



Coffee Artificial Intelligence (AI) Mapping Project

Section 1: Concept Overview

Project Objective: In 2015, recognizing the need to tackle some of the most pressing challenges facing the long-term sustainability of coffee, CI launched the Sustainable Coffee Challenge. The Sustainable Coffee Challenge is a collaborative effort of over 165 companies, governments, NGOs, research institutions, and others working to make coffee the first sustainable agricultural product. Challenge partners are working together to identify, implement, and scale solutions that enable us to meet future demand for coffee while conserving nature and improving the livelihoods of producer communities. As part of the Challenge efforts, CI and partners have identified the need for improved understanding of the role of coffee in driving deforestation and reforestation. This can help the sector understand both current areas of risk and opportunity, as well as future risks given climate change scenarios. This requires developing methodologies for identifying and mapping the variety of coffee production systems globally (i.e. multi-strata shade systems to full-sun plantations), overlaying these with climate models and tree cover imagery, and integrating outputs into user-friendly tools. Government agencies, companies, producer groups, and civil society could leverage these outputs to identify priority landscapes to undertake participatory processes for aligning on coffee + forest action plans. As a step in the direction of improved decision-making tools, Conservation International and partners need to get a better understanding of where coffee production is occurring.

A reliable coffee map is necessary to evaluate: 1) deforestation associated with coffee production systems, 2) areas at risk for future deforestation, and 3) management options for degraded lands. In addition, for companies sourcing coffee, a detailed coffee map overlaid with forests can be used to detect land use change on farms within their supply chain. This information is useful to quickly address or substantiate deforestation free claims to comply with upcoming legislation, as well as be a basis for more accurately tracking of on-farm emissions due to land use change in support of progress against corporate commitments. However, there is no current authoritative/reliable global map of coffee. The information available varies by country, is often modeled from suitability, and can be multiple years old. A yearly map is necessary to capture up to date locations of coffee production and forest encroachment. Additionally, mapping coffee production on farms is resource intensive with multiple physical, financial, and time constraints that will not be able to easily scale to a global production map.

Brief Description: This project aims to develop and apply machine learning algorithms to high resolution imagery to generate a global coffee dataset and/or on-demand boundaries of coffee areas. We are currently building a large training dataset that includes both data collected in the field and digitally ocular sampled polygons over recent high-resolution imagery. The algorithm developed for identifying coffee trees on the landscape will be rigorously validated both for the year it was trained from and additional years, potentially allowing the algorithm to be applied to future imagery as tasked. A core set of partners including CI, leading coffee companies, Planet and a technology partner will collaborate to build a first solution set.

This project will generate a validated annual remotely-sensed global coffee dataset for researchers, policy makers, NGOs and coffee companies to utilize for decision-making and sustainability interventions. The dataset (and potentially future datasets) will be hosted on a public-access platform, such as Global Forest Watch, that will allow users to explore the data and download for further analysis.



In addition to making the coffee production area dataset freely available, a scientific publication outlining mapping developments this project makes will be submitted for publication. These advancements could provide key learnings for similar mapping efforts in other commodities.

Country of Focus: Global

Key Performance Indicators:

Indicator	Metric	Baseline	Project Target
Leading coffee companies participate in piloting the global coffee dataset	Number of polygons or points for training data	--	5,000
Global coffee dataset, developed with machine learning	Number of new resources created for the coffee sector	--	1

Please indicate how this project aligns with the 2025 Targets:

- Resilient supply
- Strengthen market demand
- Improve well-being & prosperity
- Conserve nature

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Project Status: Existing project under implementation

Project Timeline: *Start date:* Click or tap here to enter text. *End date:* 12/31/2022

Section 2: Partnerships

Involved Parties:

Organization Name	Role in Project	Contribution
Conservation International	Lead	Coordinating efforts with technology partner, Planet and coffee sector. Lead methodology development and create training data.
Leading coffee companies	Contributor	Providing anonymized data in CSV (with spatial data), KMZ, or SHP format.
Your organization	Thought partner	Serve as key partner and thought leader to partner on delivering the sector a global coffee map.

Expectations for Partner Engagement: One of the critical pieces to developing a machine learning algorithm is extensive coffee farm training data. While the CI team is pulling on our existing data and in



parallel working to manually map coffee areas over Planet’s high-resolution imagery and categorize production systems, we still lack sufficient point and/or polygon data to validate coffee in the areas of interest. Without access to this validation data, CI and partners would need to collect and validate coffee locations in the field, which broadens the scope of work, requires resources, and substantially extends our timeline. Is your organization interested in supporting this effort? At this point in the development, there are three ways to get involved:

- 1) **Data contributor:** Do you have point or polygon data that can be shared with CI? We are looking for partners to send us anonymized data in CSV (with spatial data), KMZ, or SHP format. As CI and partners work to create a new coffee farm dataset for training, your anonymized data will solely be used for validating coffee areas.
- 2) **Ground truth support:** Do you have extension teams on the ground who could help validate coffee plots as part of their daily activities? We’d be interested in exploring how we could leverage their support.
- 3) **Thought partner:** Do you want to help shape this work further? We’d love to set up a time to discuss how your organization could engage in this effort as a key partner and thought leader to partner on delivering the sector a global coffee map!

Deadline for partnership opportunities: 12/31/2022

Section 3: Funding

Project Costs:

Total project costs	N/A
Secured funding	N/A
Funding needed	N/A

Explanation of Funding Use: N/A

For more information on this project, please contact Raina Lang at rlang@conservation.org and Kristen O’Shea at koshea@conservation.org.