



# Blockchain in Brazil and Sustainable Supply Chains

## Case study overview

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Between April 2020 and August 2021, BSR, Rever, Wholechain and IDB Invest worked together with a consortium of leading Brazilian consumer brands to drive supply chain traceability from raw material to end-product. They conducted a first-of-its-kind test of the feasibility of Blockchain technology for the **traceability of the cotton, recycled glass and leather value chains for three Brazilian companies**. This short case study will describe the context and objectives of the project, as well as the analysis process of the three companies' supply chains, the technical solutions identified, and the conclusions of the feasibility study.

## Context and Objectives

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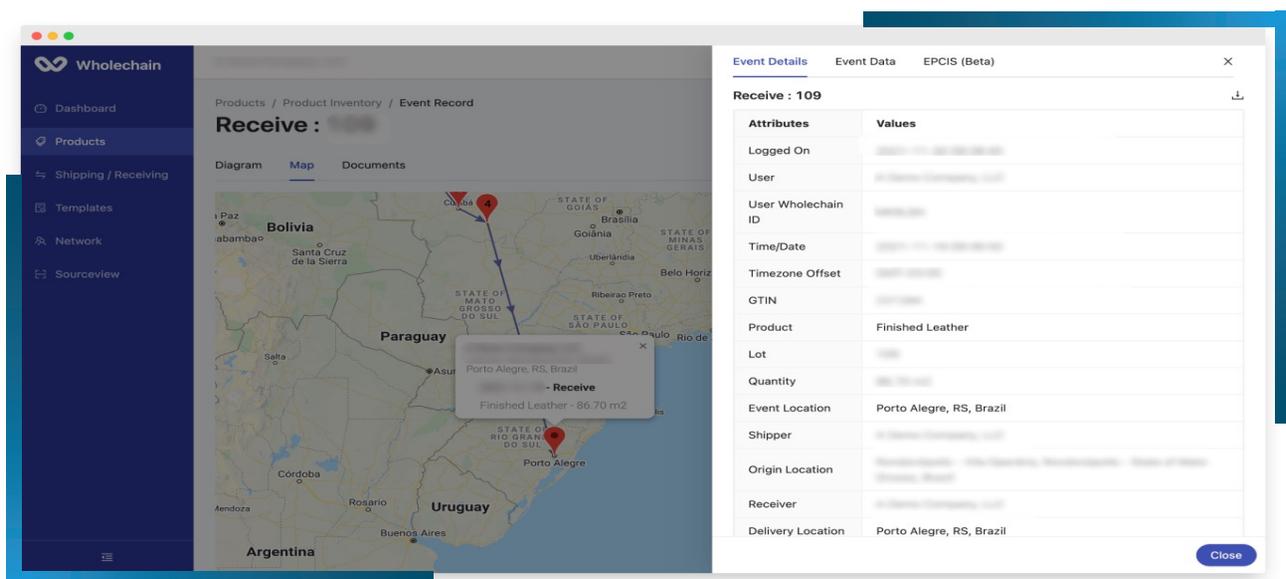
Large companies involved in global commodity markets with extensive supply chains and complex procurement systems regulated by multiple-tier trading schemes often lack visibility beyond their tier one suppliers. The complexity of value chains is exacerbated by this opacity, limiting transparency on the sources of the components and inputs that make up their products, as well as potential areas of risk associated with concerns ranging from labor standards, employee safety and environmental impacts to product quality. **Company supply chains are the source of some of their most significant social and environmental impacts**. For instance, a [study from CDP](#) states that supply chain carbon emissions are around 11.4 times higher than operational emissions. Moreover, companies with global supply chains are more likely to face [human rights issues such as forced labor](#) and other forms of labor exploitation. Therefore, **traceability can be an important tool for companies to better identify their main suppliers including their footprint**. This will improve their supply chain management practices as well as ensuring the sustainable sourcing of raw materials.

Stakeholders increasingly expect improved supply chain traceability from companies. The **conscious consumer now wants to know the origins and the journey of their products**. Fashion consumers for instance identified a lack of transparency as a barrier to purchasing clothing marketed as sustainable. Moreover, given the increasing number of regulatory developments requiring supply chain transparency and the amount of scrutiny investors are now placing in ESG (Environmental, Social, and Governance), traceability could be a major factor in providing these companies with a competitive advantage for their exports.

However, due to the complexity of trading models along supply chains, the task of tracing every element of a product's journey from the raw material to finalized product presents a challenge. A large number of actors with varying management and procurement systems as well as general requirements can lead to an overall lack of visibility within certain tiers of the supply chain.

## The Tecnology

Emerging technologies such as blockchain can solve the ongoing challenges within supply chains. Supply chain networks are often complex, siloed and operate with several disconnections from their management and procurement systems. This leads to an overall lack of visibility between actors. **Blockchain technology offers a method of data-sharing that allows for the continuation of claims whilst enabling data privacy and trust between actors**. For example, a cotton harvest logged on the blockchain generates a hash, which from that point onwards is associated with the given event such as date, geographic location, quantity, farmer information, pest and disease documentation. Information logged on the blockchain remains unaltered and so is available for upstream and downstream supply chain actors to examine at any point in time. **This information not only enables actors to gain valuable insights into supply chain activities such as material loss, waste, cost analysis, carbon footprint, and fraud, it also gives a bigger picture of the supply chain process to consumers**.



The screenshot displays the Wholechain software interface. On the left is a dark blue navigation sidebar with the 'Wholechain' logo and menu items: Dashboard, Products, Shipping / Receiving, Templates, Network, and Sourceview. The main content area is titled 'Products / Product Inventory / Event Record' and shows a 'Receive' event. A map of South America is visible, with a red pin and a blue arrow indicating the event location at Porto Alegre, RS, Brazil. A pop-up window over the map shows the event details: 'Finished Leather - 86.70 m2'. On the right, an 'Event Details' panel is open, showing a table of attributes and values for the event.

Attributes	Values
Logged On	2023-11-08 10:00:00
User	admin@wholechain.com
User Wholechain ID	123456
Time/Date	2023-11-08 10:00:00
Timezone Offset	+03:00
GTIN	1234567890123
Product	Finished Leather
Lot	123456
Quantity	86.70 m2
Event Location	Porto Alegre, RS, Brazil
Shipper	ABC Company Ltd
Origin Location	Ribeirão Preto, SP, Brazil
Receiver	DEF Company Ltd
Delivery Location	Porto Alegre, RS, Brazil

Traceability solutions that leverage blockchain have great potential to address knowledge gaps around supply chains, including where to improve their footprint across value chains. Wholechain, for example, is a technology solution that provides end-to-end event-based traceability to enable trust, coordination, and transparency in fragmented supply chains. Wholechain is designed to simplify data capture and distribution so that companies can communicate with integrity on the impact and journey of their products and ingredients. Due to its highly adaptable user interface and interoperable technology, Wholechain is made for use across commodities and sectors.

The Wholechain **solution enables all actors in the supply chain to share product information and attributes which leads to efficiency, productivity gains and reduced material loss**. An operational proof of concept of such a solution applied to uniquely complex supply chains of three different Brazilian companies representing distinct industries can help companies and their suppliers at any tier to gain traceability and credibility along their value chains. **Ultimately, traceability data can help identify where and how to reduce the companies' exposure to social and environmental risks**, allowing for better alignment with international sustainability standards and expectations.

## PROVENANCE POSITIVO PROJECT

IDB Invest, BSR, Rever Consulting, and Wholechain have collaborated with a consortium of three leading Brazilian consumer companies to drive supply chain traceability from raw material to end-product. The aim of the project was to enable these companies to gain traceability of sustainable raw materials, to better understand their impact across the value chain and support transparent storytelling to consumers around their supply chains.

This initiative was the first of its kind in Brazil. It allowed companies, their supply chain players and IDB Invest to demonstrate leadership by participating in a blockchain-based sustainability collaboration in the country. The work conducted with the three companies assessed the feasibility of implementing a fully digitized supply chain that would record on blockchain all supply chain events taking place at each point of the raw materials value chain with the help of the Wholechain traceability solution. This feasibility study looked at a practical solution for three distinct raw materials (cotton, recycled glass packaging and leather) chosen by different consumer goods companies and ultimately provided a continuity plan for each company.







# BRAZIL

# COTTON



## Key Findings

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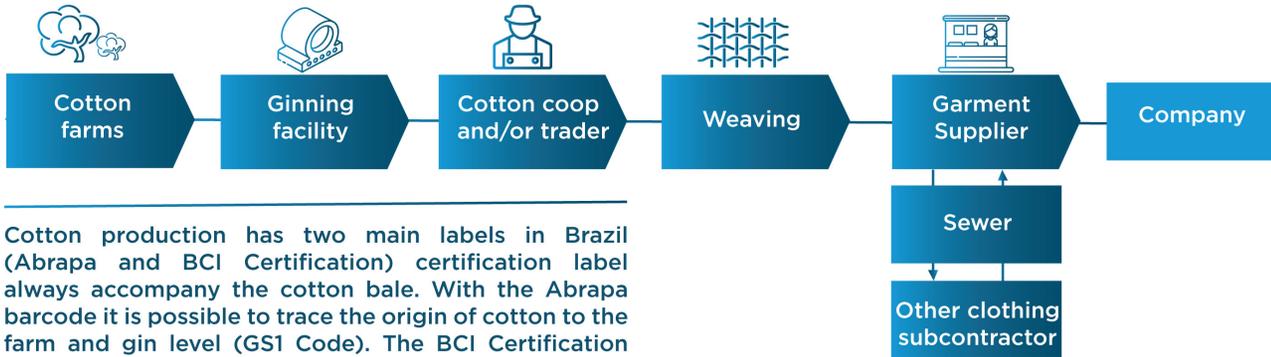
The cotton value chain faces significant risks because of the restricted geographic location of their production, their dependence on natural systems and an overall decline in productivity. **Up to 99% of the world's cotton farmers live and work in developing countries, representing high social and environmental risks.** On top of this, there is a lack of traceability as cotton sources are mixed along the value chain.

For the cotton supply chain of the apparel company, extensive information on raw material traceability was already available. One of the main weaving suppliers had a rigorous (although underused) management system (ERP) in place and used cotton certified as **Better Cotton Initiative (BCI)** and **'Abrapa' (the Brazilian national certification)**. The Abrapa barcode enabled the company to trace the origin of the cotton to the farm and GIN level (GS1 code)<sup>1</sup>. The BCI Certification served as a guarantee of sustainable production but was based on mass balance accounting and did not provide sourcing information. In addition, other suppliers used a variety of software and excel spreadsheets to manage production.

Our assessment identified several gaps. Only the BCI credits were passed to the clothing suppliers. The Abrapa certification contained a great deal of information captured in codes and tags with the cotton. However, much of this information would be lost due to actors being unaware of its value or use.

1. GNI: Goods identity number; GS1: Global Trade Item Number.

# High Level Value Chain Mapping



Cotton production has two main labels in Brazil (Abrapa and BCI Certification) certification label always accompany the cotton bale. With the Abrapa barcode it is possible to trace the origin of cotton to the farm and gin level (GS1 Code). The BCI Certification guarantees sustainable production, but it does not provide sources information - based on mass balance.

The clothing stage is usually centralized in one garment supplier that subcontracts sepecific services, such as cutting, sewing and washing.

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# LEATHER

## Key Findings

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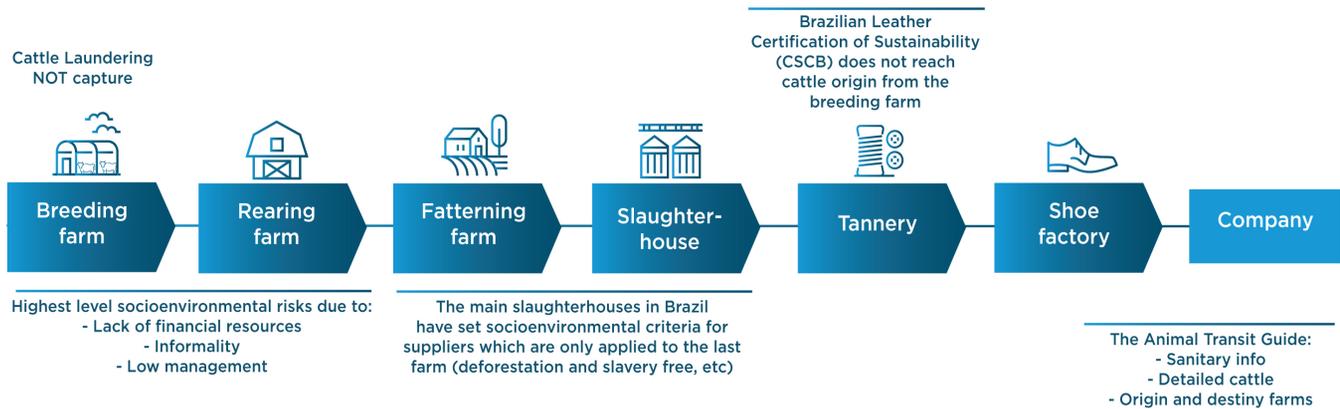
Cattle are a major consumer of natural resources, and a top driver of issues such as carbon emissions and deforestation. For instance, the Brazilian cattle industry is [one of the main drivers of deforestation](#) in the Amazon Rainforest, which leads to the loss of biodiversity, soil degradation, and has serious negative impacts on water cycles. Moreover, livestock production is responsible for 14.5% of all human induced GHG emissions, according to the [FAO](#).

On the leather value chain, the project assessment demonstrated that although a significant part of the brand's supply comes from environmentally healthy regions, the company had no means to completely ensure that its leather sourcing did not come from vulnerable biomes such as 'Cerrado' and 'Chaco' (biomes are usually more exposed to deforestation related to cattle production). Stakeholder concerns for the traceability of operations are most prominent in these 'critical deforestation areas' where the demand for leather in retail is high and data management systems lack the control to monitor natural habitat conservation.

The current and most widely used solution to trace the origin of cattle in Brazil is the Animal Transport Guide ("Guia de Trânsito Animal" - GTA), a paper-based documentation system with a high risk of fraud or inadvertent mislabeling. Moreover, the economic return of production is low at the cattle farm level, the most critical phase of the leather value chain. At this tier, there is a high degree of social and environmental risks, including deforestation. A lack of financial resources, informality, and information on management systems present key challenges for internationally recognized traceability systems. However, this also represents an opportunity for 'first mile' mobile-based solutions such as Wholechain's mobile app. In 2019, BSR and Wholechain partnered to prove this use case and to challenge the [informal vanilla supply chains in Madagascar](#).

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## High Level Value Chain Mapping



At the slaughterhouse level, social and environmental criteria are applied to suppliers, but these only consider the last farm where the cattle passed through, while the Brazilian Leather Sustainability Certification (CSCB) does not currently include details as to the origin of the livestock. This means that these systems do not provide visibility of “cattle laundering”, a practice that transfers animals from rearing farms that have contributed to deforestation (and are under State embargo) to legally compliant breeding and fattening farms, to be commercialized.

Traceability from the last farm (the fattening farm) to the slaughterhouse is possible, considering the medium to high level of connectivity of suppliers on fattening farms, slaughterhouses, and tanning facilities. Solutions for improving traceability for other leather commodities in the supply chain also exist. For instance, one of Brazil’s major meat food processing manufacturers is carrying out an innovative beef traceability project to understand the origin of cattle in its supply chain, which could be extended to include leather. However, challenges remain for tracing the origin of the cattle at the breeding and rearing level and would require an intensive effort of the supplier’s capacity for training.





## Key Findings

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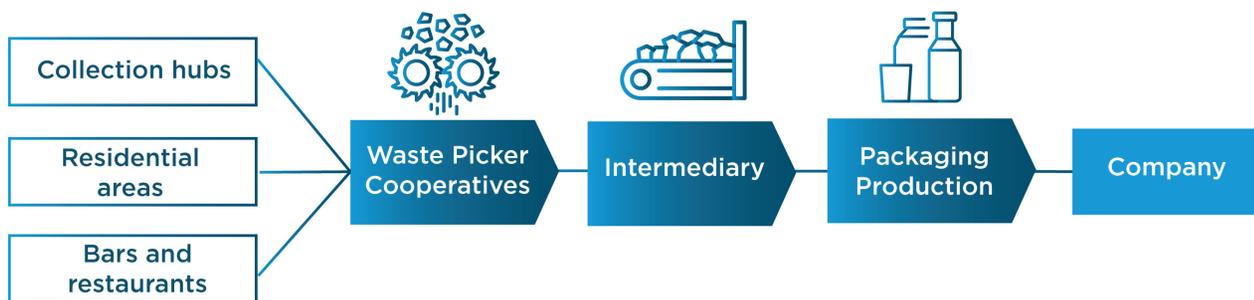
Less than 10% of single-use packaging is recycled, with most of the packaging being sent to landfills, incinerated, or discarded. The COVID-19 crisis has increased the use of single-use products and packaging, which intensified the existing [global waste crisis](#) with negative impacts on ecosystems, oceans and human health. Moreover, the [production of glass products](#) requires critical raw materials such as clear water and minerals, as well as a significant amount of energy, with an important level of CO2 emissions.

The glass supply chain feasibility project evaluated the cosmetics brand's sourcing of recycled glass. Due to Brazil's National Solid Waste Legislation and the company's emission reduction targets, the brand launched a program of glass collection cooperatives, material processors and a packaging manufacturer to collect post-consumer glass and transform it into perfume packaging. To estimate volumes of recycled glass at each stage of the process, the brand manually consolidated its invoices. Real-time sourcing information about the volume of raw materials with data about cooperatives involved, leakage along the value chain, and sources of clear glass was not available. The company did not have a way to directly track, in real-time, the end-to-end and post-consumer material collected by cooperatives, sent for processing, and used by their perfume packaging manufacturer.

At the post-consumer glass collection level, the main cooperative analyzed used a collection system that involved 100+ waste pickers responsible for collecting glass from consumers. However, the cooperative's system of measurement for the weight of glass is an estimation based on the size of the containers that arrive and leave the facility. The first accurate weight measurement is only conducted upon arrival at the glass processor, which reduces the level of control over the volume of recycled glass collected. Another challenge is that at the cooperative level, good quality glass, part of the clear glass bottles needed to produce perfume containers, is often diverted for use in the counterfeit

drinks market. In addition, low levels of post-consumer recycled waste are a key barrier to increasing reused material.

At the glass processor level, the brand's partner works with over 600 affiliated cooperatives across the country. These cooperatives receive training from the processing company to improve glass sorting, increase the quality of the material collected and attend to the expectations of the brand for its packaging. The processor had a management system (ERP) that controlled which cooperative and hub provided the glass until the final production point within its facilities, but this information was not required or used by its client (the packaging manufacturer). The glass processing supplier could increase production capacity by threefold if there were sufficient post-consumer glass material. It is currently expanding its collection points to meet the brand's needs.



At the packaging manufacturing level, the main supplier is a sector leader with detailed management systems and production controls, including comprehensive efforts to improve energy efficiency and reduce CO2 emissions. Despite the robust management systems in place at this tier, which could facilitate the potential implementation of a blockchain solution, the varying maturity of the suppliers' information systems presents a challenge. Furthermore, the ERP system for the packaging manufacturer does not show the data back to the collection level. The actors across the glass supply chain collect different types of data, but there is no connection between these pieces of information from one actor to the next and there is no true visibility along the entire supply chain. Currently, the main information gathered is the weight and quality of the glass.



# Conclusions

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## COTTON

The feasibility assessment concluded that it is viable to implement a blockchain traceability solution for cotton produced in Brazil. One of the prerequisites would be for the apparel company to replicate the Abrapa certification to other cotton supplying markets. Moreover, issues related to user experience must be addressed. Informal suppliers at the clothing manufacturing stage for example may not possess the adequate digital capabilities to implement these technologies. It is essential to improve information distribution across tiers, and, in particular provide simple, mobile-based, technology solutions that are accessible to a wide range of users with varying levels of digital literacy. In addition, clothing suppliers and their subcontractors would require training to manage a new traceability application.

The existing information management system for fabric suppliers and the barcode tracking system (under the Abrapa certification) facilitates the scalability of blockchain and represents a potential competitive advantage for Brazilian cotton sourcing. In addition, suppliers at tiers 1, 2 and 3 of the value chain have good mobile signal connectivity, which allows for a simpler process of implementation and data collection. Improving traceability has clear benefits to the brand, such as reducing costs and risks along the value chain. Applying a blockchain traceability solution can provide the real-time data necessary to understand where and when potential overproduction among small suppliers is occurring. This information is critical to preventing age-old labor issues, reducing risk, and drastically reducing costs associated with monitoring and auditing.

## LEATHER

Blockchain traceability has also been evaluated as a viable solution for the leather value chain. By providing regular production data and capacity checks at 'first-mile' birth farms, a blockchain traceability solution can treat the issue of cattle laundering while avoiding the exposure of sensitive data in regulatory documentation. A focused traceability solution is therefore likely to be more welcomed by suppliers than current efforts based on access to regulatory documentation.

For slaughterhouses and tanneries, a blockchain traceability system could be implemented given their standardized and available information systems with access to technological resources and more structured management. Low-budget solutions for blockchain can be tested in the first steps of the leather value chain.

## GLASS

Blockchain in the glass packaging supply chain would also bring substantial benefits. By using real-time information, companies can identify points of leakage and incentivize performance. To capture the necessary data; it is critical that value chain staff (especially among the glass collecting tier) receive the appropriate training.

The solution for glass is easily replicated with other recycled materials such as plastic and metal. An end-to-end traceability system can benefit the company as well as increasing glass recycling by allowing the brand to measure emission reductions from the post-consumer material that is being integrated to the final packaging. The solution can also improve supply chain operations by using better data to increase the volumes collected, improve the quality of raw material sourced, and reduce commodity costs. Finally, this solution can enable a compelling storytelling experience that could engage consumers in increasing recycling efforts as well as improve brand reputation and license to operate.

## Next Steps

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Building on the positive feasibility study findings, the program will continue to the second phase. This will include a refined continuity plan to roll out and scale the solution on the ground, based on the proof-of-concept findings. We will review the success and challenges of the Proof of Concept as compared to the project plan, gather feedback from stakeholders and refine materials. This review will include an evaluation of key metrics based on PoC volumes and data, gathering feedback from stakeholders on the training and learning received and a revision of the onboarding methodology and materials. Data templates and collection methods will then be amended according to the revised conclusions. Once implemented, the project can start scaling up the solution. This will require identifying tiers 1 and 2 suppliers to onboard and deploy the revised project plan. Suppliers will have to receive ongoing support from Wholechain to ensure continuous tracking of KPIs with a recurring evaluation schedule.

As a result, companies will gain greater visibility into their supply chains in real-time, especially in tier 1 and 2 suppliers, reducing the social and environmental risks across the value chain. The solution can also help companies to reduce audit and operational costs by streamlining data collection across supply chain stakeholders, with clear gains in production time and management efficiencies. Moreover, greater transparency can help companies predict potential disruptions or other unanticipated supply issues, which would reduce operational risks and increase productivity. Companies will increase their brand value to consumers by showcasing evidence-based storytelling of the positive impacts across the supply chain.

## Authors

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**BSR** is a global nonprofit organization that works with its network of more than 250 member companies and other partners to build a just and sustainable world. From its offices in Asia, Europe, and North America, BSR develops sustainable business strategies and solutions through consulting, research, and cross-sector collaboration. Visit [www.bsr.org](http://www.bsr.org) for more information about BSR's 25 years of leadership in sustainability.



**REVER Consulting** is a Brazil-based consultancy dedicated to turning business into a driver of global sustainability. REVER is a B-Corp certified company and a signatory of the UN Global Compact since 2015. Since its creation in 2005, REVER has executed more than 200+ projects throughout Latin America across 12 sectors with extensive experience in the Food, Beverage, and Agriculture (FBA); financial institutions; fashion industry and manufactories. As the South American partner of two leading international sustainability organizations, REVER has access to rigorous methodologies and international specialists across sustainability disciplines, including climate change; diversity, & inclusion; human rights; supply chain; ecosystems services; inclusive economy; local development; financial inclusion; ESG; and sustainability management.



**Wholechain** is a blockchain-based traceability solution built to enable trust, coordination, and transparency in fragmented supply chains. Wholechain works across commodities, allowing businesses to manage risks and increase efficiencies while enabling consumers to make more responsible decisions. Wholechain is a partner on Mastercard's blockchain, former winner of the Fish 2.0 Competition at Stanford for Supply Chain Innovation, and a winner of the FDA's New Era of Smarter Food Safety Low- or No-Cost Food Traceability Challenge. Wholechain is also a partner with Rever Consulting enabling traceability in soy, leather and other commodities throughout Latin America.



**IDB Invest**, a member of the IDB Group, is a multilatera development bank committed to promoting the economic development of its member countries in Latin America and the Caribbean through the private sector. IDB Invest finances sustainable companies and projects to achieve financial results and maximize economic, social and environmental development in the region. With a portfolio of \$13.1 billion in asset management and 385 clients in 25 countries, IDB Invest provides innovative financial solutions and advisory services that meet the needs of its clients in a variety of industries.