**1. Background / Why we wanted to do this Project?**

Throughout our project focused on sustainable coffee, we gained valuable insights into the importance of understanding the origin and farming practices behind the coffee we consume. We discovered that coffee is one of the most valuable commodities in the world, and India is the seventh largest producer of coffee globally, with smallholder producers in the Western Ghats responsible for the majority of its cultivation. Despite being grown in bio diverse and densely forested regions, coffee is mainly consumed in urban centers and big metropolitan cities across the country.

We learned that the rural to urban journey of the bean includes numerous transformations before it reaches the end consumer, who has little information about the origin of the coffee, the ecosystem, biodiversity, or the land where it was grown, and the hands that grew it. Although the 'specialty coffee' and 'specialty foods' space sometimes communicates details about the origins of the coffee bean, such as the name of the plantation, elevation, coffee variety, and processing details, they focus mainly on the physical properties of the coffee bean rather than farming practices. Terms like 'forest' and 'shade-grown' are used loosely to describe any tree cover on plantations, and terms like 'sustainably grown' and 'fair trade' are used without any meaningful details on what practices the coffee plantation or brand might be following to bring about ecological sustainability or well-being of workers.

Through our research, we discovered that the social and environmental impacts of coffee are well documented both in India and across the world, with concerns about the intensification of production, increased use of chemical inputs, removal of forest cover from coffee farms, and biodiversity loss. Smallholder producers are under increasing pressure to switch to intensive farming practices, and the absence of recognition for best practices and connectedness with consumers could strengthen these trends.

We believe that a more meaningful connectedness between producers and consumers and disambiguation could be an important driver to push policy as well as shifts in consumer demand for more process-oriented information about products like coffee. To promote ecological sustainability, protect biodiversity, and support the well-being of workers, it is important to understand the origin and farming practices behind the coffee we consume. Through our project, we gained a deeper understanding of the importance of sustainable coffee and the need for greater transparency in the coffee supply chain.

**2. Goals and Objectives of this Project:**

Our project aimed to transform the way traceability and connections between coffee producers and consumers were perceived, with a focus on valuing both people and nature.

1. **Objective 1:**

We had specific objectives to guide us towards this overarching goal, including the development of an interactive traceability platform that would map and showcase the origin stories of coffee.

Our aim was to highlight the importance of biodiversity and the daily experiences of smallholder producers, shifting the narrative towards ecological sustainability and farmer livelihoods. To achieve this, we created an engaging web experience that immersed coffee drinkers in the often-overlooked aspects of coffee production, connecting them with the people and ecosystems behind their favorite beverage.

In addition, the research yielded ethnographic data on the histories of smallholder coffee producers in the region and traditional ecological knowledge. The objective of the project was to expand this research to the Nilgiris District, Tamil Nadu, in order to pilot community-based ecological monitoring and subsequently scale it to more smallholder producers in these regions. We had established relationships with Farmer Producer Organisations (FPOs) in these areas, making the pilot project and future scaling feasible. By collecting biodiversity and producer stories from multiple geographies, we aimed to curate a rich dataset for the traceability platform and test its ability to incorporate new farm data.

In this project, our aim is to create an initial prototype of a web-based platform that presents the ecological and ethnographic data in an engaging manner for urban consumers. We plan to use various mixed media techniques such as photo, video, audio, and geo-mapping to tell the story of coffee from origin to end customers. While the scope for an interactive platform is vast, we intend to focus on creating a complete prototype that can be used to engage with consumers and gather feedback on how to enhance their experience. In subsequent phases, we aim to expand the platform, adding more stories, exploring newer immersive techniques, and highlighting a broader range of subjects related to the origins of coffee, including details on the native flora and fauna present in the ecosystems where coffee is grown.

1. **Objective 2:**

We had set an objective to facilitate dialogue and interactions between coffee producers and consumers regarding sustainability in coffee value chains through pop-up events across Bangalore. We recognized that the access and use of internet-based platforms could be limited, and hence we decided to design an offline version of the coffee story to be showcased as pop-up events across Bangalore city. We collaborated with various partners across the city to host these pop-ups. We believed that pop-up versions would be an effective way to reach out and invite a diverse range of coffee drinkers to engage with the origin stories of their coffee.

**3. Methods and Approach**

In order to achieve our project objectives, we employed a mixed-methods approach that combined ethnographic research, community engagement, data analysis, and technology development.

1. **Ethnographic Research:**

We conducted in-depth ethnographic research in coffee-growing regions in India, focusing on the BR Hills in Karnataka and the Nilgiris District in Tamil Nadu. The research aimed to understand the farming practices of smallholder coffee producers and their relationships with the ecosystems in which they operate. We also collected data on traditional ecological knowledge, biodiversity, and the histories of smallholder coffee production in the regions. We used a combination of qualitative methods such as interviews, focus groups, and participant observation to collect data.

1. **Community Engagement:**

We engaged with coffee-producing communities in the BR Hills and the Nilgiris District through partnerships with Farmer Producer Organizations (FPOs). We collaborated with FPOs to involve smallholder producers in ecological monitoring, including biodiversity surveys and mapping of native flora and fauna. We also engaged with coffee drinkers in urban centers through pop-up events that showcased the stories of coffee producers and the ecosystems where coffee is grown.

1. **Data Analysis:**

We analyzed the data collected from ethnographic research and community engagement to identify patterns, themes, and relationships. We used qualitative data analysis software to assist with this process.

1. **Platform Development:**

We developed an interactive traceability platform that maps and showcases the origin stories of coffee, incorporating data on farming practices, biodiversity, and traditional ecological knowledge. The platform includes mixed media elements such as photos, videos, audio, and geo-mapping to tell the story of coffee from origin to end customers. We also developed an offline version of the coffee story to be showcased as pop-up events across Bangalore city.

1. **Survey:**

We conducted a survey to identify potential solutions for traceability platforms, including existing solutions, gaps in the market, and potential challenges. The survey aimed to gain insights into consumer preferences, industry standards, and legal requirements, which informed the features and functionality of the platform. By seeking to understand the pros and cons of existing traceability platforms, we made informed decisions about how to develop an effective and sustainable solution that met the needs of all stakeholders involved.

**3. Outcomes**

1. **Industry Review: What’s out there, traceability-wise?**

We believed that conducting research was crucial in order to identify potential solutions for traceability platforms, including existing solutions, gaps in the market, and potential challenges. Through research, we aimed to gain insights into consumer preferences, industry standards, and legal requirements, which would inform the features and functionality of a potential platform. By seeking to understand the pros and cons of existing traceability platforms, we aimed to make informed decisions about how to develop an effective and sustainable solution that would meet the needs of all stakeholders involved.

Prior to developing our qualitative platform, we conducted a thorough background search into the costs, benefits, and complexities associated with blockchain technologies. Our research involved a comprehensive review of academic and industry literature, as well as multiple conversations with leading players in the blockchain space, both in India and abroad. Among the companies we consulted with were TraceX, CropData, and Ripe.io, who provided valuable insights into the implementation of blockchain technologies in the context of supply chain management. These discussions helped us gain a deeper understanding of the challenges and opportunities associated with the use of blockchain in the supply chain space.

Our research revealed that traceability platforms have been developed in various industries to provide transparency to consumers and stakeholders about the supply chain of products. For example, in the fashion industry, the "Who Made My Clothes" campaign by Fashion Revolution encourages brands to provide transparency about their supply chains and the people who make their garments. Similarly, in the food industry, platforms like OpenSC and Provenance allow consumers to trace the origin of their food products, from farm to table.

These platforms often leverage technologies such as blockchain, QR codes, and data analytics to track and share information about the production and distribution of products. These platforms claim their purpose is to increase transparency, accountability, and sustainability in supply chains by providing consumers with the information they need to make informed choices about the products they purchase.

As per our research, early adopters of blockchain propound several potential benefits of using this technology in small scale food systems, including:

* Increased transparency: Blockchain technology can provide a more transparent view of the food supply chain, allowing consumers to trace the origin and journey of their food products.
* Improved traceability: Blockchain can enable real-time tracking of food products, making it easier to identify and isolate the source of foodborne illness outbreaks and to recall contaminated products.
* Reduced food fraud: Blockchain can help reduce the risk of food fraud by providing an immutable record of food products and transactions, making it harder to tamper with or manipulate information.
* Improved efficiency: Blockchain technology can reduce the time and costs associated with food supply chain management by streamlining processes and reducing paperwork.
* Increased trust: The use of blockchain can help build trust between different actors in the food supply chain by providing a secure and transparent record of transactions.

However, the implementation of blockchain technologies also poses significant challenges, such as high implementation costs, the need for a robust technical infrastructure, and the need for collaboration between different supply chain actors. These technologies have been critiqued in existing literature as follows:

* Complexity: Implementing a blockchain-based system can be complex and require significant technical expertise. This can be a barrier for small-scale farmers or producers who may not have the resources to invest in the technology.
* Cost: Implementing a blockchain-based system can be expensive, requiring significant investment in hardware, software, and technical expertise. This can also be a barrier for small-scale farmers or producers who may not have the financial resources to invest in the technology.
* Standardization: There is a lack of standardization in the food industry, which can make it difficult to create a standardized system for tracking and tracing food products using blockchain technology. This can result in challenges with interoperability and data sharing between different systems and stakeholders.
* Adoption: Adoption of blockchain technology in the food industry can be slow, as there may be resistance to change or a lack of understanding about the benefits of the technology. This can also result in challenges with getting all stakeholders in the food supply chain to participate in the blockchain-based system.
* Data quality: The accuracy and quality of data entered into the blockchain-based system is critical for its effectiveness. Ensuring that data is accurate and up-to-date can be a challenge, especially in complex supply chain.

While there is no comprehensive data on the extent of blockchain use in the specialty coffee industry globally, there are several initiatives and projects that are exploring the use of blockchain technology for coffee traceability and supply chain management. One notable initiative is the "Farm to Cup" blockchain platform, which was launched by IBM and Farmer Connect in 2019. This platform uses blockchain technology to provide consumers with information about the origin and journey of their coffee, while also ensuring fair prices for smallholder farmers.

Similarly, most blockchain-based traceability systems are designed to allow users to track the journey of coffee beans from the farm to the final consumer. The system was designed to capture data at each stage of the supply chain, including information about the coffee variety, farm location, processing method, and quality parameters. These systems use a combination of QR codes and blockchain technology to store and track this information. Farmers are given QR codes that they can use to track their coffee beans, and the data is uploaded to the blockchain as the beans moved through the supply chain. Consumers can then scan the QR code on the coffee package to access information about the coffee's origin and journey.

While the use of blockchain technology in the specialty coffee industry is still in its early stages, there is growing interest and investment in the technology as a tool for improving traceability, transparency, and sustainability. As more initiatives and projects are launched, we can expect to see an increase in the use of blockchain technology in the specialty coffee industry globally.

An equally important perspective is that of consumers, how and why do consumers engage with traceability platforms. In the coffee space, our literature review suggests that consumers are increasingly interested in knowing the origins and certifications of the products they buy, including coffee. A 2020 study by the National Coffee Association in the United States found that 41% of coffee drinkers were willing to pay more for coffee that is sustainably grown or sourced.

Another study by Fairtrade International found that 66% of consumers globally look for certification labels on products, including coffee, to verify that they meet social, environmental, and economic standards. In addition, 54% of consumers said they are willing to pay more for products with such certification labels.

This data suggests that consumers, in certain geographies, are becoming more conscious of the impact their purchasing decisions have on the environment and the people involved in the production of products like coffee. Providing information about the origins and certifications of coffee can help to increase consumer confidence and encourage them to make more sustainable choices.

We did not come across any comprehensive studies specifically on the Indian subcontinent regarding consumer preferences for sustainable and certified coffee. However, there have been some reports and surveys conducted in India that shed light on consumer preferences for coffee. According to a 2018 survey by the Coffee Board of India, the majority of Indian coffee consumers preferred filter coffee over instant coffee. The survey also found that consumers were willing to pay a premium for high-quality coffee and that taste was the most important factor when choosing coffee.

While there may not be comprehensive data on consumer preferences for sustainable and certified coffee in the Indian subcontinent, there is growing awareness of the importance of sustainable coffee production and consumption in the region. Coffee companies and organizations are working to promote sustainable coffee practices and certification programs, which could help to increase consumer demand for sustainable coffee in the future. Based on our interviews with blockchain developers, we see that this is a rapidly growing field with more and more players who are advocating the use of QR codes and blockchains as a way to identify and benchmark sustainable farming practices.

1. **Participatory Ecology Research with Coffee Producers**

We engaged with coffee-producing communities in the BR Hills and the Nilgiris District through partnerships with Farmer Producer Organizations (FPOs). We collaborated with smallholder producers in a unique participatory ecology exercise to involve smallholder producers in ecological monitoring, including biodiversity surveys and mapping of native flora and fauna. This exploration provided fascinating views into what species community members considered to be important ecological indicators. We were in the process of developing shared farming guidelines around these ecological indicator surveys.

1. **Survey on Shared Values with Coffee Drinkers**

We successfully carried out a survey with 800 coffee drinkers across Bangalore. This online survey prompted consumers to reflect about shared values and concerns, such as changing climate, increasing coffee prices, global market changes, vulnerabilities of smallholder farmers and so on. The results provided an insight into values and willingness to pay for certain physical and symbolic qualities in coffees, all which are valuable for planning sustainability mechanisms across the value chain.

1. **Communication Platform**

We are in the final stages of uploading a communication platform that allows coffee drinkers to engage with the complexities and behind-the-scenes process. We are currently in the process of publishing this website/story with the right partners to ensure maximum visibility.