

## SOURCING DEFORESTATION-FREE CACAO IN PERU

Copernicus Sentinel data is being used by chocolate producers to ensure that the cacao they source from tropical regions is not contributing to deforestation.



### THE CHALLENGE

Many of us are chocolate lovers! Europe in particular has a long-standing chocolate history, with Switzerland, Belgium, Italy and Germany all boasting world famous brands and chocolatiers. In fact, Europe is the largest importer of cocoa beans, paste, butter and powder in the world<sup>1</sup>. Before going any further, let's clear up some understandable confusion between the terms "cacao" and "cocoa". Cocoa is created after the cacao beans are roasted or ground and separated into butter and powder. The product can be consumed as a drink or blended with sugar and milk to make chocolate. Despite

Europe's love affair with chocolate, cacao can only be grown in humid climates within 25 degrees of the equator, so it doesn't actually grow on the continent at all, meaning we have to import every bean! This begs the obvious question; "where do we get our cacao?" Cacao comes from the Cacao tree (*Theobroma cacao*), which is native to South America, but also grown in West Africa, Asia and Central America, with most of Europe's cacao imports coming from West Africa and South America. In 2022, Europe imported 1.7 million tonnes of cocoa beans<sup>2</sup>, but this kind of demand comes at an environmental cost. Over the last fifty years, global cacao cultivation has resulted in the disappearance of about 15 million hectares of global forest cover<sup>3</sup>, resulting in the commodity coming under the spotlight of the new [EU Regulation on Deforestation-free products \(EUDR\)](#). In 2023, the EUDR came into force and means that any operator or trader who places cacao (and other specific commodities) on the EU market, must be able to prove that the products do not originate from recently deforested land or have contributed to forest degradation. This is a landmark operational change, and quite a challenge for cocoa importers. The impetus behind this regulation is clear; 90% of global deforestation is driven by the expansion of agricultural land, contributing to climate change,

biodiversity loss, soil erosion and desertification, and hindering sustainable development<sup>4</sup>. Despite the obvious noble intentions of the regulation, this demands from cocoa importers a level of supply-chain transparency that they have never had to provide before. How can they know that their cocoa is not contributing to deforestation? This is where Sentinel data comes into play.

1. <https://www.cbi.eu/market-information/cocoa/what-demand>

2. <https://www.cbi.eu/market-information/cocoa/what-demand#:~:text=Many%20of%20the%20largest%20global,and%20France%20at%20103%2C000%20tonnes.>

3. <https://www.nadar.earth/blog/deforestation-free-cacao-supply-chains>

4. [https://efi.int/sites/default/files/files/flegtredd/Sustainable-cocoa-programme/Factsheets/20230530%20EUDR%20Cocoa%20factsheet\\_CDI\\_EN.pdf](https://efi.int/sites/default/files/files/flegtredd/Sustainable-cocoa-programme/Factsheets/20230530%20EUDR%20Cocoa%20factsheet_CDI_EN.pdf)

HOW SATELLITES CAN HELP

Nadar is a remote sensing company who have developed a solution which aims to support traders and importers of various products under the EUDR, including cocoa, by mapping their farms, monitoring deforestation with confidence, and creating the required due diligence documents.

Nadar use Sentinel-2 data, in conjunction with other commercial data sources to map areas of commodity cultivation (currently cacao, coffee and rubber) and then assesses whether this activity is contributing to deforestation/degradation. There are several steps to this process. First, supplier information is gathered and farm plots geolocated. Using a mobile application, the user can then outline the plot boundaries. Once completed, Nadar can perform deforestation checks using Sentinel data with the solution being able to differentiate between natural forest and plantations using AI and time series analysis. A risk assessment is then conducted based on the geospatial analysis and country-level risk indicators. Finally, a due diligence statement is produced which can automatically interface with the EUDR Information System. This is useful because before introducing a commodity into the market, traders must make available to the competent authorities a corresponding due diligence statement via a register that has been set up by the European Commission. Authorities explicitly promote the use of geographic information as part of these due diligence checks, including the use of remote sensing i.e., Copernicus and/or other sources and GNSS coordinates to locate specific forest plots i.e., via Galileo and/or other sources.

Nadar utilises a Machine Learning approach to detect deforestation with Sentinel data and time series analysis. Time series analysis is widely used for identifying abrupt changes by analysing repeated data from specific locations (pixels) where the forest may have experienced disturbances at certain times. They rely on variables derived from the raw EO data, including vegetation indices such as the Normalized Difference Vegetation Index (NDVI), the Enhanced Vegetation Index (EVI), the Leaf Area Index (LAI), and the Soil Water Index (SWI).

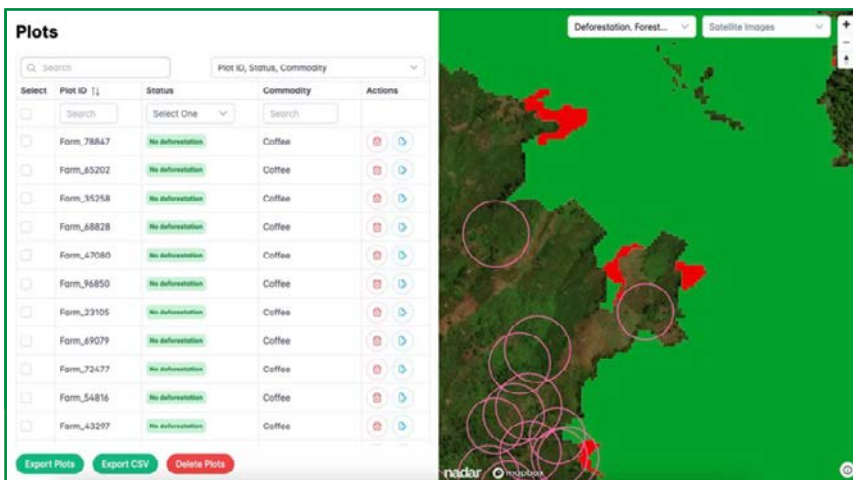


Figure 1: Nadar's EUDR compliance solution – Source nadar.earth

The satellite data:



Sentinel-2 carries an innovative wide swath high-resolution multispectral imager with 13 spectral bands. The combination of high resolution, novel spectral capabilities, a swath width of 290 km and frequent revisit times provides unprecedented views of Earth. Sentinel-2 images can be used to determine various plant indices such as leaf area chlorophyll and water content providing information useful for agricultural and forestry practices and for helping manage food security. Sentinel-2 also provides information on pollution in lakes and coastal waters. Images of floods, volcanic eruptions and landslides contribute to disaster mapping and help humanitarian relief efforts.

Copernicus Sentinels data are available under an open and free data policy.

Sentinel-2 data can be accessed at <https://scihub.copernicus.eu>

More info: <https://sentinels.copernicus.eu>

The Service Provider

Nadar is a German-based SME who specialise in EO-enabled forest monitoring services. Among their services they provide carbon sequestration Monitoring, Reporting, and Verification (MRV) solutions and have more recently developed an end-to-end software solution for compliance with the EUDR.



<https://www.nadar.earth/>

## WHO IS CONCERNED?

Original Beans is a Dutch chocolate manufacturer. They pride their business on being 100% regenerative and work closely with Nadar to ensure the cacao they source does not come from areas that are contributing to deforestation.

Original Beans source cacao from all around the world, including Peru (where this case focusses), Ecuador, Columbia, Bolivia, Mexico, Dominican Republic, Democratic Republic of the Congo, and Tanzania.

In Peru, they work with APPCACAO, the national trade association that represents Peruvian cacao producers on national and international policy issues that are important to the cacao sector. APPCACAO facilitates trade by providing information about cacao offerings on behalf of its partner cooperatives. They act as a connector, promoting Peruvian cacao and helping interested buyers find the best cacao in Peru.

By using the services of Nadar, Original Beans can ensure that the cacao cultivating activities that APPCACAO facilitates are not resulting in or contributing to deforestation in Peru. The importance of remaining adherent to the EUDR cannot be understated. Violations can result in severe penalties for importers. For example, under the EUDR fines of up to at least 4% of the company's annual EU-wide turnover in the preceding year can be applied. Moreover, imported commodities can be confiscated as well as any resulting revenue. Market authorities also have the power to stop violators from accessing public funding for up to a year for serious infringements and can halt the selling of relevant products within the EU. These kinds of penalties also have implications for actors further down the value chain as they can result in the loss of trade and associated revenues for growers and associations such as APPCACAO.

As a testament to their commitment to transparency and sustainability, Original Beans host an interactive map which shows where they source their cacao from along with local stories of farmers and the kinds of biodiversity that can be found in the region.

### The Primary Users

Original Beans, founded in 2008 and based in The Netherlands is a craft chocolate producer. They source beans from smallholder farmers in regions like the Amazon Rainforest, the Congo Basin, and the Peruvian Andes. By working closely with these farmers, Original Beans ensures they receive fair prices, supporting local economies and communities. They have a central sustainability and conservation mission, whereby for every chocolate bar sold, the company grows a tree in the regions where it sources its beans.

ORIGINAL BEANS

<https://originalbeans.com/>



Figure 2: Sourcing map – Source originalbeans.com

WHAT ARE THE BENEFITS?

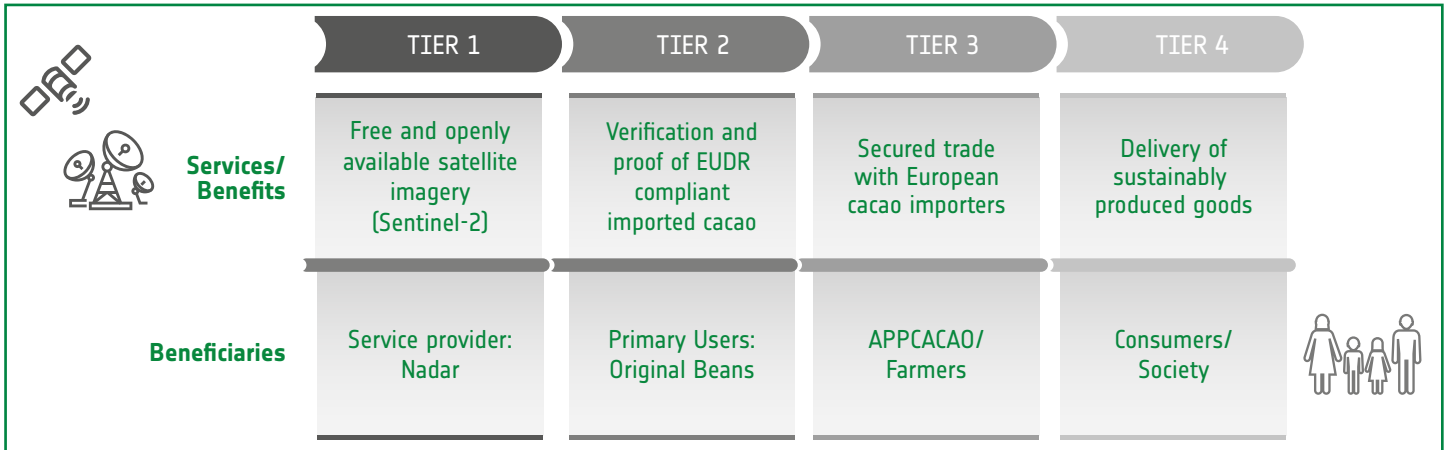


Figure 3: Value chain of the main stakeholders and beneficiaries

Thanks to the free and open nature of Copernicus data, Nadar can build services, such as their EUDR compliance service, for their clients while simultaneously saving in data purchasing costs. This enables entities such as Nadar to build robust and sustainable business models which in turn allows them to enter the market faster and begin competing in a financially sustainable manner.

Using this Sentinel-enabled service, Original Beans can prove their adherence to the requirements of the EUDR. This allows them to sell their products into the EU market while simultaneously maintaining their established trading relationships with their sources in Peru. By proving their adherence to the EUDR, they can also avoid the various penalties that could be imposed upon them, which range from substantial fines to the cessation of trade.

APPCACA0 and the cacao producers they represent are heavily incentivised to ensure their cacao comes from sustainable sources and is not contributing to deforestation. By doing so, they can maintain trading relationships with the likes of Original Beans. This not only ensures continued revenues, but also protects the natural habitats, biodiversity, and the lives of local communities within the regions from which cacao is sourced.

Finally, the consumers of the products in question and society as a whole benefit from the verified deforestation-free chocolate products. The preservation of forests is something that affects the entire globe. Ensuring that Europe’s impact on forests remains minimal is key to the fight against climate change and habitat loss.



**Societal**

Consumers and society benefit from the protection of natural habitats and the livelihoods of local communities (Tier 4).



**Environmental**

The use of Sentinel data helps minimise deforestation which in turn protects natural habitats and aids in the fight against climate change (Tiers 3 & 4).



**Economic**

Thanks to Sentinel data, Nadar saves money in data acquisition costs. Original Beans protects their business operations and avoid potential financial penalties. APPCACA0 and local farmers maintain trading relationships and associated revenues (Tiers 1,2 & 3).



**Regulatory**

The use of Sentinel data helps Original Beans adhere to the requirements of the EUDR (Tier 2).

## EXTENDED IMPACT

The extension of Sentinel data in applications such as the one studied in this case are profound. Firstly, although not explicitly mentioned in this case, Sentinel-1 can also be a useful data source in deforestation detection. Given the tropical regions where cacao grows, it can often be challenging to detect deforestation during rainy seasons, with optical imagery (i.e., Sentinel-2) not being capable of seeing through cloud. This is where radar data, (i.e., Sentinel-1) can come into play and be used as a complementary data source thanks to its “all weather” capability which can guarantee continuous monitoring through clouds.

Secondly, we have the geographic extension. Thanks to the global coverage of Sentinel data, providing EUDR compliance monitoring can relatively easily be extended to other parts of the world such as Africa or Asia. Typically, the algorithms developed for one region would require some “training” to calibrate them for new regions and new forest types. Nevertheless, the regional extension of services is considered completely scalable.

Finally, we have the extension of the service to different commodities. Currently Nadar’s solution is primarily used by clients involved with cacao, coffee and rubber production, but the EUDR actually covers several commodities: cattle, cacao, coffee, palm oil, rubber, soy, and timber as well as derived products such as chocolate, leather or furniture. Extending the solution to each of these commodities could bring with it associated challenges that are unique to each commodity, however, the application of Sentinel data in deforestation detection for all of these commodities is again considered completely scalable.

## ABOUT THE PROJECT

The Sentinel Benefits Study (SeBS) is conducted by EARSC (European Association of Remote Sensing Companies) with partners The Green Land, IIASA (International Institute for Applied Systems Analysis) and Evenflow on behalf of the European Space Agency (ESA). It has the goal to study 20+ full cases by analysing the impact of the use of Sentinel data along a value-chain. This short case has been prepared where there has been an interesting use made of Sentinel data, but it has not (yet) been possible to conduct a full case. It tells the story of the use of Sentinel data without going deeply into the economic or environmental benefits.



We acknowledge that the understanding of the case was supported by discussions with Caroline Busse from Nadar and Jan-Marcel Schubert from the Original Beans. We thank them for their valuable insights and availability



***“What makes Nadar so special is that it is very easy to use in the field and that the platform focuses on the important data points and checks for EUDR compliance without overcomplicating things.”***

*- Jan-Marcel Schubert, Conservation Cacao Leader, Original Beans”*



**Do you know an interesting case demonstrating the benefits derived from the use of Sentinels data?**

**Email [info@earsc.org](mailto:info@earsc.org)**

**More Information on Sentinels Benefits Studies:**

**[www.earsc.org/sebs](http://www.earsc.org/sebs)**



The Sentinels Benefits Study is funded by the EU and ESA. The views expressed in this study cannot be taken to reflect the official position of the EU or of ESA.

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More information on [www.earsc.org/sebs](http://www.earsc.org/sebs)