

FUTURE FOODS RESTORING A HUMAN CONNECTION

WHY THIS INFOSHEET?

Agri-food technology is developing at such a fast pace that it is almost impossible to keep up with all the new knowledge and insights coined by tech pioneers. In a series of three info sheets, Fairfood and CTA aim to collect current challenges and share possible solutions, in order to create a shared learning curve within our [Blockchain for Agri-Food community](#).

HOW CAN NEW TECHNOLOGIES HELP RESTORE THE HUMAN CONNECTION IN OUR FOOD CHAINS?

In recent decades, the human connection within our food system has all but disappeared. Consumers often have no idea who produced their food or where it even came from, let alone what the social and environmental implications of the production process are. Meanwhile, farmers have no idea where their products end up and what a consumer is willing to pay for it and based on which criteria. The only thing left for them to compete on, is price. The radical transparency offered by blockchain technology has already been presented as a potential solution to reintroduce the human connection to our food chains. In this info sheet, we'll explore the ways in which digitalisation and blockchain technology can help bridge the gap between farmers and consumers, so that our food chains can operate on a more holistic basis.



2025: MEET SMART CONSUMER LORETTA, LONDON

Together with her husband and two young kids, 36-year-old Loretta lives in a suburb of London. Every morning she rides her bike into town, where she works as a brand manager at a design agency. She tries to come in before everyone else, so she can get in thirty minutes of reading news articles before starting her workday.



Those articles are usually the bigger background stories that bring existing systems into question and are critical of the status quo. Loretta is what you could call a 'woke' consumer; she takes a sincere interest in the story behind the products she buys – and in Loretta's case, a special interest in the food that she and her family consume. Years ago, this led to her to cross meat off the menu, but more recently she's become more aware of the subject of social sustainability.



Over the past few years, Loretta has noticed an increase in apps that help her answer questions like, 'where did this orange originate from?', 'what is the ecological footprint of these bananas?' and 'are the people cultivating my olive oil making a decent living?'. This has completely changed her shopping experience. QR-codes on packaging allow her to explore the history of the products she buys. Based on this information, Loretta has consciously chosen a number of brands that she's loyal to - for now that is, because there is always room for improvement.



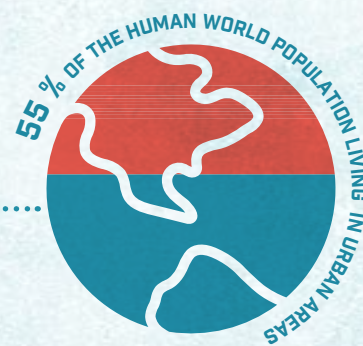
To Loretta, it's about the world she leaves to her children, and to the children of the people producing her food. Additionally, she tries to teach her children to do good, and to give them a proper food education. An app she recently discovered allows her to actually introduce her children to the people producing their food. How tangible it all became, the moment she saw her children interacting online with the children of the farmer who produced their avocado's.



THE BIG DISCONNECT

In today's world, we have lost the connection to the origins of our food. 55 percent of the human world population currently lives in urban areas. A number that is expected to increase to 68 percent by 2050 (1).

IN 2020



BY 2050

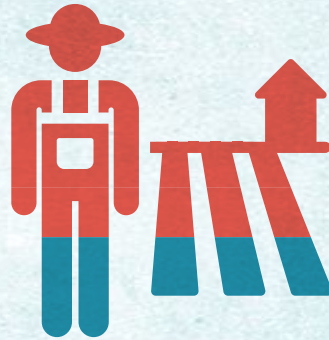


±30 YEARS AGO



44% OF THE GLOBAL WORKFORCE IS DIRECTLY INVOLVED IN AGRICULTURAL PRODUCTION

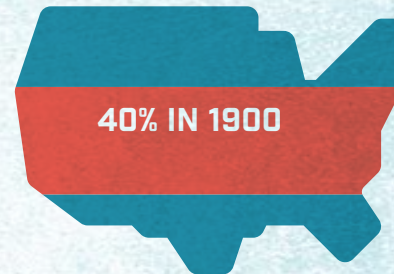
TODAY



< 30% OF THE GLOBAL WORKFORCE IS DIRECTLY INVOLVED IN AGRICULTURAL PRODUCTION

Less than 30 percent of the global workforce is directly involved in agricultural production, compared to 44 percent a mere 30 years ago (2).

Countries such as the **United States** have seen an even more staggering decrease; from 40 percent in 1900, to just 2 percent today (3). Due to large scale industrialisation, advancements in agritech, genetic modification and the use of fertiliser and pesticides, the total yield per hectare of land went up significantly in most countries over the last century.



40% OF THE GLOBAL WORKFORCE IS DIRECTLY INVOLVED IN AGRICULTURAL PRODUCTION



2% OF THE GLOBAL WORKFORCE IS DIRECTLY INVOLVED IN AGRICULTURAL PRODUCTION

UNITED KINGDOM



IN 1900
2 TON PER HECTARE



IN THE 2000'S
8 TON PER HECTARE

In the UK, wheat yield went up from about 2 ton per hectare in 1900 to over 8 ton in 2000's (4).

The Netherlands produced 236 million kilos of pork in 1950, compared to 1,5 billion in 2018. In 1950, the country had 410 thousands farms, while today that number has decreased to a mere 54 thousand, according to the nation's central statistical office (CBS).

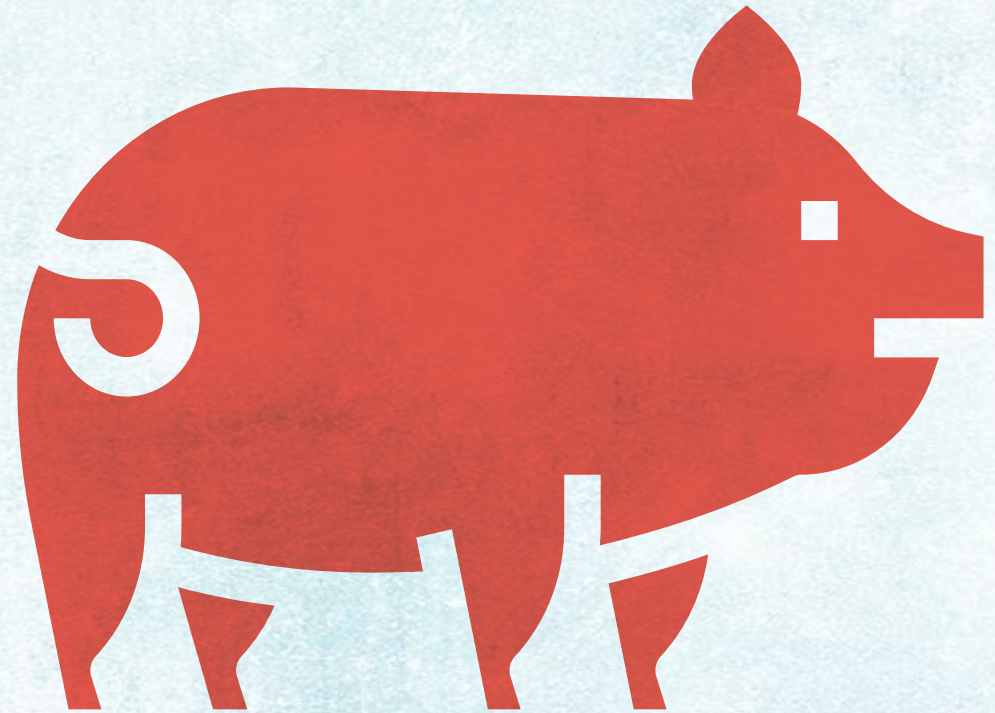
Countries focus on large scale production of a handful of crops, of which the bigger share is meant for export. All other products needed to feed their population are imported. As a result, our food supply chains have become increasingly scattered, long and complex, and the people producing our food are too far away from us to see, literally. By now, most of us know nothing about our food; let alone where it comes from or who produced it.

THE NETHERLANDS



IN 1950: 236 MILLION KILO'S OF PORK / 410.000 FARMS

TODAY: 1,5 BILLION KILO'S OF PORK / 54.000 FARMS



“A MAJORITY OF TODAY’S CONSUMERS ARE AT LEAST THREE GENERATIONS REMOVED FROM AGRICULTURE, ARE NOT LITERATE ABOUT WHERE FOOD COMES FROM AND HOW IT IS PRODUCED, AND TEND TO HAVE HIGH EXPECTATIONS,” THE NATIONAL INSTITUTE FOR ANIMAL AGRICULTURE WROTE IN A REPORT IN 2012 (5). “BECAUSE THESE CONSUMERS DON’T KNOW THE PEOPLE WHO PRODUCE THE PRODUCT, THEY ARE DRIVING REGULATIONS FROM A BASIS OF NON-TRUST RATHER THAN A BASIS OF TRUST.”

It is a common issue, the divide and - as a result - the misunderstanding between farmers and consumers (6). Consumers have increasingly high expectations of farmers in terms of sustainability, animal welfare and food quality, while farmers all over the world are already struggling within the food system as is. Many of them are trapped within systems that were built for mass production. They can't even begin to think of a more environmentally friendly business plan before their huge bank loans have been paid off. Others struggle to just make ends meet – to simply feed and educate their children. Can we really expect them to invest in new, more sustainable production methods, when this is their reality?

The challenge is clear, but not easy; we will have 9 billion people to feed by 2050, which we'll have to do in a dramatically more sustainable way, without bankrupting the world's farmers. To do this, we need to bring trust and accountability back into our food system. By opening the black box on our plates and creating radical transparency, we can once again see who is involved in the production process and what the social and environmental implications of that production process are. We have to restore the connection between farmer and consumer, so that we can work towards a better food system for all together.

“BACK IN THE DAYS, EVERYONE HAD A FARMER IN THEIR FAMILY OR KNEW THE STORY OF HOW OUR FOOD IS PRODUCED. NOWADAYS THERE IS MUCH MORE DISTANCE. WE WANT TO INVOLVE CITIZENS IN WHAT WE ARE DOING. POLITICS WILL FOLLOW CITIZENS IF THEY FORM A CERTAIN OPINION.” - RONNE SMOLDERS BOARD MEMBER AGRACITIE, DUTCH FARMER LOBBY ORGANISATION (7)

CHALLENGES STEMMING FROM A DISCONNECT BETWEEN FARMERS AND CONSUMERS

LACK OF INFORMATION AND FEEDBACK

Today's food chains are structured in a way that keeps smallholder farmers from knowing where their products end up. Information about, for example, (changing) consumer preferences and potential quality gains, are reserved for the big food brands in the West, causing an immense imbalance of knowledge.

Knowledge equals power; without it, farmers have no way of improving their products, to generate a better price. It's like a Bangladeshi farmer who traveled to several countries in a quest to learn said to the Food and Agriculture Organization (FAO): "Before, our condition was just like a frog living in a cave. When we came back from these countries we realized that we had been in the darkness. We accumulated so much knowledge." (8)

“SMALLHOLDER FARMERS ARE OFTEN BASED IN RURAL AREAS, FAR AWAY FROM THEIR CONSUMERS. THEY DON'T GET TO INTERACT WITH THE END CONSUMER; THE FARMERS MIGHT NOT EVEN KNOW WHAT THE END PRODUCT OF THEIR HARD LABOUR LOOKS LIKE, OR HOW IT TASTES. ONE CONSEQUENCE OF THE WAY FOOD SUPPLY CHAINS ARE CURRENTLY STRUCTURED, IS THAT THE FARMERS MISS OUT ON THE OPPORTUNITY TO SHARE INFORMATION ABOUT THEIR PRODUCT AND, THE OTHER WAY AROUND, TO COLLECT INFORMATION ABOUT CONSUMER PREFERENCES.” - KIRSTEN COPPOOLSE, CHIEF OPERATING OFFICER THE NEW FORK (9)



RACE TO THE BOTTOM

One of the main consequences of the lack of consumer feedback is that farmers do not have the knowledge or incentive to produce higher quality products. Moreover, their produce will most likely end up on a large pile anyway. This leads to a race to the bottom in both pricing and quality, as there is no way for better quality producers to stand out and charge more for their products. One of the few things, if not the only thing left for them to compete on, is price.

FOOD FRAUD

Consumers buying horse meat labeled as beef. It happened in 2013 throughout Europe. How can you know what is actually on your plate if, from a consumer point-of-view, the supply chains of our food are clouded and untransparent? The lack of a connection between consumer and farmer leaves a lot of room for food fraud. "Consumers need to be more savvy", says the deputy chief food safety officer from the Canadian Food Inspection Agency in reaction to a case of food fraud. "We need to understand how food is produced, where it comes from and be more aware when it comes to product labelling."(10)

LACK OF AGENCY

How can consumers take responsibility for the food on their plates, if they have no way of knowing where it came from? "It is important that they [consumers] know that food production has a major impact on our living environment," the Dutch Government stated in a report on the future of Dutch agri-culture, promoting a more connected food system. "This requires a shift in thinking, as until now the majority of consumers still choose low prices and high convenience, whilst at the same time many people are making higher demands of their living environment and of the farmers and growers who work in it."(11)

INEFFICIENCY

Consumers who have lost their connection to the origins of their food, also allow for an inefficient food system. "There is a lot of imported meat in Dutch supermarkets, while The Netherlands are exporting a lot of meat. Foreign tomatoes, while Dutch tomatoes are going abroad. That unnecessary shipping of food should stop", says Ronne Smolders, board member of Agractie, a Dutch farmer lobby organisation (7).

SUPPORTING EACH OTHER IN TIMES OF CORONA

As we navigate our way through a worldwide pandemic, we are confronted by deeply rooted issues within our food systems. For one, we are reminded of the extremely vulnerable position of the people at the very beginning of our food chains. As the Food and Agricultural Organization states: "Vulnerable groups [...] include small-scale farmers, pastoralists, and fishers who might be hindered from working their land, caring for their livestock, or fishing. They will also face challenges accessing markets to sell their products or buy essential inputs, or struggle due to higher food prices and limited purchasing power. Informal labourers will be hard hit by job and income losses in harvesting and processing." (12)

'Support your locals' is a phrase often heard these days, referring to local food producers, shops and restaurants among others. We should indeed find ways to support each other, be it close by or far away. The question is, how we can begin to think of supporting each other, if we have no way of knowing where the products that we buy are coming from? As our food system is currently built up, are consumers really empowered enough to actively support the people making their food?

EXPERT VIEW

JAN HUIJGEN, SOCIAL FARMER AND CEO AT EEMLANDHOEVE

“It is a rather urgent task, recovering the human touch on the way to a socially and environmentally sustainable food system. It feeds into the need for innovative ideas and for ideology instead of the primarily rational, individualistic, materialistic and capitalistic approach that we are using today.

By now, people have proven to be more than just ‘marketable consumers’. They have concerns about our climate, about biodiversity, about social sustainability. At the same time, people live by stories, and especially now that current stories turn out to be useless and finite, that causes a need for appealing stories that consumers can relate to - that they can feel with their hearts, head and hands.

It is a matter of social innovation: we need a new, social movement of citizens that stand side-by-side with farmers, and together stand for a more sustainable food system. I very much see an important role for tech in this, but we have to be aware and not let solution finding escape to big tech and let this feed into the surveillance capitalism that big tech companies stand for.”



A NEW GENERATION OF TECH: RESTORING THE HUMAN CONNECTION

Innovative technology is not necessarily known for increasing the amount of meaningful human experiences in our daily lives. Instead of talking to each other on the train, people are focussed on the devices in their hands. We don't call to schedule appointments anymore, we book them online. We don't buy our food from local stores, but order it online. Automated, non-personal online exchanges have taken away the need to interact with each other in person.

But technology also helps us connect with people we otherwise would have never met. It allows us to connect with strangers, and even trust them enough to share car rides or even our own house. Thanks to modern technology, we can communicate with everyone from everywhere around the world, while learning more about each other, ourselves and this world in the process. If we use this hyperconnectivity in a positive and responsible way, it can help create a shared understanding and more empathy towards each other. Furthermore, it can help us build a world that is better equipped for everybody.



Until recently, however, a problem was presented by the fact that it has been difficult to trust each other online, as we are never sure who truly is on the other side of our screen. According to a recent study on the differences between online and offline interactions (1), online interactions result in a:

- 1. DEHUMANISING EXPERIENCE:** fewer nonverbal cues make it harder to accurately understand someone online and make the communicator appear less thoughtful.
- 2. GREATER ANONYMITY:** which is associated with disinhibition and aggressive behavior—potentially because anonymity reduces accountability, allows for more negative behavior.
- 3. MORE OPPORTUNITIES TO FORM NEW SOCIAL TIES AND BOLSTER WEAK TIES:** the sheer amount of opportunities to form connections may have negative consequences. Studies show that people who made an online partner selection from a large pool of choices were less satisfied with their decision the following week.
- 4. WIDER DISSEMINATION OF INFORMATION:** which can help in quickly gaining feedback and growing an audience, but also allows for a quick dissemination of false information.

New technologies can actually help to change that. With the recent increase in Internet of Things (IoT) devices and growing online activity, we create more and more data everywhere we go, and we find new ways of connecting the physical to the digital world. Using artificial intelligence (AI), we are rapidly improving our ability of analysing this data to better identify our deepest needs. Meanwhile, 3D technology and VR are offering better ways of communicating with each other online, allowing us to show more of our natural nonverbal cues.

At the moment, it's mainly commercial companies that are buying into these promises, using them to encourage us to buy more stuff and creating a false sense of personalisation. However, interesting use cases are popping up, in which these new technologies are used to identify what we actually want or need, be it in our relationships through dating apps, in our (food) consumption or when it comes to our health. In some ways, they even allow us to better know ourselves and find the right people and products to build longer lasting relationships with. The problem is that the more personal we get, the more important it becomes that we stay in charge of our personal data, and know exactly who is using it, at which moment and under which conditions.

CASE STUDY: SPINN COFFEE

Spinn Coffee bypasses retail stores entirely by bringing coffee producers and consumers together on their digital platform. They offer a smart espresso machine that connects to your WiFi, can be controlled from your smartphone and detects when your coffee runs out. It allows you to select coffee from a large database of smallholder farmers and automatically orders new coffee from your favorite growers as you run out. On their website they offer a "coffee quiz" - a short questionnaire to find the best coffee for your personal taste. By skipping retail, they realise larger margins for coffee farmers.



BRIDGING THE GAP BY USING BLOCKCHAIN TECHNOLOGY

New encryption technologies such as blockchain are beginning to fill the void by providing us with an easy way to authenticate ourselves, verify data and interact with each other one on one without any intermediaries. This allows us to virtually go beyond trust online and hold people accountable for the information they provide. Blockchain technology makes it possible to verify the origins of data, allowing us to trust it and, by combining it with other encryption technologies, protect it. All of this is essential when building sustainable human connections online. Ultimately, this creates an opportunity to reconnect farmers and consumers.

Blockchain technology facilitates direct, transparent, immutable and automated data- and valuta interactions. Since these interactions take place on an immutable ledger, the data cannot be tempered with. Imagine an instant post package being delivered, transparently traceable to a specific person and with a 100 percent guarantee that it hasn't been opened along the way. This closes the gap created by time and distance that occurs when sharing data and interacting online. Combined with automated agreements (or so called smart contracts) and easy authentication methods available through blockchain, this could potentially help to bring back trust and a common understanding between farmers and consumers. Ultimately, blockchain allows us to close the gap in time, distance and cultural alienation through creating direct, verified, one-on-one interactions within food supply chains.



5 EXAMPLES OF HOW DIFFERENT ACTORS IN THE SUPPLY CHAIN CAN PROFIT FROM A RESTORED CONNECTION BETWEEN FARMERS AND CONSUMERS USING BLOCKCHAIN TECHNOLOGY:

BINKABI: BUYING FROM THE SOURCE

Most smallholder farmers and farmer cooperatives are unable to sell their products further down the chain, let alone directly to consumers. That's because they lack the right information, the finance needed to invest in the right machinery and inputs, the correct documentation and paperwork to be trusted by financiers, and the financial infrastructure to do business internationally(13).

By sharing their own transparent and verified data, farmers could establish the trustability they need to gain access to financing and to do business internationally. By using cryptocurrency transactions, they could send and receive money more easily, without having to depend on local financial infrastructures. They could establish further trust by using smart contracts to automate agreements. This would, for example, offer them access to funds only after goods have arrived on the port and have been checked by a third party verifier. Smart contracts can include any conditions, set to increase the trustability that farmers need to do direct business with other parties(14).

The start-up Binkabi developed a digital marketplace connecting the end buyers and end sellers of different commodities. On their platform, they allow farmers and SMEs access to financing through peer to peer lending. By bringing banks, warehouses and other service providers together on one platform, trades can be settled instantly, using smart contracts as an escrow for payment versus delivery of the goods.

This significantly lowers the risk, time and therefore costs and barrier of entry for such trades. By tokenising commodities, Binkabi makes them tradable and fundable on the blockchain.

All of this touches upon an issue that is highlighted by the current COVID-19 pandemic. As long supply chains are facing enormous challenges due to national lockdowns, as borders stand in the way of the global distribution of products and as we close our restaurants, the people producing the world's food supply are left with stock they can no longer bring onto the global market. One answer to this issue is to ask consumers to 'support their locals', which seems difficult to do in long supply chains in which ownership claims are difficult to make. Who exactly are you supporting, by buying that locally produced carrot? Is it actually locally produced? Blockchain-enabled marketplaces, like the one Binkabi is facilitating, provide an answer to these questions.

“ALTHOUGH MOST PEOPLE WILL CONTINUE TO BUY THEIR FOOD FROM SUPERMARKETS, IT IS STILL POSSIBLE TO ENHANCE THE PROFILE OF FARMERS AND GROWERS IN THE VICINITY OF A TOWN OR CITY. BUYING FROM FARMERS AND GROWERS, AT REGIONAL MARKETS AND FROM URBAN FARMS, CAN HELP BRING PRODUCERS AND CONSUMERS CLOSER TOGETHER AND HELP PEOPLE TO APPRECIATE FOOD AND THE WORK OF THE FARMER MORE.” - DUTCH MINISTRY OF AGRICULTURE, NATURE AND FOOD QUALITY [11]

SCANTRUST: GATHERING FEEDBACK

When scanning a QR code and tapping into the history of a certain product, the end consumer doesn't just participate in the traceability of a product. He or she is also adding a lot of business value for the other parties involved in the supply chain. After scanning said code, a person will automatically leave a digital trail. Metadata such as the time and location of the scan can be useful to other parties. And the data about the person in question can be even more useful. For instance, information about sex, age and demographics can provide valuable insights for all actors involved in the supply chain.

Once a consumer lands on a web page after scanning a QR code, he or she also adds value by simply reading the page. The average cost per click – the amount it costs a company to let someone click on their ad – is already more than 5 USD on LinkedIn(15). The food brand gains extra attention from its customers – attention it can use to prompt repurchases, sign ups for newsletters and other forms of consumer engagement and conversion, adding to the fact that the brand is already winning more of their consumer's trust by providing them with transparent product information.

ScanTrust is a blockchain enabled traceability platform that offers companies a dashboard to keep track of scan analytics and scanner demographics. Their platform also offers a customer loyalty system that enables companies to set up different types of consumer engagement campaigns. After scanning a product, the end consumers can choose to follow, re-engage and advocate for their brand and products via the ScanTrust platform.



SIM: TIP THE FARMER

Blockchain doesn't just allow for the exchange of information. It can also be used to transfer value through direct, borderless, peer-to-peer cryptocurrency transactions. In recent years, many projects have popped up that allow consumers to directly send a tip to the farmer(s) that produced their products. This could provide a solution to the lack of investment in the quality of products, as farmers can now be directly rewarded for prestige and excellence. Furthermore, it provides a solution to margin escalation, as the money is sent directly to the farmer's wallet, after selling the product for the regular price to the next person down the chain.

Supply chain information manager SIM has been building traceability systems for over ten years. More recently the company has adapted blockchain technology to offer a QR-code generator on their platform that enables customers to scan products and trace them back to their origins. In 2018, SIM launched a partnership with Albert Heijn and Refresco to trace orange juice back to the orange plantations in Brazil. Customers were able to send personal messages to the fruit pickers(16). They recently also added a feature in which a tip can be sent to any farmer or food worker anonymously and directly, without an intermediary and without transaction costs(17). Accenture (18) and IBM (19)are also exploring this "tip the farmer" concept.

It is important to note that solutions such as these have also been subject to criticism. In the case of SIM, it didn't take long before some of the plantations in the Albert Heijn partnership were linked to historical human rights violations (20). It has also been argued that tipping farmers in and of itself is not sending the right message; a living income should be a human right, not a gesture of good will.



ETHICHUB: CROWD FUNDING AND INVESTING

Companies that are digitally connected to each other on a blockchain can even go a step further when it comes to consumer engagement. The more a consumer knows about the producers of her or his food, the more they will trust them. When a farmer or farmer cooperative needs extra finance, for example to pay for their next inputs, or a new innovation that could make them more productive, they now have a lot of trustworthy online data to show on their historical production, output and more, confirmed by others in the chain.

The rural smallholder farmers and cooperatives that were previously disconnected from the end consumer, now have access to a channel that allows them to build up and interact with an audience. What if you, as a consumer, could directly invest in the new windmill, expansion or basic input finance for the next harvest? The use of blockchain technology would significantly decrease the cost, time and administrative burden that ordinarily occur when carrying out such transactions(14). Consumers could easily send a borderless transaction directly to the farmer's wallet, while farmers can provide direct and transparent proof of their activities. Thinking one step further, the loan could be paid back granularly, in the form of discounts on the product or in the traceability of the product itself. All the loan agreements and conditions can be embedded in a smart contract so that all the set conditions and the outstanding loan remain fully automated and transparent for every party involved.

Involving end consumers through crowd funding isn't merely a potential way to create access to funding; there are many more advantages to it. It can help validate the business model of the investment or even serve as a marketing tool. Most importantly, it's a great way to create loyal customer relationships(22).



Financial involvement and full transparency are therefore great ways to solidify trust and to rebuild and strengthen the relationship between consumer and producer.

EthicHub is a Spanish crowdfunding platform for unbanked farmers. The platform runs on the Ethereum blockchain, which makes all of the transactions and money flows on the platform fully transparent to everyone involved. It makes it easy for anyone around the world to participate without international bank transfers. EthicHub works with “local nodes” as they call them; people that serve local communities and give access to their loan applications. The local nodes are responsible for guaranteeing the repayment of the loans. They validate the information provided by farmers and, where needed, help them to organise themselves in order to use the money responsibly.

MOBIVITY: CUSTOMER LOYALTY

Improved farmer-consumer interaction could potentially lead to improved customer loyalty, ultimately benefiting all chain actors involved. Blockchain too, lends itself to rolling out loyalty programmes, in which consumers are incentivised to both partake in the supply chain and remain loyal to that very supply chain. Deloitte identifies 5 benefits of creating loyalty programmes using blockchain technology(23):

1. Reducing costs
2. Enabling a frictionless system
3. Making the process near real time
4. Providing a secure environment
5. Creating unique business opportunities

There is marketing value to having an involved and loyal consumer. Looking at blockchain solutions that use QR codes to onboard consumers, brands can calculate exactly how much value they gain from every QR code scan. Ultimately, they can create a fitting compensation for the scan. Think of a discount on the next purchase, a collectible item or a token with actual value.

Mobivity provides a platform to connect restaurants, retailers, personal care brands and their partners with customers to increase their retention, visits and spend. At the moment, they are not connected to any traceability system or digital products. Instead, they use a sales system in order to gather transactional data from consumers and AI to analyse this information to ultimately discover trends and patterns in how consumers interact with a business. They also use this information to offer a personalised loyalty programme with the use of cryptocurrency. Mobivity has seen great successes as it has already been implemented by 36 thousand stores and used by 16 million consumers around the world.



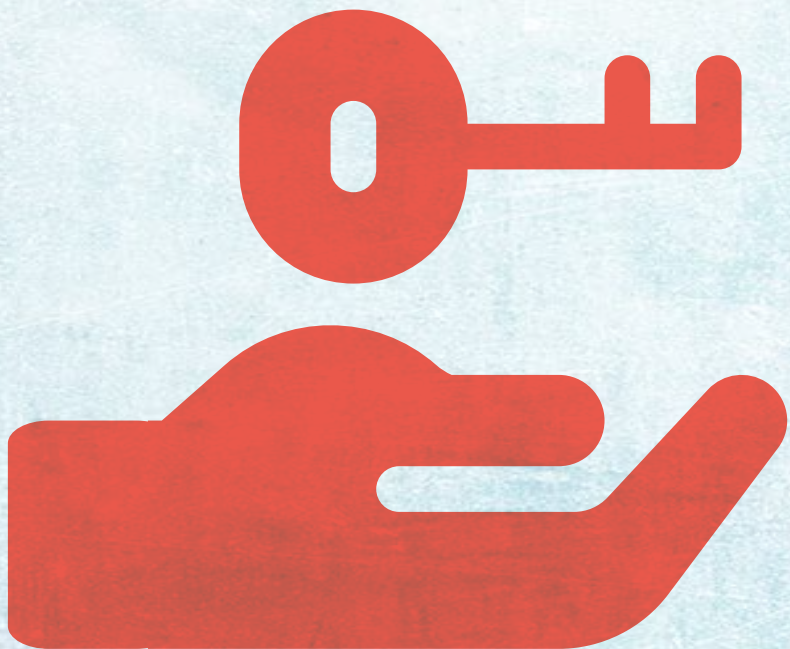
TOOLBOX

In order to create a secure digital bridge between producers and consumers, there are some conditions that need to be met.

3 essentials:

● DIGITAL TOOLBOX ESSENTIAL #1 CONNECTING THE PHYSICAL AND THE DIGITAL

Connecting the physical to the digital is a matter of identification. Supply chain actors can do this by following regular KYC procedures. When actors do not have a government issued identity – as is very common with smallholder farmers in developing countries – a digital identity can be built up over time. (Read more about this in a previous info sheet, [Small Farmer, Big Data.](#))



When including the end consumer in a traceability system, there is incentive to know who exactly this consumer is. However, to securely connect every product to only one consumer, it is important that some form of connection is established between the product and the consumer. This is why most traceability systems place a QR code or NFC tag on the product so that the consumer can easily find the information and interact with it. In this case, the scanning proves that they are the person at the end of the chain who consumed the product and who marks the “end” of the traceability, closing the loop.

To prevent that a product is scanned by multiple people or is not connected to the right digital product (the information about the product online), a system should be in place to ensure that only the end customer can scan the QR code, and that the QR code cannot be multiplied. To tackle this very issue, ScanTrust developed a counterfeit proof QR code. Their QR code contains a tiny QR code right in the middle, which is so small that it cannot be copied; the quality would simply be too poor to scan it.



● DIGITAL TOOLBOX ESSENTIAL #2 LIGHTWEIGHT BLOCKCHAIN

When connecting farmers and consumers to a blockchain, it is very likely that they will interact with the blockchain using basic smartphones. It is therefore important to build a very lightweight application, built on top of a lightweight blockchain that can be operated on a basic smartphone. Furthermore, it is important to have an easy-to-use app to allow both nontechnical consumers as well as smallholder farmers to use the app and interact with each other. If the platform, blockchain, app, or any other element doesn't work perfectly or is not extremely easy to use, both farmers and consumers will end up not using it (24).

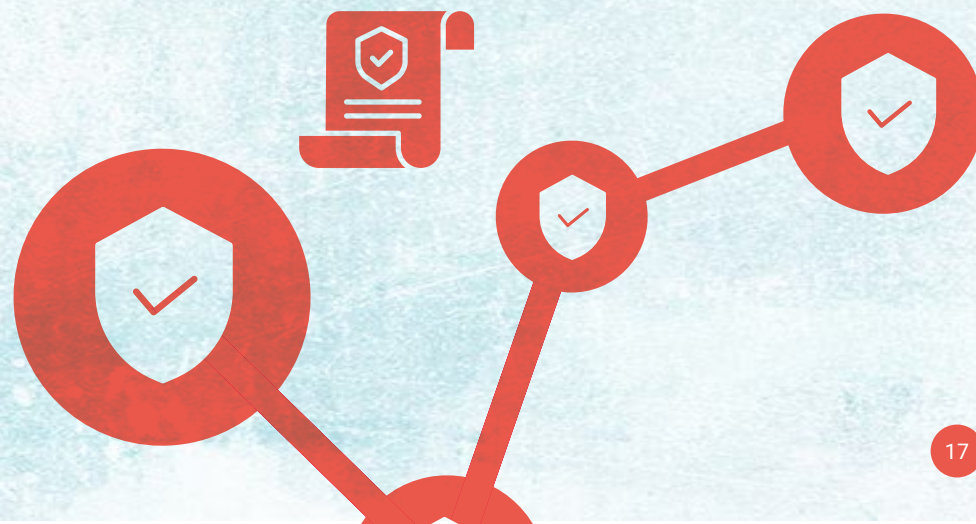
CASE STUDY: TOPL

Topl is a lightweight and fast blockchain, purposefully designed for applications in low-and-middle-income countries. Topl's blockchain makes use of an UTXO transaction model with emergent sharding and an ouroboros proof of stake algorithm (from the cardano blockchain). It is designed to facilitate intuitive traceability and impact measurement. On the Topl blockchain, anyone can create tokens and smart contracts, which can be used to tokenise supply chain commodities and automate agreements. Topl has also created a stable currency which is based on a collection of different commodities, in order to provide a stable and independent medium of exchange on their platform.

● DIGITAL TOOLBOX ESSENTIAL #3 CRYPTO TO CASH EXCHANGE

Finally, in order to incorporate any solution that involves cryptocurrency transfers, there should be a way to exchange cryptocurrencies to cash and vice versa. For Western consumers this shouldn't be a huge problem, especially not when working with redeemable tokens that offer access to (store) discounts or goodwill, as this will circumvent the need for dealing with anti-money laundering regulations. However, for smallholder farmers, this process is potentially more difficult, as they need to exchange tokens to their local currency and potentially do not have access to any form of financial services yet.

Currently, there are quite a few projects being developed that will help rural communities exchange cash for crypto and the other way around. Pundi X has already sent out hundreds of points of sales devices to kiosks in small Indonesian villages that allow smallholder farmers to exchange cryptocurrency for cash and back(25). Their goal is to make buying cryptocurrencies as easy as buying a bottle of water. The applicability of this also depends on smartphone ownership among smallholders; it is almost certainly a matter of decades before most people in the world will have access to smartphones (21) which will also offer them access to cryptocurrencies.



EXPERT VIEW

NATHAN ANDERSON, CEO AND FOUNDER SCANTRUST



“The human connection and trust in food producers will only be restored when consumers are able to independently check and verify that the food they are buying is authentic and claims about provenance are genuine. This independent verification can be achieved by way of two critical methods:

- Tamper-resistant, unique tags for each product that bring physical products online. Secure QR codes and NFC chips are most suitable for this.
- An independently verifiable audit trail linked to the tags, removing trust issues from specific product claims such as biological, certified and sustainable. Public blockchains are suitable for this purpose.



Secure, unique tags combined with data storage that minimises human intervention (for example using IoT sensors and other data sources in the upstream supply chain) mitigate the bulk of questions about whether food brands’ sustainability claims can be trusted.

Starting with a wider use of the necessary technology and continued consumer pressure, the transition towards a fully transparent and connected food industry will happen in three phases:

- Phase 0: Status quo, today
- Unverifiable bio/eco labels with the burden of trust on third-party certification bodies
- Typically offering very basic traceability information, for example only the country of provenance
- Phase 1: 2025
- Most food brands selling premium products or products from at-risk supply chains, including coffee, vanilla, and cacao, will adopt traceability solutions as a response to demands and to justify their price premiums and sustainable practices
- “Proof-of-origin” will be a recognised necessity, rather than just a competitive advantage
- Phase 3: 2035
- Rigorous traceability solutions are a standard adopted by all food producers in all major markets
- “Proof-of-nothing-to-hide” will be the new paradigm – companies that do not disclose product provenance will not be trusted anymore”

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