Beleaf World

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Introduction

Modern society is structured in an ever increasingly connected and globalized world. The digital age enables us to stay connected to family, friends, and world events with relatively trivial barriers to entry. The goods we consume are routinely shipped from international ports, where the sheer scale of this operation means we can get a full 40-foot container from China to Europe for less than $1000.

The other side of this globalization looks very different. Almost 80% of the world's poor live in highly underdeveloped rural areas, depending on agriculture that feeds nearly 70% of the global population for their livelihood.

The true importance of their role in modern society is often not apparent to them and yet routinely preyed upon by malicious or incompetent actors resulting in exclusion from fair pricing, lack of access to efficient capital markets and financial services, and a social security net that we've grown accustomed to in the west.

This paper introduces Beleaf, a vision for how emerging technologies coupled with confident capital markets can radically change how 80% of the world's poor interact with the world, building upon concepts and ideas derived from United Nations and European Union thinking and initiatives into a platform that is commercially viable, robust, and fair.

Background

As the 15th century turned into the 16th in the full swing of the renaissance with England rising to become the dominant power in Europe, wheels began to be set in motion that would lay the foundation of the world we currently experience.

The emergence of the first forms of modern banking and financial instruments such as stocks, overseas colonies that would grow the majority of the world's food, and the complex supply-chains, paper trails, and laws that governed all of this started to begin. These constructs would coalesce around centralized entities in a handful of nations and corporations, turning into a flywheel effect that would see the west propelled into its modern format, with the rest of the world that underpins it routinely left behind to make-do with what little falls outside.

As the 20th and 21st centuries turned around, focusses and priorities shifted. The Green Revolution from 1940 was designed to combat world hunger and brought about the widespread adoption of industrial fertilizers and pesticides. Its introduction caused a massive growth in the amount of food we produce globally, but severely reduced the number of types we consume to just a handful of stables and left significant environmental damage that we're still wrestling with.

At the twilight of the century the arrival of the World Trade Organisation and International Monetary Fund liberalized how we do global commerce, thrusting once again into the world stage smallholder farmers, fair pricing, and food security; the latter becoming a flashpoint on the world stage during the 2007/08 global food crisis.

Around this same time, as the west's attention turned to the impacts of climate change and global warming, focus started to shift to ensuring the long-term viability of our food supply chain, the impact it has on the environment, and what to do about the inordinate strain it places on our biomes; with 26% of greenhouse gas emissions, 50% habitable land use, and 70% freshwater consumption today all going to agriculture.

Landscape

International agriculture markets run on extremely tight economics. Impacts in the price of fertilizer for example, can lead to cascading knock-on effects downstream. Major market speculators and commodities traders make the global market exceptionally efficient compared with isolated localized ones but are also massive drivers behind unfair pricing to producers; as intermediaries squeeze every piece of profit possible out of the system to ensure their own interests are protected in an ever-competitive landscape.

This fragmented, yet cutthroat environment is one of the primary reasons that the only organizations that have taken serious investigations into how to radically change the space and bring it in-line with modern, ethical, and equitable standards are NGOs and other non-profit institutions, who themselves alone are not equipped to deliver a market driven solution.

The almost complete lack of transparency within the food supply chain makes traceability and provenance of the food we consume almost impossible. The proliferation of food and transport standards juxtaposed with little serious leadership in the space fragments our ability to bring these systems into a single coherent form that we'd expect in something so critical to the world.

Deployment of technology to address these issues is patchy and incomplete. With the vast majority of where it is needed in the world incredibly underdeveloped and undigitized, but lacking a formal, efficient capital market that would allow for market-led solutions to really be explored.

The UN Development Goals

Under the United Nations Development Programme (UNDP), there has been considerable attention being given to initiatives that can solve these problems.

They highlight key metrics they're measuring such as the $40 Billion in damages caused by fraud in these systems, and the sheer need of efficiency required to handle the population increases we'll see by 2050.

They themselves also highlight the fragmentation of the space, and how difficult it is to deploy technology into this space, further refining our thinking that anything short of vertically integrated solution will be insufficient to tackle the complexity of the end-to-end supply chain.

Vision

BeLeaf sets out a vision of a platform to not just meet the expectations of UN and EU desires in the space – be it across traceability, equity, or environmental impact – but exceed them.

By vertically integrating the entire stack, from produce monitoring, to logistical tracking, trade and settlement, and financial services, we will create a platform that empowers the poorest individuals and families the world's developing nations, equipping them with the tools they need to understand their value in the global supply chain, access and negotiate in fair exchanges, and verifiably prove their reputation on the market.

The risks associated with entering the market to tackle just a single fragment will be eliminated as we design a whole new ecosystem, building upon blueprints laid out

by UN, EU, and Bay Area thinking, and supported by government level rollouts to maximize market penetration.

Western priorities to better understand where the food we eat and the impact it has on the environment will be realized as traceability – integrated as part of a complete solution and not side though – enables instantaneous understanding of its footprint.

Developing nations will be able to unlock the benefits of a mature and efficient capital market, bringing access to resources critical for their sustainable growth and financial freedom to millions of families who for generations have been completely unbanked.

Approach

Our approach is defined as 2 main phases, though with large amounts of overlap and parallel execution in terms of their delivery. This can then be defined by 2 main categories of users; those in the west with access to technologies that we would consider normal and appropriate, and those in developing markets that have very limited access to digital services.

Phase 1 will be the development of the core exchange platform.

Phase 2 is predicated on our platform not product thesis.

Vertical integration of each step of a trade, from listing produce, negotiating Incoterms, tracking the produce from the farm to the final destination through however many required merchants, and with trusted and verifiable international payment rails.

Much like how emerging "super apps" work, we'll invite select partners to come and build in-ecosystem, bringing financial services such as insurance, savings, and derivatives.

New and differentiating players will be empowered to provide even more value to the ecosystem with an aligned value proposition, but in a manner that isn't fragmented and difficult to navigate.

Approach
(continued)

This transformed user experience is critical to the empowerment of those in the world who have limited access to technology or information. International terms of Commerce (Incoterms) are exceptionally hard to navigate, especially for individuals who have only ever experienced being a farmer.

BeLeaf will put the power of AI Large Language Models to work, creating an experience that cuts away all the complexity and provides every single farmer with the power of a trusted domain expert; be it in negotiation, insurance, logistics, or anything else.

Radical transformation of global agriculture trade will not occur without eliminating the barriers of entry to information and

understanding. Incoterms, despite their improvements in recent years, are still obtusely complicated for smallholder farmers whose lives – for generations – have only been farming. This is why BeLeaf will make deliberate design choices around the user experience – especially for the producers and brokers – that will eliminate these barriers of entry, ensuring everyone's experience on-platform is agentic, supportive, and seamless.

Similarly, the interconnected world of modern finance is also a nebula that we believe farmers should not have to understand how to navigate to ensure their financial security, and freedom. BeLeaf will build and maintain its own financial products and settlement layer – starting with the exchange – powered by blockchain technology.

Platform Architecture

In-line with our platform not product approach, BeLeaf contains multiple moving parts.

This section will outline each of these core components, their value proposition and their touch points both inside and outside of BeLeaf.

Platform Architecture

Exchange

At the heart of BeLeaf is a radical new approach to the buy and sell of agricultural products. Solutions to traceability, fair pricing, and financial transparency all begin with changing how we do commerce, meaning the exchange needs facilitate that.

Whilst for purchasers and brokers, this might look like any traditional marketplace or exchange they're used to, negotiation and Incoterm generation works very differently, with the experience that farmers and cooperatives are getting radically different.

Listers of produce will not need to navigate or understand the additional complexities of trade other than stating what they've produced and how they're prepared to get it onto the market in a natural language conversation. The BeLeaf AI agent will ensure it has enough information to handle all of the complex steps of listing and Incoterm writing, making it clear to the farmer what their opportunities and obligations are in a manner that feels very natural to everyone; conversational.

Platform Architecture

Incoterms

Given we're abstracting away the complexities of Incoterms who do not want or need to navigate them, we'll be creating a new class of digital asset built on the technology foundations laid by NFTs and perfected by ERC-3643 tokens.

Once all parties agree to their terms, we'll mint on-chain and distribute to each of the members of the agreement their specific token that represents their terms.

These tokens will then form the backbone of the payments and settlements layers, also done on highly liquid and scalable public blockchains, with payments being acknowledged and released as BeLeaf tracks each obligation being met.

Platform Architecture
Settlement

Our current institutional finance rails are no longer fit for purpose.

They're slow, brittle, and ripe with fraud.

BeLeaf will turn to blockchain based payment settlement and trade, leveraging the highly liquid stablecoin markets on public blockchains such as Base ensuring everyone can make safe and secure international transactions with minimal fees and overhead

Platform Architecture

Wallet

To ensure everyone has equal and fair access to the settlement layer; and thus, can trade with the world, we've partnered with a leading UK cryptography firm, Arqit, as their pilot launch program for their new embedded retail wallet.

This is being built in collaboration with work that senior Sibylline engineers have developed over the last 2 years as leaders in ERC-4337 account abstraction.

Every user of BeLeaf will get a free, non-custodial, smart contract wallet, that features social login with private key recovery, key-device provenance ensuring that even in the event of a private key compromise users funds are safe, gasless transaction rails, and native transient ramping for authorized users, ensuring a seamless transition into the ecosystem without any prior knowledge of crypto.

ARQIT

Platform Architecture

Integrated Supply Chain

Creating a complete supply chain experience is a twofold challenge.

Firstly, we need to integrate with existing suppliers up and down the various levels of the chain, from local distributors, to international shipping companies, ensuring we can create and track produce from anywhere in the, to anywhere else in the world our buyers need it. Each stage of the supply chain will have identified partners and programmatic hooks into the BeLeaf platform, inline with our need to transform how smallholders experience the international stage of shipping.

The second component is bridging a fully fledged IoT platform into the platform to provide complete, high-fidelity tracing of environment and condition of the produce from start to finish. BeLeaf will become the distribution platform for millions of IoT devices, each one tracking the light, temperature, location, and dozens of other metrics about millions of tonnes of produce, providing complete insight and feedback on the quality of goods from farm to table.

This second stage represents one of the flagship use cases for IoT that has been championed by the vendors, and indeed the UN themselves, but struggles with getting significant traction due to scalability of distribution, despite the proven quality of the concept itself. The vertically integrated nature of BeLeaf unlocks what will become a key distribution channel for getting these devices into the 70% of the supply that's highly non digitized, creating a sudden and sharp shift towards a completely digitized chain, whilst removing the complexity of tool sprawl by keeping the experience native and in-platform.

Platform Architecture

Reputation

Given the immutable nature of blockchains, and the vertical integration of the rest of the supply chain system, especially including holistic logistical tracking, we're now able to provide a highly robust reputation system that goes beyond simple review-based systems.

Consistently provable, to-specification deliveries, tracked end-to-end using the native logistics tooling, and all recorded on-chain for provenance, provides the foundations for a reputation and reporting system that is inherently resistant to fraud.

Fake accounts will be impossible to create and fake since there will be no on-chain evidence of their authenticity. Complaints of quality will have a proven trace of the produce's environment from start to finish, allowing us to pin-point the exact moment of degradation in qualit

AI Agent

An essential part of the BeLeaf stack is the AI Agent that assists users with every single part of the process of creating, listing, selling, and shipping produce.

The agent itself is a fine-tuned LLM that has deep domain knowledge of Incoterms, agriculture, and the capabilities of the platform. It features industry-leading RAG capabilities and function calling capabilities ensuring it's capable of both assisting its user with the most up-to-date and personalized information from the platform by reading their previous order history and obligations, and by performing the actions themselves from a conversational approach.

It's this agent that underpins our abstraction layer for Incoterms. These are highly complex documents, but fundamentally just text documents that with sufficient tooling and tuning can be mastered by LLMs. What

this means in practice is that users can describe what terms they're looking for ideally, or those they'd accept conditionally or not at all, as you would to a broker; people who know your true intentions and desires better than any computer-based system. Armed with this insight, the AI agent can create, negotiate, and draft terms on your behalf with a high degree of confidence,

This is a radical step away from any traditional mechanism for smallholder farmers to list their produce on the international stage; eliminating barriers of entry to all of them and providing a fair and equal playing field for all. The text-based nature of this approach also means that the digitization requirements of these platforms are minimal. A simple cheap android device with a very low-bandwidth internet connection is sufficient for them to unlock this opportunity, but doing so in a manner that isn't daunting.

Finance Suite

With the fundamental groundwork of the platform in place, capturing, securing, and monitoring trade for smallholder farmers, financial products can begin to enter a maturing market.

This is where the real value capture starts to emerge.

Finance Suite
Debt Tokenisation

As mentioned in our banking infrastructure, BeLeaf users will be able to transact and store value using stablecoins; on-chain tokens that represent some underlying asset, the most common being USDC or USDT, which are underpinned by massive liquid dollar reserves (cash or US Treasury bills)

Stablecoins enable fast, cheap, international transactions without the complexity of the traditional financial infrastructure. They represent the foundation of the financial tooling that BeLeaf can be built upon.

One of the biggest challenges for most businesses in developing markets is their access to investment capital to continue to grow and operate their businesses. One of the root causes is the difficulty in creating accurate risk profiles for these farmers due to the informal economy, lack of visibility into their accounts books, and untrusted audits.

BeLeaf is fully vertically integrated, meaning we have an innate ability to build a holistic risk profile for each farmer or cooperative, predicated on their financial profile, current order book, and real-time data monitoring from our logistics and IoT partners.

These models can be leveraged to create and issue debt that can then be "tokenized" and listed on blockchain protocols for purchase, rather than requiring individual capital partners and LP's to buy them from you.

Finance Suite
Tokenisation

To tokenize an Off-Chain Asset (OCA), the asset must first be digitized. This can be done by creating a digital representation of the asset, such as a digital deed for a piece of property or a digital certificate of ownership for a share of stock.

Once the asset has been digitized, it can be tokenized by creating a smart contract that represents the asset on the blockchain.

The smart contract will define the ownership rights of the token holders, as well as the terms and conditions under which the tokens can be transferred. Once the smart contract has been deployed, tokens can be issued to represent the ownership of the OCA.

Crypto tokenization of OCAs has a number of benefits, including:

- **Increased liquidity:** Tokenized OCAs can be traded on decentralized exchanges, which can make them more liquid than traditional OCAs.

- **Fractional ownership:** Tokenization allows for fractional ownership of OCAs, which can make them more accessible to smaller investors.

- **Transparency:** Blockchain transactions are transparent and immutable, which can provide greater transparency and security for investors.

- **Reduced costs:** Tokenization can reduce the costs associated with trading and managing OCAs.

Since BeLeaf is the issuer of the debt, this tokenization process will be done by us, and thus we can govern the percentage of the yield that is passed to token holders, and the fees we collect in the process, as the broker and custodian of the digitized asset.

Finance Suite
Decentralised Yield (Defi)

Simply being banked and holding onto currencies, in the form of stablecoins or otherwise, is insufficient.

As inflation continues to rise, farmers deserve access to financial products that in turn allow them to take advantage of return on investment of unused capital, namely deposits.

Our banking infrastructure will enable all farmers to access various types of yield returning products, powered by blockchains mature DeFi protocols and products.

By integrating each of these protocols as a seamless experience within the BeLeaf financial app, the same one they use to bank and transact with, the user experience becomes akin to that we find in modern western Neobanking apps, where accessing savings-style accounts is as trivial as moving money between accounts, just leveraging on-chain primitives, rather than traditional financial institutions.

EPILOGUE

Keith Rabois, General Partner at Founders Fund, once famously tweeted;

'Formula for startup success: Find large highly fragmented industry w low NPS; vertically integrate a solution to simplify value product.'

BeLeaf holds this idea as a strong north star for how we think about bringing the right value-chain to the next generation of smallholder farmers.

It's clear that whilst even some of the largest institutions on the planet, such as the UN, have explored full or partial implementation of some of these technologies to solve these challenges, they've struggled to find a true market-led solution that can truly disrupt the sector.

Financial products with strong data moats have consistently proven to be highly robust revenue streams for companies of various sizes, from Apple's consumer credit offering that cost Goldman Sachs $4Bn, to Ramp's startup finance offering which has grown to $100ARR in just 3 years.

We believe that this recipe lays a strong foundation for bringing real transformation to smallholder farmers, where their interests are aligned with those of western institutional bodies which have long struggled to find a way to deploy expensive emerging technology.