From Hive to Jar: Zambia Honey Traceability Pilot with Nature's Nectar

Between 2024 and 2025, we partnered with **Nature's Nectar**, a leading social-impact honey producer in Zambia, to deploy and test an end-to-end digital traceability system across their supply chain.

Honey is one of the most adulterated food products globally. Without reliable data about who produced it, where it came from, and how it was processed, buyers and consumers struggle to verify authenticity. For high-quality producers, this creates a serious disadvantage.

Our objective was simple: Digitize the hive-to-jar process and strengthen verification — without disrupting real-world operations.

Building Before Anchoring

Before introducing blockchain components, we spent six months mapping Nature's Nectar's operational workflows:

- Farmer onboarding and organic survey capture

- Harvest and intake recording

- Processing and quality assurance

- Batch formation and inventory tracking

In April 2025, the system went live in Zambia.

The first phase focused on stabilizing real production workflows. Farmers and field supervisors captured harvesting data. Factory teams logged intake, processing, and batch outputs. Key traceability events were anchored using Winter Protocol to provide immutability and auditability.

Deployment happened inside live operations — not in a test environment.

What Field Testing Taught Us

Over six months of continuous use, several realities became clear.

Offline-First Is Essential

Connectivity in rural Zambia is inconsistent. Field supervisors cannot rely on real-time submission.

We strengthened the system to support:

- Reliable offline data capture

- Delayed synchronization

- Clear status indicators for pending vs anchored records

Resilience became more important than immediacy.

Real Factories Are Flexible

Initial batch logic assumed clean, zone-based inputs. Real operations were more dynamic:

- Processing happens on a rolling basis

- Multiple zones can blend into one tank

- Tank capacity determines batch formation

- Wax is a valuable secondary output

We redesigned batch modeling to reflect actual factory mechanics and upgraded wax to a fully traceable output.

Verification Before Blockchain

As we introduced credential-linked submissions, one principle became central:

Immutability only works if identity is verified first.

We implemented:

- ADA Handle-linked internal user identities

- Biometric verification prior to submission

- Location metadata capture

The sequence became:

Verify identity → Validate event → Anchor on-chain

This ensures accountability without compromising usability.

Privacy in Financial Traceability

We also tested anchoring farmer payment records using a Merkle Trie batching approach.

Testing reinforced the need for privacy:

- No personal identifiable information stored on-chain

- Only hashed or aggregated commitments anchored

- Verifiability preserved without exposing sensitive data

This creates a responsible foundation for financial traceability.

Data as Insight

During the pilot, we collaborated with the University of Amsterdam to analyze datasets collected.

Findings included:

- Confirmation of low deforestation risk around hive sites

- Environmental drivers of honey yield

- Predictive models for hive placement and yield optimization

Traceability data proved valuable not only for authenticity, but for environmental and operational insight.

From Pilot to Production

After six months of iteration, the system matured into a production-ready version featuring:

- Offline-first architecture

- Flexible batch modeling

- Multi-output traceability (honey + wax)

- Credential-gated submissions

- Privacy-aware financial anchoring

The pilot is now graduating into a scalable solution ready to support additional honey producers.