



Taste meets

Responsibility

True Cost Accounting in the value chain:
Our cocoa fruit balsamic vinegar and the real
costs for people and planet



KOA



elocompanion

Creating transparency in the value chain



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“For this project, I was given the opportunity to experience the entire production process of vomFASS cocoa fruit balsamic vinegar at first hand. The aim of my trip was to fully calculate the ‘true cost’ of the environmental impact of production. To do this, I analysed all processes all the way to the finished product. The results help vomFASS and Koa to optimise processes and to make them more sustainable.

My journey began in the south of Germany, where I learnt the basics of the analysis at elocompanion and started with the literature research. I then visited the vomFASS factory to familiarise myself with the processing of the delicatessen product and collect initial data. I spent the next three months in Ghana, country of origin of the cocoa fruit juice, getting to know Koa's work and collecting the remaining data for this report. Throughout the project, I received expert support from elocompanion.

This report summarises the results and is also a call for honest prices that reflect the true value for the environment and society.”



For 30 years, **vomFASS** has stood for first-class delicatessen products - from fine balsamic vinegars and oils to high-quality spirits and wines. With more than 230 franchise shops, vomFASS is one of the most popular fine food retailers in German-speaking countries. The unique concept of filling high-quality products directly from the barrel into bottles that customers bring with them emphasises the company's long-standing commitment to sustainability.



Koa Switzerland AG or **Koa Impact Ghana Ltd.** is a Ghanaian-Swiss start-up founded in 2017. It produces cocoa fruit juice from the previously unused pulp of the cocoa fruit. In this way, additional income is created for cocoa farmers in Ghana and food waste is counteracted.



Transformation through collaboration and self-empowerment is the goal of **elocompanion**. As a subsidiary of elobau GmbH, which has many years of experience in sustainable corporate management, the young business consultancy passes this on to its clients.

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The cocoa fruit balsamic vinegar

The cocoa fruit is the fruit of the cocoa tree (*Theobroma cacao*). It contains the cocoa beans, which are covered in a white pulp. To obtain cocoa, these are first fermented. During this process, the pulp normally decomposes and flows off.

Koa presses the freshly harvested beans and then returns them to the farmers for fermentation. This preserves the fruity, velvety cocoa fruit juice, which has a flavour reminiscent of lychee with honey notes.

In its manufactory in Waldburg, vomFASS produces a balsamic vinegar out of the juice, which can be used for salads, for example.

By the way: This and many other balsamic vinegars at vomFASS are made 100% from the fruit that gives them their name, so they contain the pure fruit and no brandy vinegar is added.



The results - in a nutshell

The **life cycle analysis** from cocoa cultivation to the finished cocoa fruit balsamic vinegar in the vomFASS shops and the subsequent calculation of the **'true' environmental costs** resulted in a value of **around €0.55 per litre of vinegar**. The results show that **transport** accounts for the largest share of the environmental impact, which is also reflected in **the impact category 'climate change' at €0.32**.

For Koa and vomFASS, it is important to support the origin of the cocoa fruit juice: **Smallholder families in Ghana** receive an **additional income** through the cooperation with Koa. In this way, both social and ecological challenges are addressed.

ca. €0.55*

per litre of cocoa fruit balsamic vinegar

*the price refers to one litre of vinegar without a bottle

How do you assess the environmental impact of a product?

Life Cycle Assessment (LCA)

The life cycle assessment or life cycle analysis (LCA for short) is a tool that can be used to assess the environmental impact of a product. Unlike the carbon footprint, which only focuses on greenhouse gases, the LCA considers many different environmental factors, such as soil acidification or the formation of particulate matter [1].

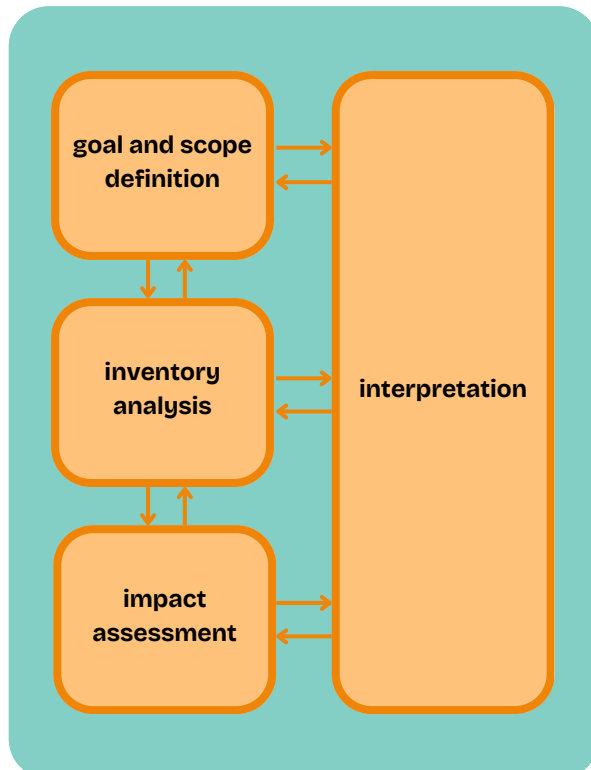


Fig. 1: LCA scheme according to ISO 14040/14044 [3,4]

Approach

The LCA follows a scheme that is regulated by ISO 14040 and 14044 [3,4] (see Fig. 1).

Goal and scope definition: First of all, it is important to determine the functional unit (here: one litre of cocoa fruit balsamic vinegar) to which all values relate, as well as to set the system boundaries. This defines which processes are to be analysed and why.

Inventory analysis: Data collection can then begin, with the aim of balancing the most important inputs (e.g. diesel, electricity) and outputs (e.g. by-products, waste).

Impact assessment: These inputs and outputs have an effect on the environment, which can be divided into different categories, so-called impact categories (e.g. climate change, particulate matter formation).

Interpretation: Finally, the results are interpreted. This can be used, for example, to identify areas for improvement.

The procedure is iterative, i.e. it is necessary to keep switching between the individual steps in order to achieve the best result. This is illustrated by the arrows in the diagram [1].

Data collection

- directly at vomFASS and Koa, e.g. through surveys with the cocoa farmers at the Akrofuom site
- supplemented by figures from studies and databases, e.g. 'Probas' from the German Federal Environment Agency [2], to assess the impact of transport



How does this become a price?

True Cost Accounting - calculation of the 'real' costs

In order to translate the environmental impacts determined in the LCA into tangible values, organisations such as CE Delft [5] or the True Price Foundation [6] have developed so-called monetisation factors for the various impact categories. These are based, for example, on the damage costs of environmental impacts, which are not normally included in the sales price (external costs). In this way, the environmental damage caused can be translated into a currency.

Example: For the impact category 'Terrestrial acidification', the environmental damage is measured in 'kg SO₂ equivalents'. According to the Environmental Prices Handbook [5], damage of €4.97 is recognised per kg SO₂ equivalent.



$$2 \text{ kg SO}_2 \text{ equivalents} \times \text{€}4.97 / \text{kg SO}_2 \text{ equivalent} = \text{€}9.94 \text{ environmental damage}$$

Impact categories analysed

Complex processes with many different substances cause environmental impacts, which in turn have complex and far-reaching consequences for nature and people. For this reason, there are scientific standards according to which the environmental impacts are categorised and continuously updated.

Five relevant impact categories were identified through the analysis (see **Table 1**).

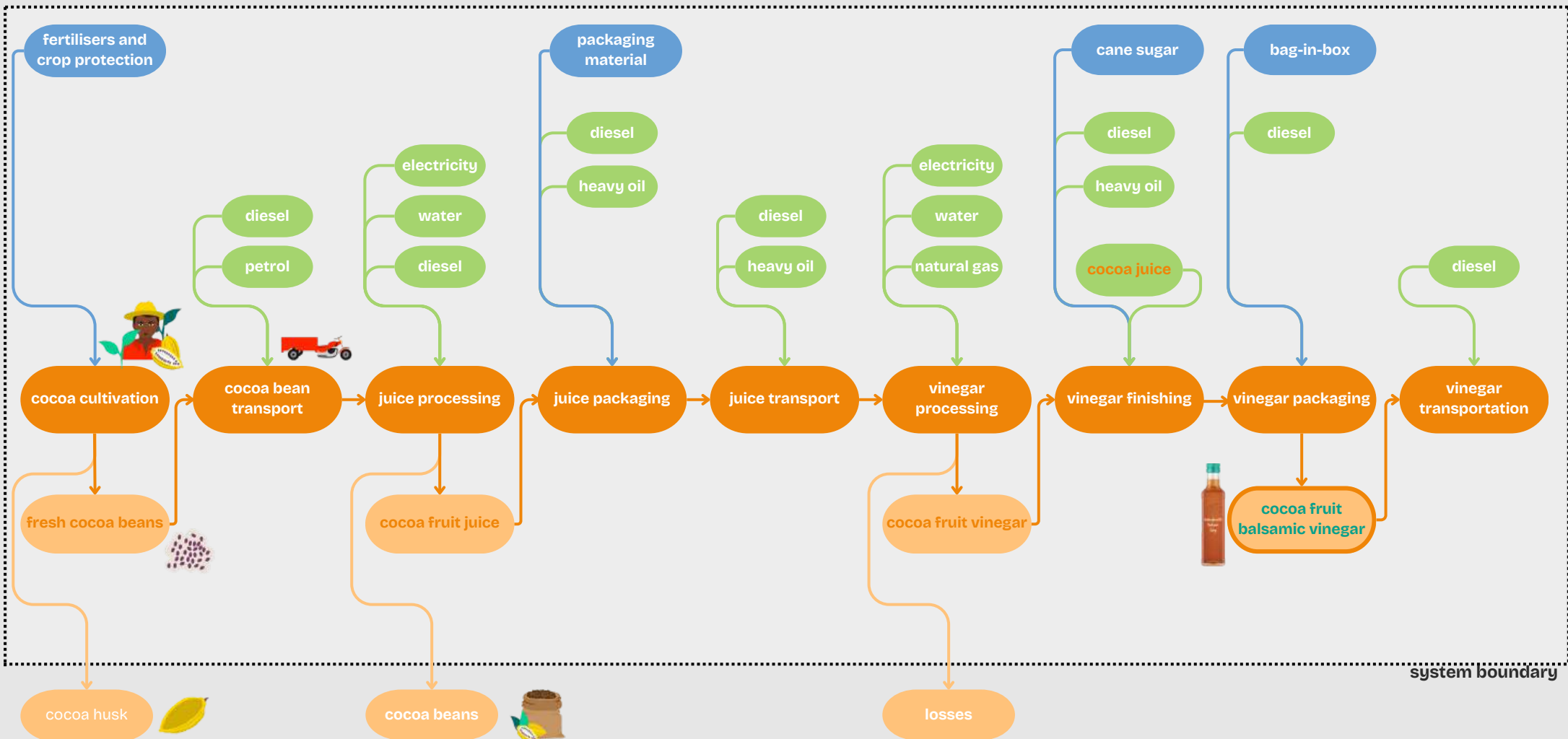
Climate change	Particulate matter formation	Photochemical oxidant formation	Terrestrial acidification	Human toxicity
Increase in the global average temperature due to greenhouse gases such as CO ₂ .	Formation of small particles in the air that can cause respiratory problems and illnesses.	Formation of near-ground ozone by pollutants that lead to smog and damage the respiratory tract.	Accumulation of acidic substances in soils that can damage plants and animals.	Harmful effects of chemicals on human health.

Table 1: Impact categories according to ReCiPe 2016 [7] with short explanation

From cocoa fruit to vinegar

The processes analysed, including the inputs and outputs, are shown in the following diagram. The system analysed begins with cocoa cultivation and ends with the transport of the finished cocoa fruit balsamic vinegar to the vomFASS shops. The sales phase in the shops and the disposal phase were therefore not considered.

The cocoa fruit juice for the vomFASS vinegar was produced by Koa in Assin Akrofuom. The fresh cocoa beans are supplied by local farmers. After gentle preservation and packaging in 10-litre bags, the juice is transported by lorry to the port of Tema near Accra.



Results and context (I)

Scan the QR code to find out more about the product journey and how the smallholders are paid! *



The aim of the analysis is to determine the current status of the processes. The results can be used to identify possible potential for improvement. **Table 2** shows the costs of environmental damage per process step for one litre of cocoa fruit balsamic vinegar.

Transport

At €0.16, the **cocoa bean transport** accounts for the largest share of environmental costs. To put this into context: this process step includes the consumption of diesel and petrol for tricycles, pickups and trucks, which are primarily used to transport the beans to the factory and also for employees. The use of these vehicles is essential to reach the sometimes remote communities on rough roads. It is of course in Koa's interest to save fuel. The young company is continuing to develop and wants to gradually become more efficient. To achieve this, the processes are constantly monitored and documented. Shipping freight has the greatest impact on the **juice transport** at €0.06.

From Tema, the juice is transported by container ship to the Netherlands, where the Koa warehouse is located. After the juice arrives at vomFASS in Waldburg, it is first fermented by yeast into wine and then by bacteria into vinegar. This is followed by the 'finishing' with cane sugar from Mauritius and the pure cocoa fruit juice to round off the flavour. The finished cocoa fruit balsamic vinegar is then filled into 5-litre bag-in-box packaging and is ready for transport to vomFASS shops.

"Aboboyaa"

= motorised tricycle with loading area



cocoa cultivation	cocoa bean transport	juice processing	juice packaging	juice transport	vinegar processing	vinegar finishing	vinegar packaging	vinegar transport	sum
€0.01	€0.16	€0.08	€0.07	€0.08	€0.06	€0.04	€0.04	€0.01	€0.55

Table 2: Calculated costs for environmental damage per process step

*The product journey differs slightly from the route described here. This is for customs reasons.

Results and context (II)

Processing

A peculiarity of **juice processing** in Ghana is that there are frequent power blackouts, which means that a diesel generator is required. However, there is also a solar power system on the company premises in Akrofuom that produces around 20% of the electricity for the site. The energy-intensive heating process is necessary for juice and vinegar to ensure food safety.

In addition to this, the electricity and CO₂ generated during the fermentation of the juice (equivalent to approx. €0.01) were also analysed during **vinegar processing**.

Cocoa cultivation

The value for **cocoa cultivation** is derived from the data in the Idemat database [8] for the production of fertilisers and pesticides. The survey conducted provided the input data, which was proportionally related to the juice.

Packaging

For the **juice packaging**, transport accounts for approximately €0.03, as the 10-litre bags and cartons were imported.

However, the data collected all relates to the batch of juice that was delivered to vomFASS. Koa can now deliver larger orders for export in larger packaging units and thus save on materials.

For the **vinegar packaging**, it was possible to fall back on regional suppliers.



Most of the water is used to clean the systems and equipment.

water usage

ca. 7.3 litres per litre of cocoa fruit balsamic vinegar

Climate change	€0.32
Photochem. oxidant formation	€0.14
Terrestrial acidification	€0.04
Particulate matter formation	€0.03
Human toxicity	€0.02
Sum	€0.55

Table 3: Calculated costs for environmental damage per impact category

At around €0.31, the **climate change** impact category accounts for the largest share of the costs for environmental damage, followed by **photochemical oxidant formation**. In both categories, transport is the main contributor to this damage. This is also reflected in the categories **particulate matter formation** and **terrestrial acidification**.

Cocoa cultivation, cane sugar cultivation and packaging production are responsible for **human toxicity**.

Reflection

Challenges and limitations

One challenge of the analysis was the limited availability of data. For example, no emissions data could be found for electricity in Ghana. These are average values for Germany [2].

In the case of cocoa cultivation, it was not possible to include the application and effects of fertilisers and pesticides. There is a need for additional research here in order to record the environmental costs more precisely.

Every scientific study has limitations that should be known in order to be able to better categorise the results. The prices presented are approximations of reality and are associated with a level of uncertainty. They are based on models and assumptions that attempt to reflect the complex reality.

Who cultivates the cocoa fruits?



Here, the cocoa fruits are broken open after the harvest and the beans and pulp are collected in buckets. Koa provides the cocoa farmers with tools for this and trains the farmers to ensure the hygiene and quality of the product.



Koa's work is centred around cooperation with cocoa farmers. They supply the raw material for juice production.

This co-operation includes training courses that Koa regularly offers in the communities. Participation qualifies the farmers to work with Koa in order to generate additional income alongside the sale of cocoa beans.

The common goal is to increase yields in cocoa cultivation. To this end, Koa advises the farmers on good agricultural practice, which includes the safe and targeted use of fertilisers and pesticides.



Who pays the real price?

Social responsibility at Koa

Many problems in the cocoa sector, such as child labour, are due to the poverty of the farmers [9]. However, the interrelationships are complex and Koa is still investigating whether the additional income of partner farmers increases the likelihood that they will send their children to school.

Education is an essential aspect of improving people's quality of life. Koa is also committed to the successful future of the next generation through the 'Koa Life' initiative.

In the picture below, Supply Chain Director Jennifer introduces the students of the local high school to the opportunities available to them after graduation.



Contribution of vomFASS

This research work helps vomFASS to better address the ecological problems in its own supply chain and develop solutions for them. The aim is to make our own value creation more resilient for the future. Climate change, which is the strongest factor in the true costs, is not only a threat to our own habitat, but the resulting extreme weather events are also damaging agricultural structures and are already leading to price increases for our own products.

Outlook

In order to also get involved in the cocoa fruit juice value chain, vomFASS supports Koa in improving the structures in such a way that environmental damage is reduced.

For this reason, vomFASS pays the determined true price for all batches in addition to the purchase price to the Koa foundation programmes in order to support farmer training. The money is also used to finance health programmes and drill wells for remote communities that still have no access to clean drinking water.



Sources

- [1] Ausberg, L. et al. (2015). Lebenszyklusanalysen. In: Kaltschmitt, M., Schebek, L. (eds) Umweltbewertung für Ingenieure. Springer Vieweg, Berlin, Heidelberg. https://doi.org/10.1007/978-3-642-36989-6_5
 - [2] Umweltbundesamt. Probas. <https://probas.umweltbundesamt.de/datenbank/#/>
 - [3] Deutsches Institut für Normung (02.2021). DIN EN ISO 14040:2021-02, Umweltmanagement_Ökobilanz_- Grundsätze und Rahmenbedingungen (ISO_14040:2006_+ Amd_1:2020); Deutsche Fassung EN_ISO_14040:2006_+ A1:2020, 13.020.10, 13.020.60, 13.020-80, DIN EN ISO 14040:2021-02, Berlin.
 - [4] Deutsches Institut für Normung (02.2021). DIN EN ISO 14044:2021-02, Umweltmanagement_Ökobilanz_- Anforderungen und Anleitungen (ISO_14044:2006_+ Amd_1:2017_+ Amd_2:2020); Deutsche Fassung EN_ISO_14044:2006_+ A1:2018_+ A2:2020, 13.020.10, 13.020.60, 13.020-80, DIN EN ISO 14044:2021-02, Berlin.
 - [5] de Bruyn, S., Bijleveld, M., de Graaff, L., Schep, E., Schroten, A., Vergeer, R., Ahdour, S. (2018). Environmental Prices Handbook. Publication, Delft, CE Delft. https://cedelft.eu/wp-content/uploads/sites/2/2021/04/CE_Delft_7N54_Environmental_Prices_Handbook_EU28_version_Def_VS2020.pdf.
 - [6] True Price Foundation (2023). Monetisation Factors for True Pricing Version 3.0.0 (Authors: Galgani et al.). Amsterdam.
 - [7] Huijbregts, M. A., Steinmann, Z. J., Elshout, P. M., Stam, G., Verones, F., Vieira, M. D., ... & van Zelm, R. (2016). ReCiPe 2016: a harmonized life cycle impact assessment method at midpoint and endpoint level report I: characterization.
 - [8] Joost Vogtlander (2023). Idemat 2023. Data on Eco-costs 2023 V1.0. <https://www.ecocostsvalue.com/>
 - [9] Fountain, A., & Hütz-Adams, F. (2020). Cocoa barometer 2020. In Cocoa barometer 2020: Fountain, Antonie| uHütz-Adams, Friedel. [Bonn]: SÜDWIND eV-Institut für Ökonomie und Ökumene. S. 39.
- weitere Quellen:**
- Bundesamt für Wirtschaft und Ausfuhrkontrolle (2024). Informationsblatt CO2-Faktoren: Bundesförderung für Energie- und Ressourceneffizienz in der Wirtschaft - Zuschuss. Version 7.0. Eschborn. https://www.bafa.de/SharedDocs/Downloads/DE/Energie/eew_infoblatt_co2_faktoren_2024.pdf?__blob=publicationFile&v=2
- True Cost Initiative (2022). TCA Handbook – Practical True Cost Accounting guidelines for the food and farming sector on impact measurement, valuation and reporting. Available at: http://tca2f.org/wp-content/uploads/2022/03/TCA_Agrifood_Handbook.pdf



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What does the price tag really say?

Food is often significantly more expensive than the price in the shop suggests. Hidden, so-called 'external' costs - such as environmental damage - are generally not included in the price. Instead, society as a whole or, in the worst case, individual population groups bear the burden of this damage and have to compensate for it.

In this brochure you will gain a practical insight into the concept of true cost accounting and see how vomFASS, Koa and elocompanion are committed to honest prices without outsourced environmental damage.



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