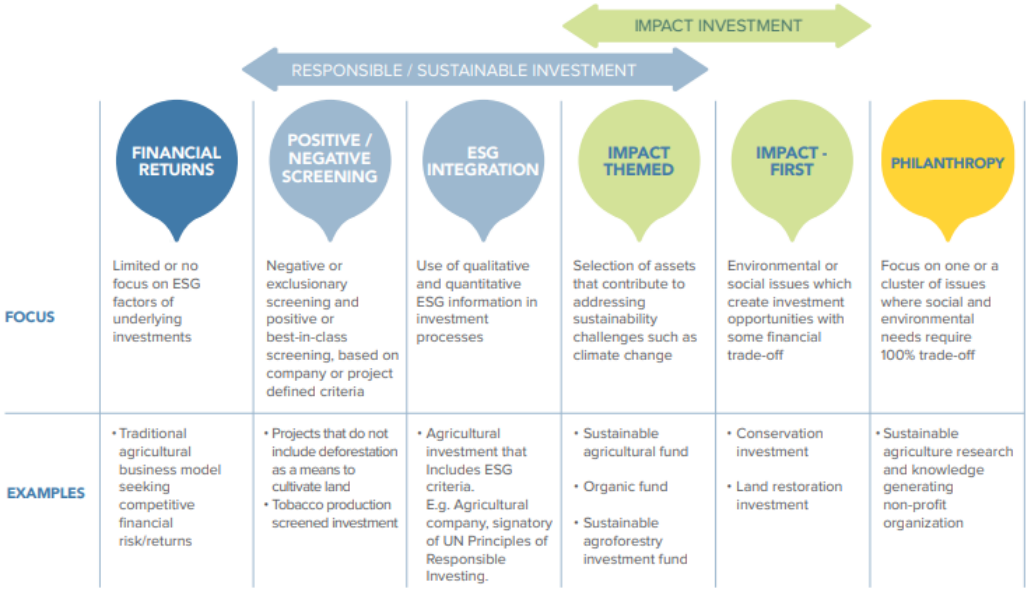


Figure: Examples of agricultural investments along the spectrum of investment options

Source: Principles of responsible investment, Valoral Advisors (2018)

Monetizing Tokenized Impact as an Investment

The analysis focuses specifically on performance-based financial models in which some financial return is based on the achievement of measurable, verified impact results.

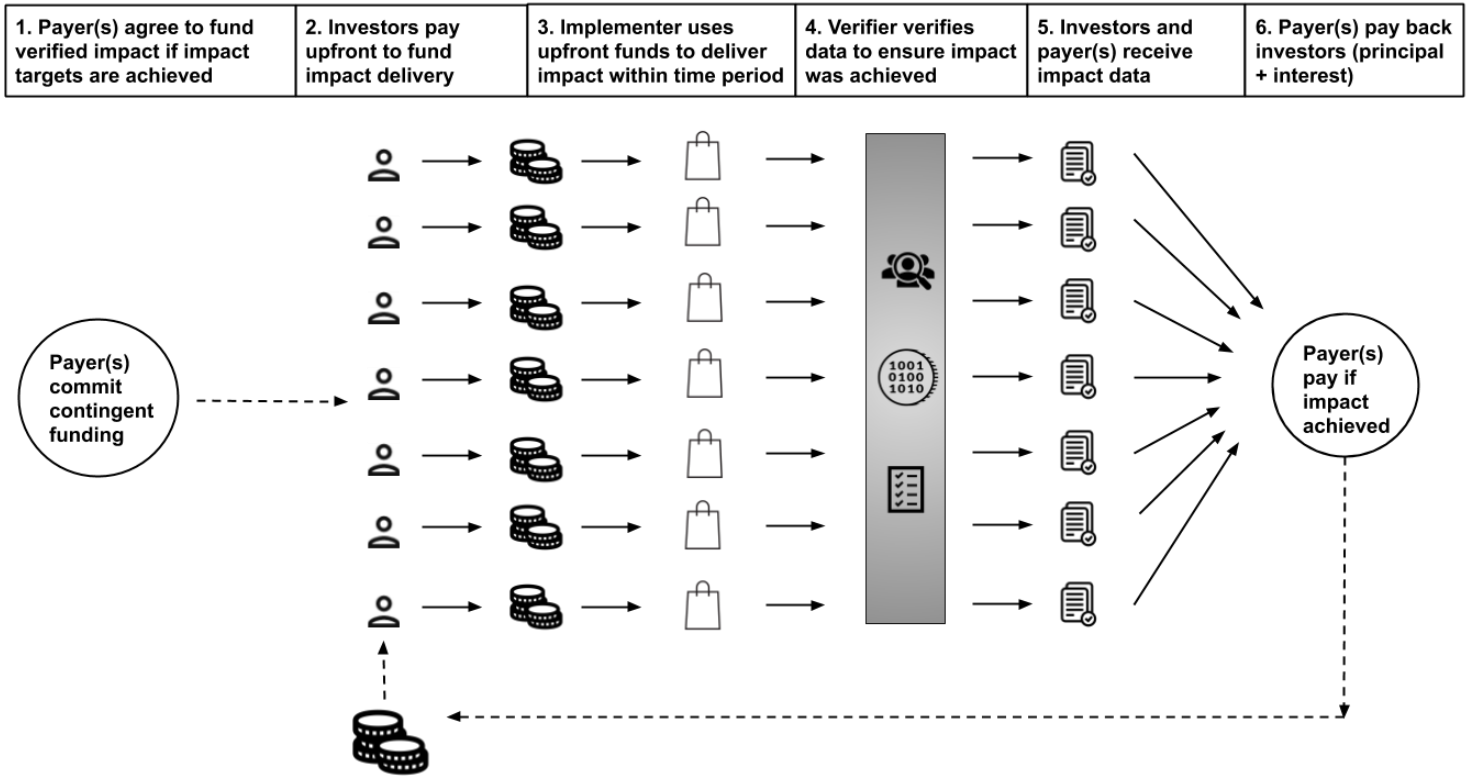
	Performance-based	**Not performance-based**
Interest-bearing	-Pay for Success (PFS) models (e.g., Impact Security, social impact guarantee) -Interest-bearing loan	-Equity investments in impact-focused companies -ESG fund investments -Fixed income bonds -Loan guarantee or loan insurance -Crop or price insurance
Non-interest bearing	-Performance-based donations -Principal-only PFS models	-Principal-only loan -Traditional grants and donations

Financial Models

- Interest-Bearing Pay for Success Model

Interest-Bearing Pay for Success

Interest-Bearing Pay for Success Model



Sub-Model: Social Impact Guarantee

- Operates like “impact insurance”
- Investors commit to pay back the payers (i.e., government or philanthropy) if impact targets are **not** achieved.
- Eliminates “double capitalization” problem

SOCIAL IMPACT GUARANTEES COULD ENABLE PAY FOR SUCCESS CONTRACTING TO SCALE MORE RAPIDLY

George Overholser
Third Sector Capital Partners, Inc.

Recently, a senior government official leaned over the table, looked me in the eye, and asked, “Is this going to get any easier?” “Yes, Pay for Success will get easier,” I responded. “Much easier, I’m willing to bet. But only if we continue to innovate.”

One innovation we are particularly excited about is something we are calling the social impact guarantee. If a government-backed social program fails to achieve social impact, the government gets its money back. And for service providers that don’t want to take on the risk of providing their own money-back guarantee, private funders can offer social impact guarantee financing. That way, if the social service provider is called upon to pay back the government, social impact guarantee funders will step in to write the check. In contrast with the social impact bond (described in Tracy Palandjian’s chapter in this volume), where private funders write checks at the beginning and the government (potentially) writes checks at the end, the social impact guarantee has the government writing checks at the beginning and private funders (potentially) writing checks at the end. You might say that a social impact guarantee is a social impact bond in reverse.

Both of these approaches reach a similar place. The government pays only if social impact is achieved. And both use private financing to offload performance risk from vulnerable service providers. But in many ways, the social impact guarantee approach can be simpler and philosophically more intuitive than the social impact bond.

Results

Results

	Financial Return (30%)	**Accessibility** (20%)	**Replicability** (20%)	**Regulatory Feasibility** (30%)	**Final Score (Average Weighted)**
Performance Based Donation	0	3	3	4	**2.4**
Principal-Only Pay for Success Model	1	3	2.5	3	**2.3**
Impact-Based Loan	3	2.5	2.5	3	**2.8**
Interest-Bearing Pay for Success Model	4	3	1.5	3	**3.0**

Recommendations

Recommendations

- **Recommendation #1:** Support the Development of a Democratized Pay for Success Investment Platform
- **Recommendation #2:** Promote the Piloting of Impact-Based Loans

Questions?