

From barley to beer: beyond traceability

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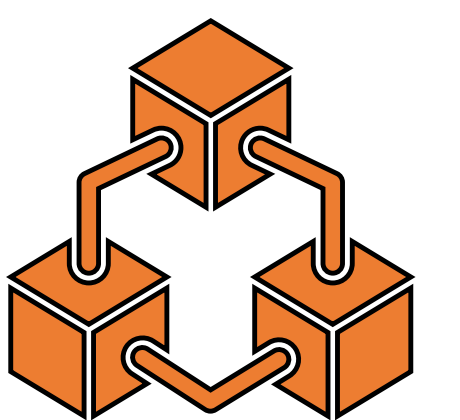
Co-Tutor: Prof. Giuseppe Aiello

Objectives:

Overcoming the limits of traditional traceability in brewing by integrating advanced technologies such as Blockchain, artificial intelligence to improve transparency, optimise quality and reduce environmental impact.

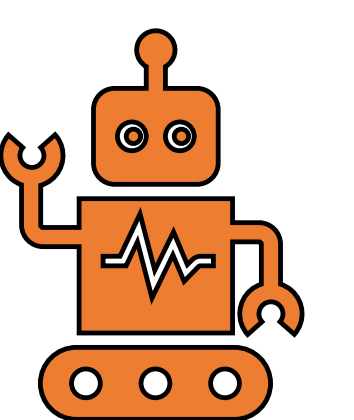
Current systems are centralised and vulnerable.

Blockchain decentralises traceability, making data secure, immutable and accessible to all, reducing the risk of fraud and improving transparency

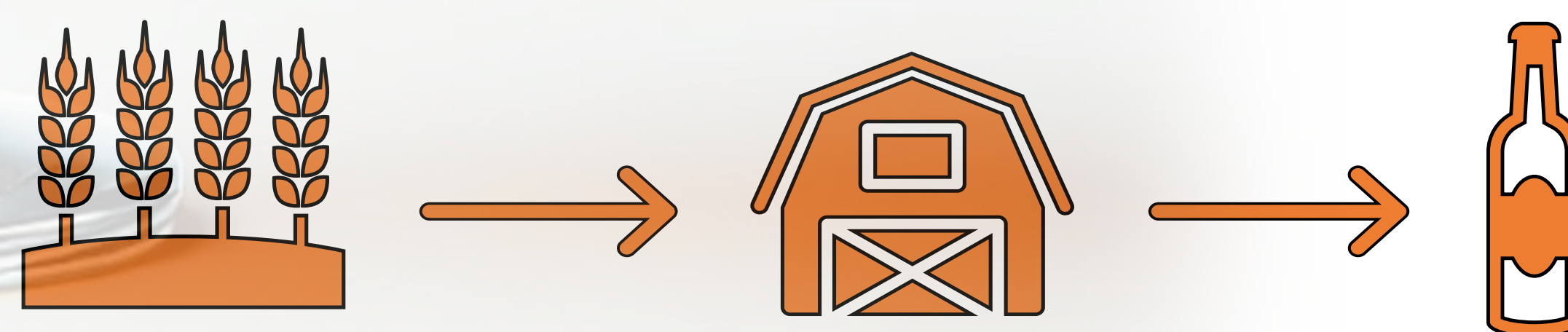
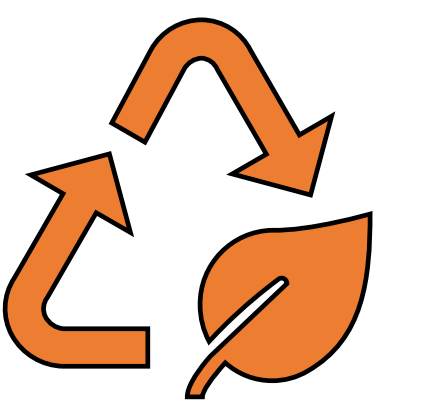


Development of a **digital twins** of the finished product, identified by a unique code describing the entire production process and physical-chemical transformations.

Thanks to **Artificial Intelligence**, the product becomes a "label of itself"



Environmental impact calculation: The aim is to assess the environmental impact of the supply chain with the **LCA** system, collecting data on energy, CO2 emissions and resources used. We will create a model to identify critical areas and reduce the impact



Activity	Months	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
A1) Characterisation and typing of barley seed		█	█																						
	1) Analysis and training of Blu-Dev	█																							
	2) Data collection for LCA	█																							
A2) Barley cultivation				█	█	█	█	█	█	█	█														
	1) Monitoring cultivation cycle			█	█	█	█	█	█	█	█														
	2) training Blu-Dev																								
	3) Data collection for LCA			█	█	█	█	█	█	█	█														
A3) Beer malting												█	█	█											
	1) Monitoring and training with Blu-Dev											█	█	█											
	2) Data collection for LCA											█	█	█											
A4) Beer production															█	█	█	█							
	1) Analysis of final product and training of Blu-Dev														█	█	█	█							
	2) Data collection for LCA														█	█	█	█							
A5) LCA Calculation		█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█
A6) Thesis and Paper Preparation		█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█

References:

Botta, V., Fusco, L., Mondelli, A., & Visconti, I. (2021). *Secure Blockchain-Based Supply Chain Management with Verifiable Digital Twins*. <https://doi.org/10.1145/3582515.3609547>

Org, S. U. (2015). *TRANSFORMING OUR WORLD: THE 2030 AGENDA FOR SUSTAINABLE DEVELOPMENT UNITED NATIONS UNITED NATIONS TRANSFORMING OUR WORLD: THE 2030 AGENDA FOR SUSTAINABLE DEVELOPMENT*.

Pilone, V., Di Pasquale, A., & Stasi, A. (2023). Consumer Preferences for Craft Beer by Means of Artificial Intelligence: Are Italian Producers Doing Well? *Beverages*, 9(1). <https://doi.org/10.3390/beverages9010026>