
Environmental compliance of coffee producers in the state of Minas Gerais, Brazil

Felipe Nunes
Britaldo Soares-Filho
Amanda Oliveira

Débora Assis
Filipe Lisboa

Traceability has consolidated as a market requirement to eliminate deforestation from agriculture supply chains, and as such has become pivotal for regulating the global trade¹. Growing pressure for deforestation-free agriculture products has led to agreements by large companies to exclude deforesters from their supply chains (e.g., Cattle Agreements), commitments from China and the United States to ban imports linked to deforestation, regulations with this end in France and the United Kingdom, and more importantly, the due diligence rules approved in May of 2023 by the European Union (EU)² to enforce the import of deforestation-free products.

The EU's due diligence mandates that seven agricultural commodities, namely cattle, cocoa, coffee, palm oil, rubber, soy, and wood be deforestation-free and that their production comply with the "relevant" legislation in the countries of origin. To this end, the regulation requires that companies trace the commodities back to their origin of production, at the same time proposing a benchmarking system to assign a level of deforestation risk to each sourcing country.

The EU's new regulation is expected to come into force in 2024. It may therefore impact the state of Minas Gerais, given that coffee is its major agricultural export. Were it a country, Minas Gerais would be the world's largest coffee producer and exporter. In 2022, the state contributed to 28.5 million out of 39.35 million sacs of coffee exported from Brazil. The National Supply Company (CONAB) estimates that Minas Gerais will produce

27.5 million sacs of coffee in 2023, which is approximately 50% of the entire national production, estimated at 55 million sacs.

Due to the relevance of the coffee production in Minas Gerais, it has become essential to evaluate the socioenvironmental compliance of coffee producers to the Brazilian Forest Code (FC) as well as with respect to deforestation. The FC is the country's primary legislation regulating environmental conservation on private lands³. In short, it establishes where native vegetation must be conserved or can be suppressed, also regulating the use of natural resources. The law defines two types of conservation areas: Areas of Permanent Preservation (APP) along rivers, water bodies and springs and on steep slopes and hilltops, and Legal Reserves (LR), a percentage of the rural property's area where native vegetation must be maintained. This percentage ranges from 80% in the Amazon to 20% in other biomes, such as those occurring in Minas Gerais, i.e., Cerrado, Atlantic Forest, and Caatinga. For non-compliant properties, the FC also determines the areas that must be restored, namely LR and APPs, as well as other illegally deforested areas.

There are around one million private properties in Minas Gerais registered on the Rural Environmental Registry (CAR) - the national web-based database of rural properties. Because the CAR is a self-reported system, there is still a need to validate its information. To do so, it is necessary to develop technological solutions capable of integrating the massive CAR dataset with detailed land-use mapping to automatically analyze the

¹Rajão R., *et al.* (2020) The rotten apples of Brazil's agribusiness. *Science*, 369 (6501): 246-248.

²https://environment.ec.europa.eu/topics/forests/deforestation/regulation-deforestation-free-products_en

³ Brazil. Federal law nº 12.727 (October 17, 2012). Available at: <www.planalto.gov.br/ccivil_03/_Ato2011-2014/2012/Lei/L12727.htm>

level of environmental compliance for each rural property located in Minas Gerais.

Within this context, we present here the results together with the methods of our computer model for calculating the FC balance at the property level for Minas Gerais. For each rural property, the model estimates the areas designated for conservation or restoration of native vegetation (LR and APPs), calculating the deficits (native vegetation that needs to be restored) and surpluses (native vegetation exceeding the FC requirements), including deforestation after 2008 as detected by the “Continuous Monitoring Program of Native Vegetation” under the auspices of the State Forest Institute - IEF. The coffee-producing farms are identified by cross-referencing their georeferenced CAR boundaries with the high-resolution mapping of coffee plantations in Minas Gerais⁴.

Results indicate that 99% of the 115,000 coffee-producing properties registered on the CAR do not show significant deforestation⁵ after 2008, which

qualifies the state’s coffee production as a deforestation-free supply chain under the regional classification standard of the EU's due diligence. In addition, about one-third of the rural properties producing coffee have more native vegetation than what the FC mandates, totaling 302 thousand hectares of forest surplus (Figure 1), thus adding a key ecosystem service to coffee production.

To calculate the FC balance, the model uses as inputs maps of state and municipal boundaries, fiscal modules, vegetation physiognomies, drainage network, land use, protected areas, and rural properties’ boundaries (Figure 2). Initially, the model calculates the total area of each rural property. Then, the model generates APP buffers along rivers, springs, and water bodies according to the FC rules for both conservation and restoration of native vegetation. To calculate the width of the riparian APPs for restoration purposes, a series of hierarchy rules is applied based on the size of the property (defined by the number of fiscal modules as specified for each municipality) and river width.

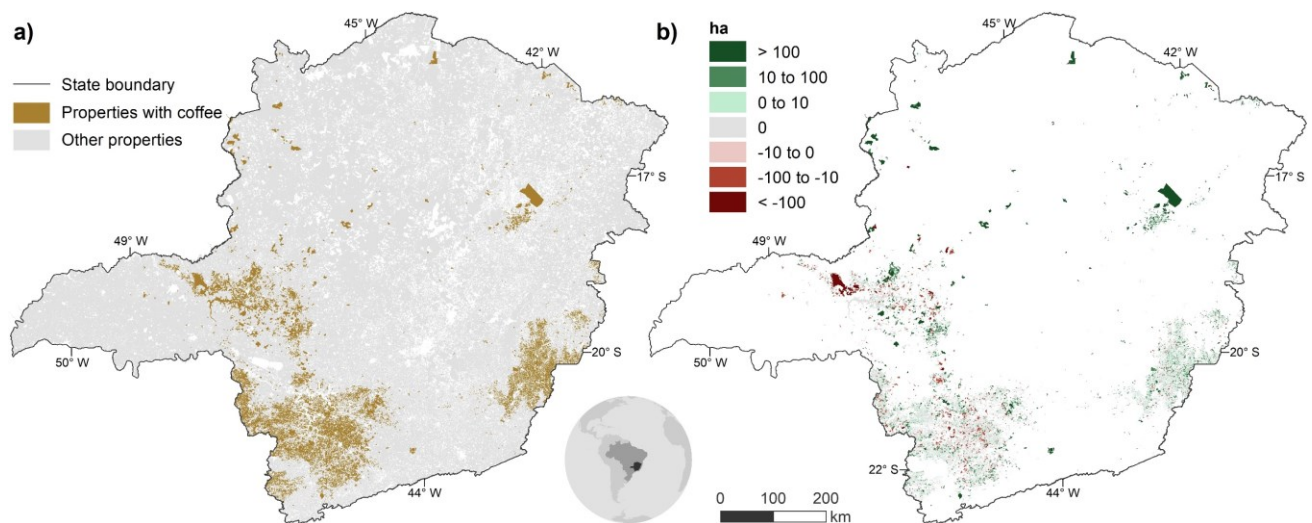


Figure 1 – a) Distribution of the coffee-producing farms in Minas Gerais, b) Environmental surpluses (positive values) and deficits of coffee-producing farms according to the Forest Code balance.

Subsequently, the model applies the FC rules to determine the requirement for LR. The legislation considers properties from less than 1 to 4 fiscal modules (FM) as small, those between 4 and 15 FM as medium, and properties larger than 15 FM as

large. Of significance for Minas Gerais, the FC exempts small landowners (up to 4 FM) from restoring the LR deficit, which represents more than 93% of rural properties in the state. Additionally, the law establishes a maximum

⁴ <https://portaldocafedeminas.emater.mg.gov.br/>

⁵ Intersection of polygons larger than 1 ha of native vegetation suppression from the continuous monitoring program of the

State Forest Institute of Minas Gerais - IEF, or deforestation larger than 6.25 hectares at property level from PRODES/INPE

percentage of the property for LR restoration, depending on the total width of its riparian APPs.

The FC balance for each rural property can be accessed by the public through the "[SeloVerde-MG](https://seloverde.meioambiente.mg.gov.br/)" platform⁶, thus allowing transparency and traceability of the coffee production across the state. The platform follows similar principles as those of the [SeloVerde-PA](https://seloverde.pa.gov.br/) platform by the State of Pará for soy and cattle traceability⁷.

The results from the automatic diagnosis of the FC balance and the coffee cultivation areas for rural properties in Minas Gerais are presented individually, ensuring compliance with legislation on personal data protection. To access a specific property's data, one needs to simply provide its CAR code. The platform allows visibility of coffee producers so as to inform their compliance regarding the national legislation for domestic markets as well as to support verification procedures conducted by exporters and importers in order to attest that the coffee comes from a deforestation-free property. This procedure includes the so-called "due diligence" required by both the UK and EU regulations. Among other requirements, the due diligence demands that companies collect information, perform a risk

assessment, and inform the geolocation of the cultivation plots to European authorities and all of this can easily be obtained using the public [SeloVerde-MG](https://seloverde.mg.gov.br/) platform.

With respect to the EU's regulation, important issues that directly impact Minas Gerais are still to be defined. For example, this refers as to whether the three-level classification of deforestation risk (low, medium, and high) will be based on a regional or product-specific approach, such as coffee. Products from regions of high-deforestation risk will be subject to a stricter inspection, and the due diligence will involve more steps, which can create obstacles and additional costs for exporting coffee to the EU.

In sum, the results presented here on the environmental compliance of the coffee producers, together with the transparency provided by [SeloVerde-MG](https://seloverde.mg.gov.br/), not only qualify the coffee from Minas Gerais as a deforestation-free or with neglectable deforestation-risk commodity, they also contribute to the debate on the criteria for legal compliance, development of traceability tools and risk assessment methods to be implemented in the coming months by both Brazil and its trading partners.

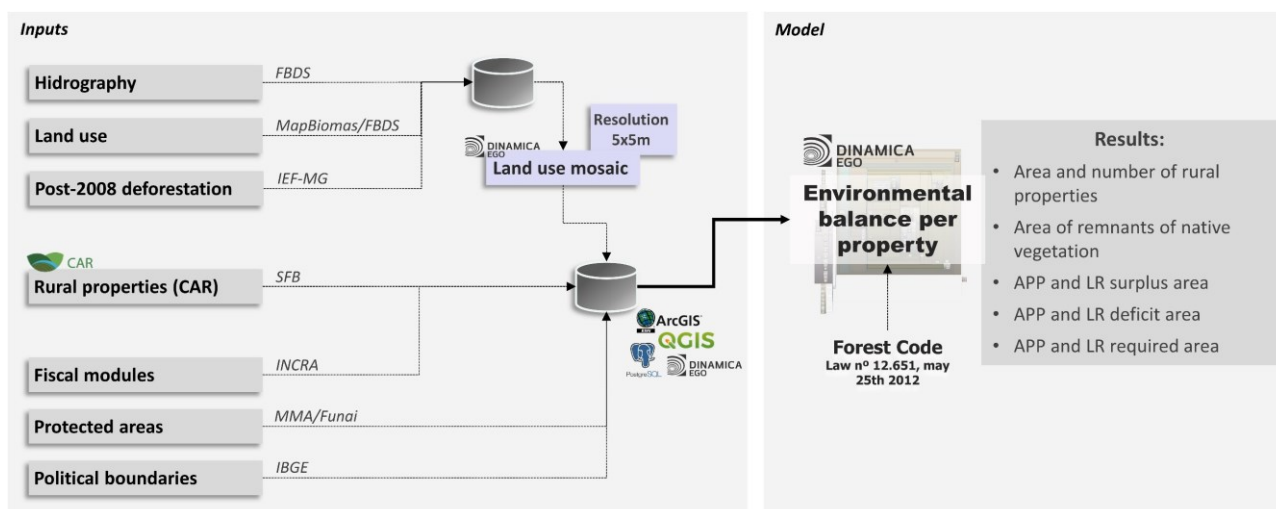


Figure 2 - Diagram with input databases and the Forest Code model results per rural property.

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⁶ <https://seloverde.meioambiente.mg.gov.br/>

⁷ <https://www.semas.pa.gov.br/seloverde/>