NESPRESSO

AAA PROGRAM & AGROFORESTRY

GLOBAL ASSESSMENT REPORT 2014-2020

BY: PUR

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Foreword

In the fight against climate change, trees and forests are one of our best allies to restore carbon balance and regenerate life on Earth. As a key regenerative agriculture practice, the integration and conservation of trees contribute to soil health and restore ecosystems so that plants, animals and humans can prosper.

By restoring coffee landscape through agroforestry, we are doing more than planting trees; we are regenerating ecosystem services and functions. Since their inception in 2014, the agroforestry projects were designed with an insetting approach, a commitment to transforming coffee production through a holistic approach that places nature and communities at the center of its projects.

> *"Insetting is performed when a company develops nature-based, positive impact projects within their value chain that drive multiple ecosystem and livelihood benefits for the company, local stakeholders and the world in general. Through its program, Nespresso transformed climate action from a niche activity to an industry standard and is a role model for many brands."*
>
> Tristan Lecomte, founder of PUR Projet

As young trees slowly grow, farmers witness positive changes on their lands. But working with nature and communities is a rich and ever-evolving process, and its many results cannot be captured nor measured the same way.

Therefore, the impacts of Nespresso agroforestry projects are expressed through three different approaches:

- measurement against operational KPIs;
- empowerment of farmers;
- ecosystems services delivered (in monetary value).

After seven years of operations, this report highlights the legacy and outcomes of each project.

Deseado Castro
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Executive summary

Over seven years, the agroforestry projects have been deployed in the sourcing regions of Nespresso where the the AAA program was in place.

2014-2020 ACHIEVEMENTS

3,497,888 trees

770,200 tCO2eq to be sequestered

12,782 farmer beneficiaries

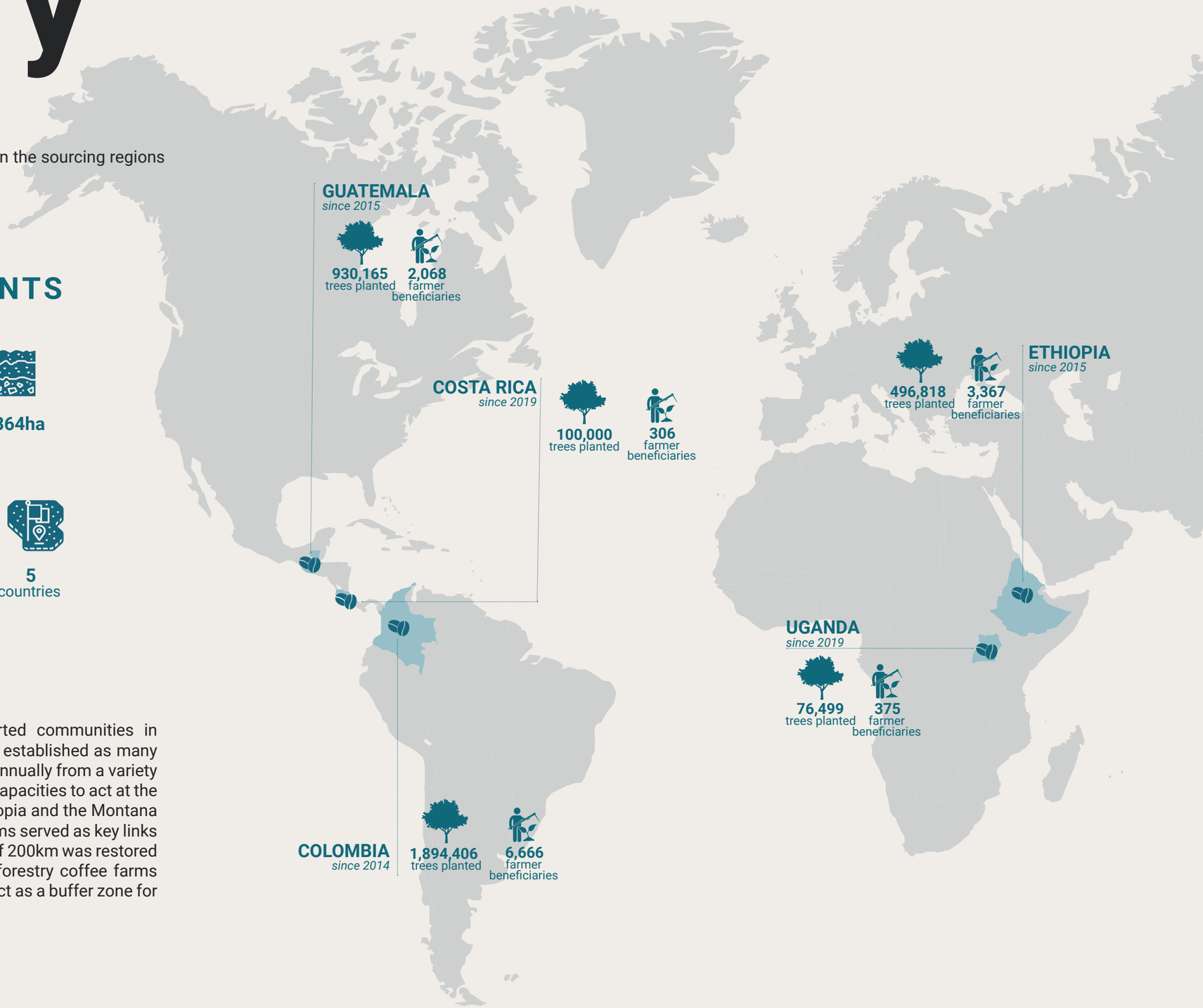
7,364ha

70 technicians

7 projects

130 species planted

5 countries

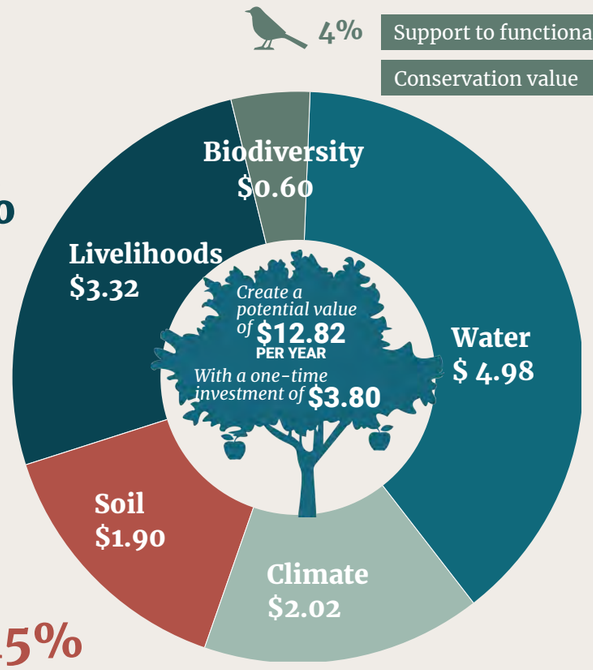


Working side-by-side with coffee farmers, PUR Projet supported communities in autonomous tree production. For instance, in Costa Rica, women established as many as seven tree nurseries, which now grow thousands of seedlings annually from a variety of 22 species. Equally PUR Projet helped build local reforestation capacities to act at the landscape level. Emblematic sites such as Rako Mountain in Ethiopia and the Montana Negra in Guatemala were reforested. Last but not least, coffee farms served as key links to establish biological connectivity. In Colombia, a green corridor of 200km was restored between the two regions of Cauca and Narino. In Uganda, agroforestry coffee farms located about 30km from the Rwenzori Mountains National Park act as a buffer zone for the fauna and flora.

Investing in Ecosystems

To complement the monitoring of the agroforestry program deployment, PUR Projet developed an economic model to assess and understand the value created by one tree on 5 areas of impacts: Climate, Soil, Water, Biodiversity and Livelihoods. Based on scientific literature review (more details in annex), the services provided by tree planting are monetized.

The model calculated that for each tree planted an equivalent of around 12 USD positive impact is delivered over 20 years.



4%
Support to functional biodiversity
Conservation value

26%
Tree products
Economic diversification & development
Social
Health
Culture

39%
Water purification
Water regulation

15%
Maintenance of soil fertility
Erosion prevention

16%
Climate Mitigation
Climate Adaptation

Carmelina de Cortez
©Elegante

Coffee in the face of climate change

In the regions where Nespresso sources coffee, farmers face climate change realities first-hand. Arabica and Robusta coffee production rely on a narrow range of temperatures and rainfalls: 15-25C and 1,500-2,000mm of rain for Arabica and 20-30C and 2,000-3,000mm of rainfall for Robusta. Any modification of these ranges (i.e. irregular season patterns, frequent droughts or heavy rain, extreme temperatures) directly and indirectly impact coffee productivity. Scientists at the Royal Botanic Gardens, Kew, predict that climate change will "cut the global area suitable for coffee production by as much as 50 per cent by 2050."

Since 2003, Nespresso has engaged coffee farmers in adopting sustainable agricultural practices such as avoiding deforestation, protecting water sources, conserving soil via the deployment of its sourcing program, the AAA Sustainable Quality™ Program. These mitigation actions of AAA farmers had to be complemented with adaptation practices at scale to increase the resilience of farming communities against climate change.

By reintroducing trees in and around the farms, re-establishing local knowledge on native species, and providing technical capabilities, PUR Projet initiated in 2014 a transformative approach to coffee production which aimed at regenerating the critical services provided by ecosystems. Nespresso supported the financing of this transition through a carbon insetting mechanism, i.e. an approach that accounts for the carbon removals potential of trees.

The successful implementation of the agroforestry program relies on farmers who need to learn new skills and convey to their communities, particularly the younger generation, the importance of trees for their future.

Helping coffee farmers adapt and build resilience to climate change was thus crucial to support their livelihood and ensure the quality and quantity of their coffee production.

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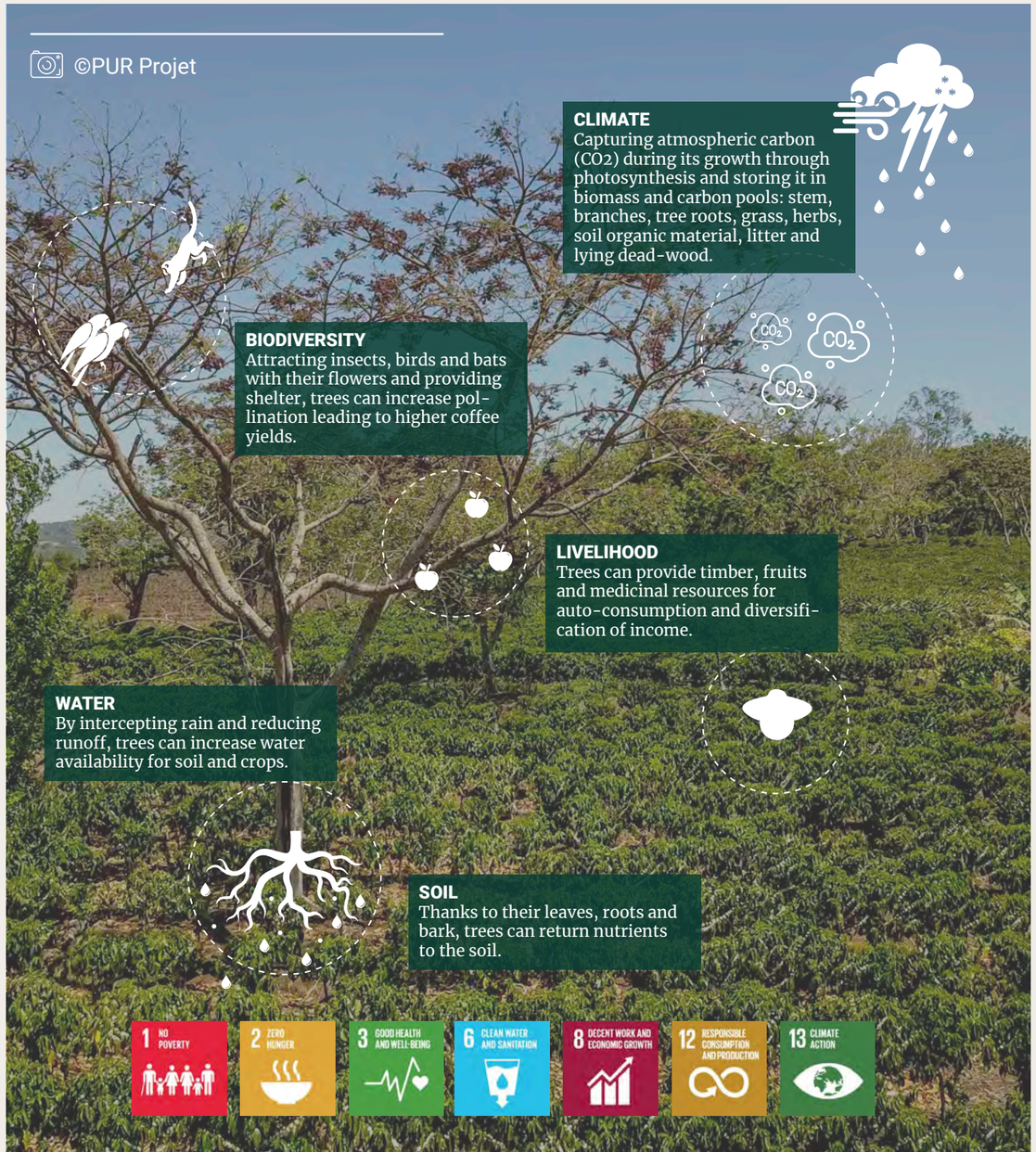
Solutions

Unlike full-sun fields, agroforestry is a land-use system in which trees are grown in and around crops and pastures to preserve productive ecosystems and adapt to climate change. Trees provide multiple services for improved quality and long-term sustainability of the production. Thus, land conservation with agroforestry is a powerful tool to restore degraded ecosystems, improve farmers' livelihoods and protect the coffee from climate change.

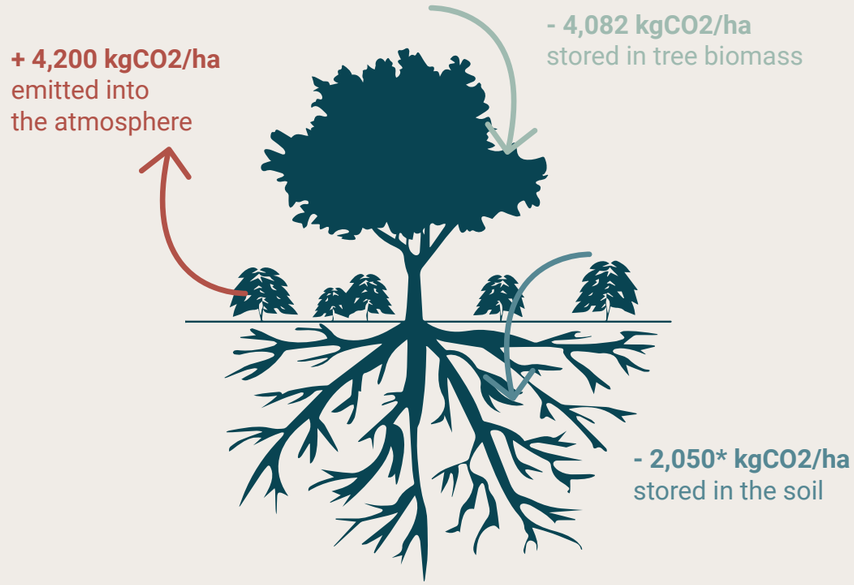


As a regenerative agriculture practice, agroforestry improves soil health, i.e. the continued capacity of the soil to function as a vital living ecosystem that sustains life.

Amongst other functions, trees help increase the carbon sequestration potential of the soil via the decomposition of aerial and underground organic matter. The actual equation between carbon stored in the biomass and carbon stored in the soil (Soil Organic Carbon) is under study with PUR Projet and TREES. The quantification model will be available by the end of 2022 and leveraged in the Nespresso Insetting plan towards 2030.

The graph below illustrates the possible carbon cycle in a Colombian farm.

THEORETICAL CARBON BALANCE



* Preliminary estimation from the SOC study phase 1 to be refined by the soil samplings in phase 2

In *Colombia*, the production of 1kg of green coffee is estimated to emit 4.2kg of CO2 on average*. Within the Colombian project, it was estimated that 284,262 tons of CO2 will be sequestrated by 729,063 trees on 2,321 hectares over a 30 years period**. Considering a coffee yield of 1,000kg of green coffee per hectare, the carbon sequestration potential of the agroforestry program in Colombia is estimated to be of 4.08kgCO2/kg of green coffee.

**Estimation made by Nespresso*
*** Data from the VCS Project Description document for the Colombian Project*

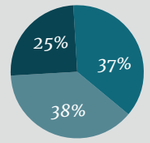
Program summary

This section, will uncover how Nespresso's Agroforestry Program has supported coffee farmers across five countries, by restoring their local ecosystems and building resilience towards climate change.

Three models of agroforestry were deployed: trees were planted at the perimeter of the coffee field in model 1, intercropped with coffee in model 2, or following high-density reforestation model 3. Species of trees were selected with local AAA communities and were mainly native species. Each agroforestry project was then implemented with customized models and species to deliver the targeted environmental and socio-economic services for the region and the communities.

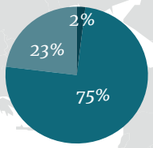
LEGEND

- Supported projects
- #Tons CO2 equivalent to be sequestered
- #Hectares restored
- #Field technicians
- Borders trees – Model 1
- Intercropping trees – Model 2
- Reforestation trees – Model 3



GUATEMALA
since 2015

215,600CO_2 1,846Ha 11

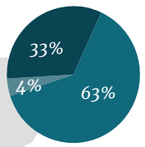


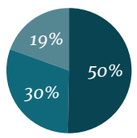
ETHIOPIA
since 2015

95,900CO_2 568Ha 8

Certification to be started 318Ha 5

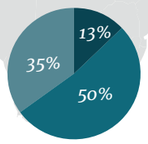
COSTA RICA
since 2019





434,400CO_2 4,477Ha 37

COLOMBIA
since 2014



Certification to be started 155Ha 9

UGANDA
since 2019

Colombia

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Colombia

Over the last two decades, uncontrolled deforestation due to agricultural expansion in the Cauca and Nariño mountains has resulted in **fragmented forest patches with low ecological continuity** and **freshwater shortages** during dry periods.

Set up on steep lands, coffee farms were highly **vulnerable to soil erosion**, **landslides**, and the **proliferation of pests and diseases favoured by the deregulated climate**. Biodiversity in pre-existing shade systems was limited to banana trees, Gravilea and Inga species, and smallholder farmers **lacked knowledge on reforestation with diversified and endemic species**.

PUR Projet and the Federacion Nacional de Cafeteros launched the Colombian Nespresso Agroforestry project in 2014 to:

- Restore eroded parcels;
- Protect freshwater sources;
- Preserve the long-term quality and quantity of coffee.

PROJECT IMPACT TO DATE

1,894,406 trees planted

434,400 tCO2eq to be sequestered

4,477 hectares

6,666 farmer beneficiaries

53 species planted

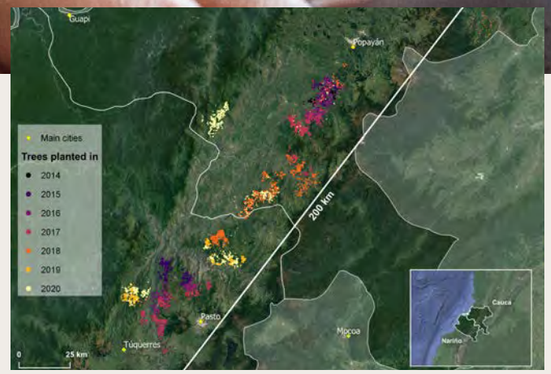
37 local agroforestry technicians employed to train farmers

"Trees are the fundamental basis for us as farmers to cultivate and protect water."

Héctor Plinio Pantoja - coffee farmer

By connecting with more Nespresso initiatives, such as the Fair Trade USA Initiative which aims to secure water access, more than 12,000 trees have been planted along rivers, around drinking water stations and on coffee farms within watersheds to secure and preserve the availability and quality of water.

The Nespresso Program in Colombia also **protects biodiversity**. The thousands of trees planted since 2014, have created homes for a variety of bird species that have returned to the coffee landscape. According to a study conducted in the project area in 2017, the species richness in the shade systems compared to full-sun parcels was distinctly higher, thanks to the diversity in vegetation type and structure. With more than **50 different tree essences** planted over the last seven years, the Cauca y Nariño project is playing a significant role in supporting and enhancing biodiversity in the region.



A GREEN CORRIDOR

In seven years, the Nespresso Program has enabled to connect the regions of Cauca and Nariño with nearly two million trees planted, creating a green corridor of about 200km.

Nora Ligia Bolanos Mera
©Worldfoodorama

Guatemala

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MONTANA NEGRA, HUEHUETENANGO

Beyond the farms, reforestation was also undertaken in communal areas such as roads or mountains. In this sense, the restoration of the Montana Negra to protect water streams and downstream coffee parcels is an emblematic initiative allowed by the Nespresso Program.

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Eugenio Cobon
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Guatemala

In the **hilly region of Huehuetenango, located alongside the Mexican border** and on the **plateau of Fraijanes**, smallholder farmers with less than three hectares of land are **highly dependent on coffee** and thus vulnerable to price volatility and climate change impacts.

Previous low-density **agroforestry systems were suboptimal in preventing erosion and water runoff on the steep coffee parcels. Farmers had lost knowledge on native essences, and shade diversity was limited to two species,** Inga (Chalun) and Grevillea Robusta, offering reduced habitats for biodiversity.

Since 2014, and with the Asociacion de Desarrollo Economico y Social Los Chujes (ADESC) in Huehuetenango and Fedecocagua in Fraijanes, PUR Projet has developed two Nespresso agroforestry projects focused on:

- maintaining soil and naturally enriching soil fertility;
- reintroducing species diversity and building capacity on pruning and thinning;
- restoring watersheds to improve water rention capacity for coffee communities.

PROJECT IMPACT TO DATE

930,165
trees planted

215,600
tCO2eq to be sequestered

1,846
hectares

2,068
farmer beneficiaries

41
species planted

11
local agroforestry technicians employed to train farmers

“There is a great impact on the local environment as the diversity of trees is increasing, and with the planting of the trees, soil erosion is reduced, the increase in organic matter and the trees increase the water supply through their leaves.”

Yovany Ben Chiroy – Local coordinator of the Huehuetenango Project

Seven years after the launch of the Nespresso Program, the Huehuetenango coffee associations developed technical skills on agroforestry to support farmers in **developing better shade systems.** Similarly, in Fraijanes, the project strengthened the experience of Fedecocagua Coop, who can now design complex agroforestry systems. Today, two thousand farmers are empowered on tree planting and maintenance and can start to perceive the first positive effects on soil and water. As a result, 41 forestry, fruit and conservation tree essences have reasserted their central place in the coffee landscape.

Costa Rica

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Costa Rica

Recognized for its incredible biodiversity, Costa Rica is renowned for its high-quality coffee. However, despite its natural wealth, Costa Rica faced **severe deforestation due to the expansion of the agricultural frontier**. Around San José, where the agricultural landscape is mainly dominated by coffee, large farms of a few hectares either grow coffee in **full sun or with mono-specific shade trees**. **Without the financial means and time to gain knowledge on proper agroforestry practices**, farmers were powerless in the face of the fragmentation of their environment.

In 2019, PUR Projet started the Nespresso Agroforestry project in La Giorgia and Orosi to:

- enhance ecosystem services to foster biodiversity;
- restore riparian and degraded areas;
- empower farmers and their communities on tree planting.

PROJECT IMPACT TO DATE

100,000 trees planted

318 hectares

306 farmer beneficiaries

28 species planted

5 local agroforestry technicians employed to train farmers

"With the project, I was able to build nurseries next to my house. I work in tandem with Doña Yamileth with the commitment to produce 4,000 trees per year (Colpachin, Cedro, Cortez Negro, Laurel, Manzana Rosa, Guanabana, Limon) whose seeds are naturally found in our farms. We fill the seed bags with our own soil because it is of very good quality. We also prepare our own fertilizer with inputs found on site, such as coffee grounds, chicken manure, ash and lime."

Doña Martha – Community Nursery Owner

In this fragmented region, restoring habitat through tree planting was crucial for the survival of endangered species, particularly birds, which are key biodiversity indicators. Within the Nespresso agroforestry project, bird-friendly species were planted, such as the Murta (Myrcia sp.). Their impacts are now monitored by the Cornell University Laboratory of Ornithology, using participatory science and acoustic sensors.

Cecilia Sánchez
©Elegante

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Beyond agroforestry and biodiversity, the Nespresso Program in Costa Rica has also been a source of autonomy for women of the community. Shortly after the launch, an initiative began to promote the participation of women within the agroforestry project. By the intermediary of the AAA coffee producers, a campaign recruited women among the farmers' families. It enabled the establishment of seven nurseries that provided the project with more than 20,000 trees consisting of 22 species.

Ethiopia

Ethiopia

Despite the country's agroforestry tradition, the very smallholder (<0.5ha) and **low-income farmers in Sidama lack knowledge on the necessity of shade in coffee cultivation**. The region is severely deforested due to a growing population, the need for fuelwood and the lack of expertise in the management of the region's forests and now **colonized by Eucalyptus trees, leading to the depletion of water sources, loss of soil fertility, and erosion accentuated by more frequent drought episodes**.

In 2015, PUR Projet launched the Nespresso program in Sidama to:

- increase the climate change resilience of coffee parcels;
- provide technical assistance in agroforestry design, pruning and stumping;
- diversify production with fruit trees to support self-sufficiency of farmers.

PROJECT IMPACT TO DATE

496,818
trees planted

95,900
tCO2eq to be sequestered

568
hectares

3,367
farmer beneficiaries

12
species planted

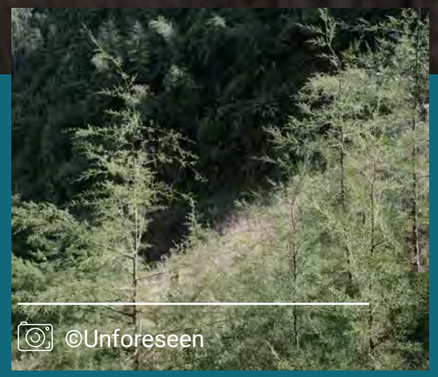
8
local agroforestry technicians employed to train farmers

"Long years ago, there was different variety and variability of life in our community. However, due to deforestation, wild animals and medicinal trees, bushes and shrubs disappeared and some of them were decreasing in number at an alarming rate. Just to list some, wild deer and gazelles are among the wild animals that were endangered, but currently we are seeing these wild animals again, thanks to the reforestation program which is underway."

Demoze Ledamo, Tree Nursery Site Manager/Owner

Nespresso Program in Sidama does not stop at the farmer's gate; it is also the inspiring story of communities taking up trees to resurrect the mountain of their ancestors: the iconic Rako Mountain. Once covered with lush forest, the slopes of the Rako Mountain had been exposed to successive deforestation for timber, agriculture and animal husbandry. Bare lands were left seriously degraded, with impoverished soils threatened by erosion. Farmers living at its feet periodically suffered from landslides during the rainy season, some so important that they covered the coffee plots with mud and sometimes even their homes.

Kambata Hatiya
©Unforeseen



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RAKO MOUNTAIN, SIDAMA

Today, the landscape is metamorphosed, and the rebirth is an example for communities: there are no more landslides; native shrubs that had disappeared from the region have started to grow again; biodiversity is back, and farmers often observe coyotes and other animals in the vegetation.

Uganda

Samson Muhisya
©Christian Lamontagne

Dominic Mujungu
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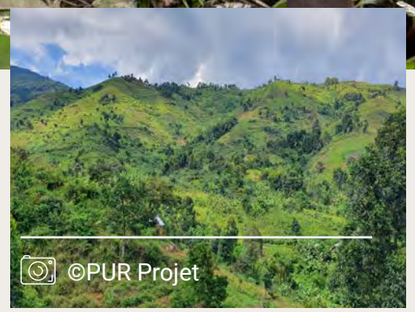
The Rwenzori project adopts a landscape reforestation approach to tackle deforestation. A third of trees are planted on degraded lands following high-density planting models, this promotes the restoration of deforested areas with diverse and native species.



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Uganda

Located a few kilometres from the western border of the Democratic Republic of Congo, Rwenzori is the largest Arabica producing region of Africa. In the past decades, the area has been heavily cleared out for full-sun agriculture and affected by the plantation of exotic species like eucalyptus and pine trees, which are harmful to the natural ecosystem. The disappearance of native trees impacted traditional medicines as well as local wildlife. Although called "Rainmaker' in the local dialect, Rwenzori suffers from prolonged and more intense dry seasons and heavier precipitation during rainy seasons. Coupled with **soil degradation**, farms are subject to frequent and **severe floods and landslides** with disastrous impacts on coffee communities. If coffee was intercropped with bananas and trees, the **shade was sporadic, ageing and poorly managed,** and farmers with low yields lacked the incentive to improve and ensure quality.

The key goals for the project are:

- reintroduce diversified Indigenous species;
- build capacity on agroforestry with local farmers;
- reforest around riverbanks to fight against floods and soil erosion.

PROJECT IMPACT TO DATE

76,499 trees planted

155 hectares

375 farmer beneficiaries

27 species planted

9 local agroforestry technicians employed to train farmers

"My dad was a forest manager. When I went to school, I couldn't pay my tuition fees. My grandfather had one eucalyptus tree which was 30-year-old. He gave it to me, and the one tree sustained my fees and my costs during my time at university. Due to this, I decided to study agroecology at the college, and I really recommend people to plant trees."

Emmy, RFCU Agroforestry Technician

Sharing borders with the Rwenzori Mountains National Park, the Nespresso agroforestry project contributes to local biodiversity conservation beyond vegetal regeneration and creates natural buffer zones for wildlife. Moreover, as part of the agroforestry activity, the cooperative members were able to deepen their knowledge of climate change dynamics through the conduction of playful training on the causes and consequences of such a phenomenon. Now skilled in the benefits of agroforestry in such a challenging context, they are empowered and better positioned to advise farmers on planting trees for the future generation's resiliency.

Annex

Pablo Ancisar
©Elegante

PROJECT METHODOLOGY

COFFEE AGROFORESTRY
A STEPWISE DEPLOYMENT OF THE NESPRESSO PROGRAM

Agroforestry refers to a land-use system in which trees are grown around or among crops or pastureland, making use of the complementary nature of trees, crops and/or animals.

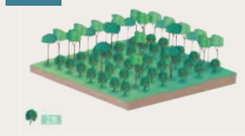
Applied to coffee farming, agroforestry means that coffee trees are grown beneath the canopy and within the landscape of other trees. **Trees are complementary to coffee as they generate a range of benefits for the ecosystems where they are planted.** Through soil protection, water replenishment, temperature regulation and other services to be discovered in the next pages, they enable the coffee to produce a stable volume at quality – increasing its economic value to farmers.

MAIN AGROFORESTRY PLANTING MODELS APPLIED IN THE NESPRESSO PROGRAM

M1 BORDERS AND HEDGES

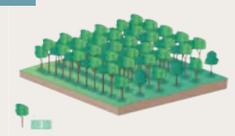
Trees are planted around the parcel, along paths, water streams, and roads.

M2 INTERCROPPING



Trees are planted inside and/or around the parcel in alternance with coffee.

M3 FULL REFORESTATION



Dense planting on unproductive or degraded lands.

M4 SILVOPASTORALISM

Planting within animal pasture parcel.

PUR PROJET'S AGROFORESTRY METHODOLOGY: EMPOWERING COFFEE COMMUNITIES AT EACH STEP OF PROJECT IMPLEMENTATION



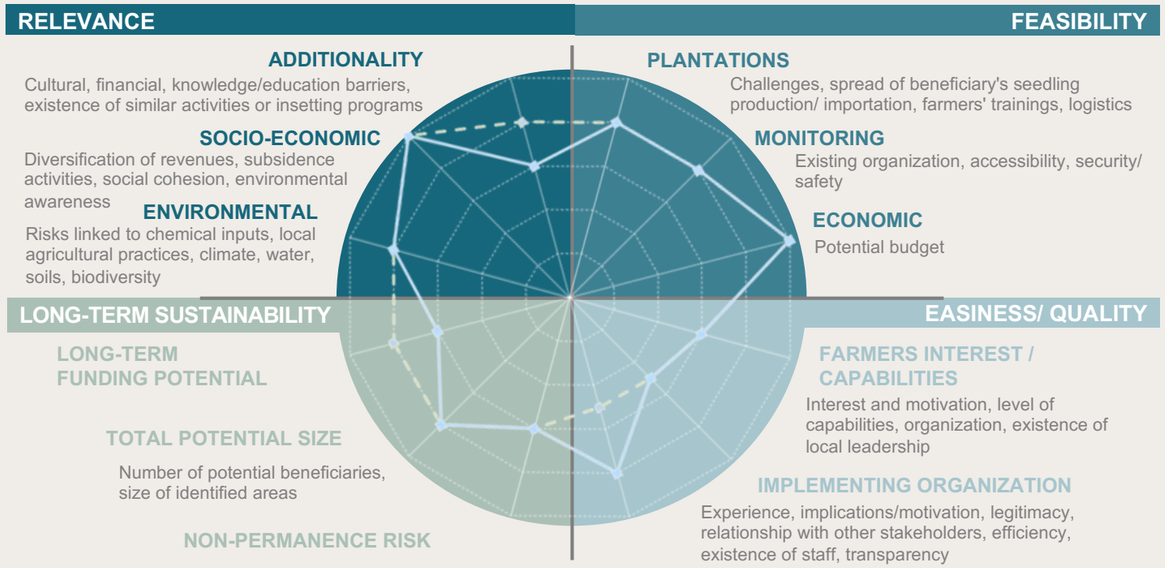



SOCIALIZATION	DIAGNOSTIC	TRAININGS	SEEDLING PRODUCTION	TREE DISTRIBUTION	FREQUENT MONITORING
Every single tree planting program starts with a **feasibility study** to assess the potential of agroforestry in the region (page 37). It is then followed by an **introduction of the project to local communities.**	Each interested farmer receives a **customized diagnostic of its farm** and is proposed a design of an **agroforestry system adapted** to the conditions of his/her farm.	Farmers receive **regular trainings** to understand proper tree management and maximize project impacts. In compliance with carbon standards, they **commit to take care of the trees** in the long term.	Plantlets are prepared **in local or community nurseries.** Building the capacity and facilities to supply the tree demand allows for the autonomy of the communities to pursue reforestation efforts in the future.	Planting waves occur annually, they rely on smooth tree distributions to the farmers and create the opportunity of **collective gathering with the community**. Farmers are responsible for planting themselves and own the trees they plant.	Trees are regularly **monitored for their survival and their growth**. Their trunks and height are measured to calculate the carbon sequestration. At certification periods, external auditors verify the carbon performance of the program.

DESIGNING IMPACTFUL AGROFORESTRY PROJECTS
FEASIBILITY METHODOLOGY

Before launching an agroforestry project with AAA farmers, Nespresso's agroforestry partner PUR Projet goes directly to the field to engage with target beneficiary communities and other relevant local stakeholders. Through **community consultations** the project is co-designed.

In particular, PUR Projet **assesses** key questions related to:



IMPACT METHODOLOGY

MEASURING NESPRESSO'S IMPACT
PUR PROJET GENERAL METHODOLOGY

MONITORING & VERIFICATION OF KEY BENEFITS
(short, medium and short)

On all projects, PUR Projet implements a monitoring and verification framework that measures and monitors the outputs of project activities and records them in a consolidated data collection database. Planting, GIS and tree are recorded in this database for reporting and adaptive management purposes. PUR Projet works with Nespresso to ensure alignment on required data to be collected.

CERTIFICATION OF PROJECT IMPACTS

PUR Projet certifies Nespresso's projects under third party verification standards for environmental and social benefits. The Colombian project is certified under VCS while projects in Ethiopia and Guatemala are Reforestation Solidaire verified programs. Ugandan project will be certified under VCS by the end of 2021. PUR Projet also started a Value Change Intervention pilot certification for the Costa Rican project.

UNIQUE ECOSYSTEM SERVICE & LIVELIHOOD STUDIES

PUR Lab, the research unit within PUR Projet, develops and implements studies related to agricultural yields impacts, economic livelihoods, biodiversity, soil health and more. PUR Projet works with local and international academic institutions, where appropriate, to ensure local relevance of the research and its global reach.

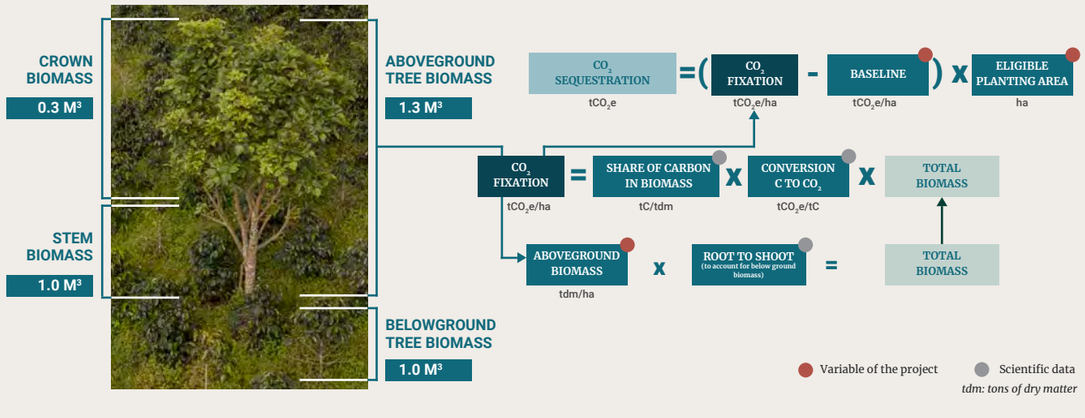
PREDICTIVE ANALYTICS

PUR Projet developed several proprietary tools and assembled a team of researchers to evaluate and predict the carbon ecosystem service and social and economic benefits associated with our programs. This helps in the design and reporting of project impacts over time.

QUANTIFYING CLIMATE IMPACTS
CARBON ACCOUNTING METHODOLOGY

To account for the carbon gains from Nespresso agroforestry and reforestation projects, PUR Projet bases its calculations on project variables and scientific data presented below.

CARBON POOLS IN A LIVING TREE



VARIABLE PARAMETERS OF THE PROJECT

ABOVEGROUND BIOMASS (tdm/ha)

The sequestration in planted parcels is calculated over time through the on-field measurement of tree diameter at breast level (biomass inventories). It is capped by a hypothesis of **maximum tons of dry matter (tdm) per hectare** selected in literature (IPCC 2006), equalling the sequestration capacity of a forest under the climate conditions of the project. Using the Mean Annual Increment (MAI), or amount of annual biomass gain (IPCC 2006), it is possible to estimate the future carbon storage of the tree. The project design (planting models, mortality, hypothesis of timber harvesting) impacts the rhythm at which this maximum tdm can be reached (MAI), influencing the planting density.

BASELINE (tCO_2e/ha)

The baseline corresponds to the situation before the project start. It is divided into various strata such as degraded fallows, pasture, perennial crop (coffee) or annual crop. The sequestration of the baseline in tdm/ha is selected based on literature review (data from IPCC or dedicated peer-reviewed studies).

ELIGIBLE PLANTING AREA (ha)

The surface of the reforested area is monitored in the planting registry through a dedicated geographical information data collection tool to allow the **geotagged collection of key information**, details, activities and results.

FIXED PARAMETERS INDEPENDENT OF PROJECT

ROOT TO SHOOT (to account for below ground biomass)

To account for the belowground biomass a ratio of 1,37 is applied to the aboveground biomass value, based on the IPCC (2006) data for tropical forests.

SHARE OF CARBON IN BIOMASS (tC/tdm)

The share of carbon in the total biomass is estimated using the default value from the AR TOOL 14.

CONVERSION C TO CO_2 (tCO_2e/tC)

The molar mass of CO2 corresponding to 3,67 is applied to convert the tons of dry matter in tons of CO2.


Diagnosis of parcels, Colombia, 2016

ECONOMIC MODELLING METHODOLOGY

ESTIMATING IMPACTS ON ECOSYSTEMS SERVICES PUR PROJET ECONOMIC MODELLING METHODOLOGY

The Monetizer is the ecosystem services economic modelling tool developed by PUR Projet, based on a selection of papers from a review of 1200 scientific studies and The Economics of Ecosystems and Biodiversity (TEEB) valuation factors, as well as field studies done by PUR Lab and Academic partners. It allows us to predict the theoretical impacts that Nespresso trees will have over the next 20 years.

For each service, PUR Projet assesses the existing proxy range (based on scientific studies) and chooses which proxy is relevant. A proxy degradation criteria is selected to adapt to the region or project type if relevant. Then, the monetary value is predicted based on scientific studies and the ecosystem services value per tree is estimated per country. Below are the outputs of the different studies used, brought back to the estimated value of one tree.

CLIMATE

MITIGATION
- Remove 11 Kg of CO_2eq/tree/year
- Remove 200 g of methane and 1 kg of Nitrous oxide

ADAPTATION
- Reduce the risks on crops quality and quantity by +20%

SOIL

IMPROVEMENT
- Sequester 2 kg of CO_2eq in the soil
- Create + 1 kg of fertilizers

PROTECTION FROM EROSION
- Conserve 40 kg of soil from erosion

WATER

DEPOLLUTION
- Remove 10 grams of nitrates
- Remove 2 grams of phosphates

RECAPTURE
- Capture +500 litres from rain
- Capture +100 litres from fog

BIODIVERSITY

- Favour the presence of pollinators and birds by +20%
- Reduce pests

LIVELIHOODS

- Provide timber
- Provide fruits & medicines
- Reduce the attractivity of illegal crops

Trees planted are then recorded per project, considering that the value starts to be created from the third year after the plantation. Over an average crediting period of 20 years, calculations are made by country and by ecosystem service of the total value created by Nespresso's trees.

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ASSESSING SERVICES BASED ON LITERATURE REVIEW AND MONETIZATION OF 19 INDICATORS

INDICATORS	PROXYS	USD/ tree/ year	USD/ha/ year
CLIMATE			
Carbon sequestration	Trees sequester up to 220 kg of CO_2 Eq in Tropical Moist ecosystems over their lifetime (20 years crediting period. From fallow land to forestry, plantation 3*3 / 1000 trees / ha. Carbon price estimated at $15.	0.17	165
Other GHG: Methan and Nitrous oxide emission reduction	Intensive monocultures often use an inadapted amount of inputs. The surplus is responsible for GHG emissions with a strong global warming potential: increase in soil nitrous oxide (N_2O) emissions (Stehfest and Bouwman, 2006) and decrease in the uptake of atmospheric methane (CH_4) (Hütsch et al., 1993; Chu et al.). By shifting 1 hectare of conventional agricultural practices (tillage, continuous planting, use of plow-disk, etc.) to conservation practices (agroforestry, reduced tillage, contour planting, less irrigation, less fertilizers, etc.), one could reduce methane and nitrous oxide emissions by respectively 338 and 1,914 kg CO2e/ha/year. Carbon price at $15.	0.03	5
Microclimatic regulation	Trees provide essential services for adaptation to climate change: - under the canopy, temperatures decrease significantly, the air is refreshed and there is more shade. It improves the development of plants and the evapotranspiration process; - adapted agroforestry systems protect crops from wind; they prevent soils from drying out and avoid damages on plants.Those processes improve «day-to-day» microclimatic regulation and also partipate to increase the overall crops resilience to extreme climatic events. Compared to full sun coffee, coffee within agroforestry systems can increase productivity of clean coffee by 1.8 kg/tree/yr, with an appropriate level of shade. Coffee price at $106 / lbs, 2.2 lbs = 1kg.	4.2	840
SOILS			
Soil organic carbon content enrichment	2.93 tons of Co2 / ha / year, up to 16 tons of Co2 / Ha / year, 10 euros / ton of Co_2.	0.03	29
Soil content enrich-ment (NPK)	Living hedges promote the return of nutrients into the soil: 250g/tree/yr for nitrogen, 6g for phosphorus, 100g for potassium. Such annual nutrient contribution is equivalent to a dozen kilos of local farm manure or 1.67 kg of chemical fertilizer 15:15:15 per tree (500/300 trees / ha of agroforestry parcel). $1/kg of fertilizer.	1.67	500
Soil fixation	By reforesting a bare fallow land, one can reduce erosion by more than 100 kg/tree/yr. In Peru, on steep slopes, PUR Lab discovered that five years after plantation, one tree can reduce soil losses by 41 kg each year (field study). From 53 tons loss / ha / year (fallow land) to 12 tons loss / ha / year, ie a reduction of 41 ton / ha / year for 1,000 trees. (78% reduction). $14.73/ ton of soil.	0.6	604
BIODIVERSITY			
Pollination rate enhancement	The proximity of trees increases pollination and can increase annual yields by 45 per cent, which corresponds in the study of +121 kg of coffee produced / ha for 200 agroforestry trees planted / ha, hence + 0,6 kg of coffee per tree planted (cleaned and dried coffee beans). Coffee price considered: $106/ lbs, 2.2 lbs/kg.	1.4	280
Integrated pest control	Forest ecosystems are important for regulating pests and vector borne diseases that attack plants, animals and people. They regulate pests and diseases through the activities of predators and parasites, such as birds, bats, flies, wasps, frogs and fungi. Forest birds-pest control service: $18.83/ha/yr. Density: 1,111 trees/ha & PUR Lab in Colombia: increase in pest control with 73 per cent confidence.	0.02	19

INDICATORS	PROXYS	USD/ tree/ year	USD/ha/ year
WATER			
Nitrate pollution reduction	Riparian forests combined with conventional crops can increase the capacity of soil to retain the nitrate from runoff by 10 g N/tree/yr. - Cost for the reduction of nitrogen: $13.98 /kg N. - This value is applied to the quantification value: 0.01 kg N/tree/yr. Proxy chosen: 0.01 Kg N / tree / year * 14 USD / Kg N.	0.14	140
Phosphate pollution reduction	Riparian forests combined with conventional crops can increase the capacity of soil to retain phosphate molecules from runoff by 2 g P/tree/yr. Cost for the reduction of phosphate: | $99,20 /kg P / - This value is applied to the quantification value: 0,002 kg P/tree/yr.	0.2	198
Water local holding capacity enhance-ment	Trees regulate hydrologic cycles in the catchment areas by capturing rain and runoff: interception by the canopy, transfer by capillarity, soil decompaction and recharge in underground water via roots system. Water captured by trees is mainly evapotranspired and also contributes to soil moisture. A tree has the capacity to increase water availability by 855 l/year for soils and crops. GWI tariff survey the average combined water and wastewater tariff was US $2.08/$m^3$.	1.78	1,778
Water input enhance-ment by fog dripping	A tree has the capacity to increase water availability by 180 l/year for soils and crops, by intercepting it from fog.Among the 310 cities in the GWI tariff survey the average combined water and wastewater tariff was US $2.08/$m^3$.	0.37	374
LIVELIHOODS			
Timber production (in cash)	A tree can produce up to 0.75m^3 of timber in its lifetime. Hypothesis of 50 per cent of the trees removed selectively for thinning during 30 years, and average revenue for farmer is 50 USD/m^3. We also consider a period of 30 years for consistency with timber harvesting.	0.79	792
Fruit production (in cash)	By diversifying activities with fruit production, farmers can benefit from the sale/consumption of fruits: Hypothesis of 20 fruit trees planted / ha out of 1000, generating each 29 kg fruit / tree / year, at $0.50 / kg.	0.29	5.8
Self-sufficiency goods production (in cash)	Agroforestry systems enhance the production of medicinal resources, which roften represents the only healing treatment possibility that some remote populations have access to. Estimated annual revenue per farmer: $21/yr ($2015) for 3 medicinal trees per farmer.	0.02	0.06
Complementary actvity development (in cash)	Agroforestry systems contribute to the reintroduction of biodiversity and to the diversification of cultures. This will lead to many benefits for populations: food soveiregnty (crops, fish, honey, etc), attraction of wildlife on previously cleared lands, etc. If producer starts with wild honey production, it is estimated from the San Martin Project managed by PUR Projet that $200/year can be generated, with a 50 per cent margin (estimated yield of 40kg/hive sold at $5/ kg). Hypothesis of 300 trees planted by producer/ha.	0.33	100
Illicit crop area reduction	Agricultural and forestry activities provide perennial crops that are financially attractive and will ensure sustainable yields. This reduces the shift to illicit crops with related negative impacts on society. Offering an alternative to timber production (1,111 trees/ha) can play the same role as policy measures for coca eradication.In Colombia, in 2000, the US government approved a two-year budget of US $860 million in support of Plan Colombia. US $642 million ($ 2,000) which is US $902.25 million ($ 2016) was designated specifically for efforts to reduce the supply of illegal crops. In 2001, the area eradicated was 72,379 ha. Thus, the cost of eradicating 1 ha of coca can be estimated at $902.25 /2 /72,739 million.	1.67	1,900

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