



**WORLD COFFEE  
RESEARCH**

# **International Multilocation Variety Trial**

# A first-of-its kind trial to facilitate the global research on the world's top coffee varieties and evaluate their performance.

World Coffee Research has gathered 31 top-performing coffee varieties from 11 suppliers around the world. The varieties—most of which have never been tested on a broad basis—are distributed to coffee growing countries for long-term evaluation on research plots.

The IMLVT generates critical knowledge for coffee producers and agronomists about how varieties respond to different soil and climatic conditions – including extreme environments with high temperatures and long dry periods, which mimic the changing climate coffee growers are seeing in coffee-producing countries around the world. The trial will allow researchers to see how varieties perform under climates predicted for 30 and 50 years into the future and provides the largest global dataset ever created for deciphering genotype x environment interaction in coffee. A follow-on study will investigate the impact of the GxE interaction on cup quality and chemistry.

Researchers will identify key traits that have allowed different varieties to adapt to different environmental conditions, which will lay the groundwork for major advances in coffee breeding, climate adaptation strategies, and future research.

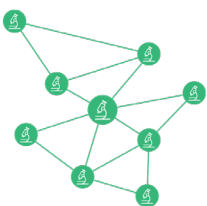
The trial also builds essential capacity within producing countries to conduct coffee research and monitor disease movement and climate trends. All participating countries agree to install, maintain, and monitor the plots (on average 1-3 per country). On each plot, a comprehensive list of variables is measured using standardized protocols developed by WCR. Each country monitors how the different varieties perform under local conditions. Countries can monitor the best-per-

forming varieties and, in some cases, negotiate for access to multiply and distribute them producers to increase supplies of quality coffee for those countries.

Never before have most countries had access to so many different varieties. Farmers around the world—as well as coffee producing countries and the industry as a whole— will benefit from access to new varieties with better productivity, disease tolerance and/or cup quality. This will result in widespread production and quality increases, contributing to more sustainable farmer livelihoods and a stronger coffee sector.



## Outcomes



### Coordinated global research

The trial strengthens coffee institutions and organizations within participating countries, and connects them to an unprecedented network of researchers working on a common project of common design.



### Advanced data for coffee

Researchers will identify key traits that have allowed different varieties to adapt to different environmental conditions, which will lay the groundwork for major advances in coffee breeding, climate adaptation strategies, and future research.



### Global benefit

Farmers around the world—as well as coffee producing countries and the industry as a whole— will benefit from genetic progress through access to new varieties with better productivity, disease resistance and/or beverage quality.



### Monitoring platform

The trial serves as a global monitoring platform to track the impact of climate change on the quality and production of coffee as well as the movement of diseases and pests around the world.

# Partner countries

Listed at right are all the countries currently participating in the International Multilocation Variety Trial. Participating countries receive a collection of 31 top-performing varieties for formal evaluation.

## Becoming a Partner Country

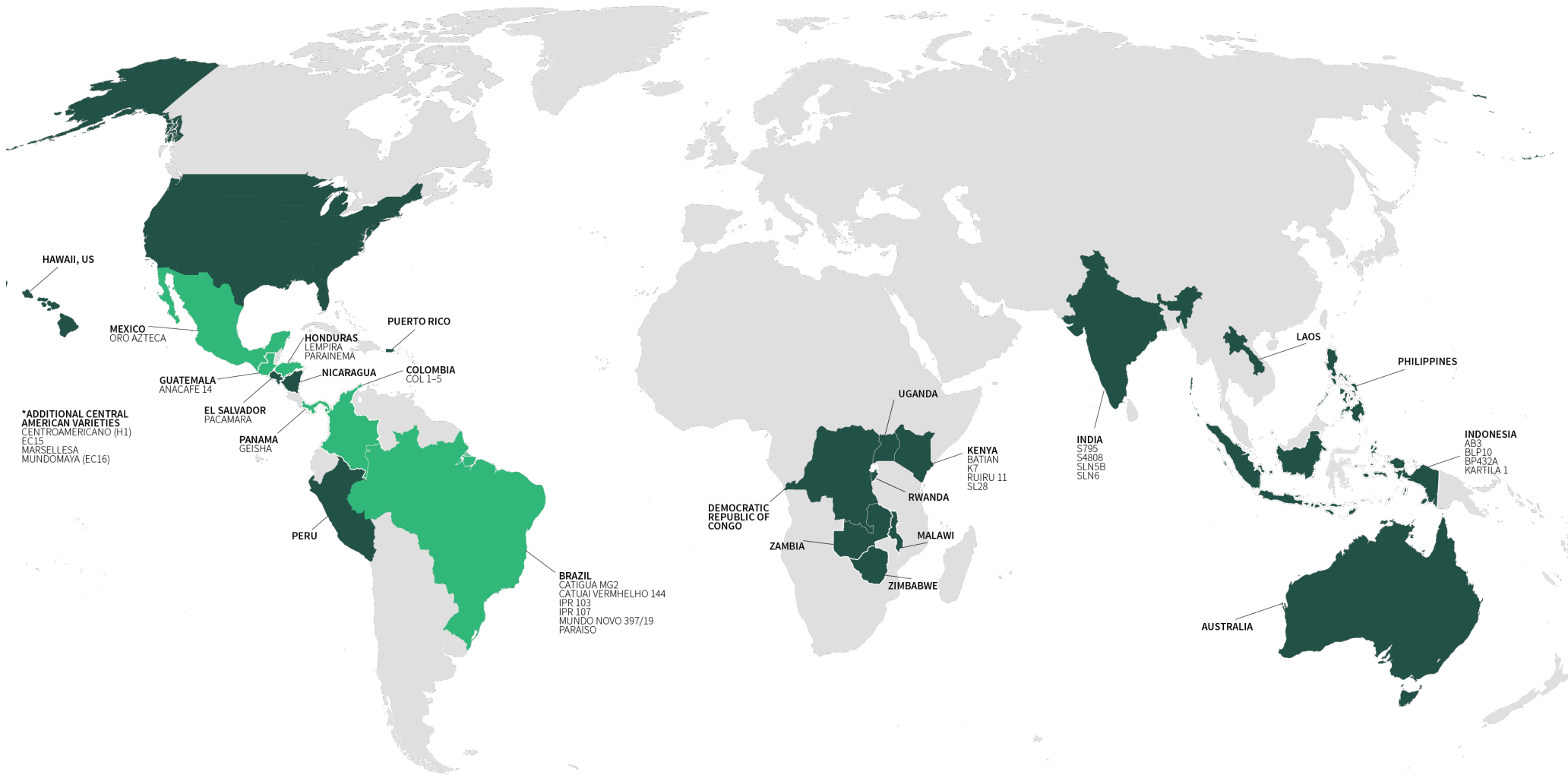
World Coffee Research welcomes new coffee producing countries to participate in the International Multilocation Variety Trial. Requirements for participation include:

- World Coffee Research places a high priority on working through the formal, national coffee body in each country. In some cases, this may be the national coffee research institute; in others, the department of agriculture. Only if there is no national body willing or able to be the formal partner will World Coffee Research consider working with a private sector entity; in these cases, the private sector entity must be granted permission to host the trial by the appropriate government entity.
- All data from the trial becomes publicly available through World Coffee Research to the global coffee industry.
- All partners must sign and respect a formal agreement, including material transfer agreements (see below).
- All partners must provide funding and human resource staffing for the trial as outlined in the agreement.

COUNTRY	PARTNERS	#
AUSTRALIA	SOUTHERN CROSS UNIVERSITY	2
EL SALVADOR	WORLD COFFEE RESEARCH	2
US/HAWAII	USDA AGRICULTURE RESEARCH SERVICE (ARS)	1
INDIA	CENTRAL COFFEE RESEARCH INSTITUTE (CCRI)	1
INDONESIA	INDONESIAN COFFEE AND COCOA RESEARCH INSTITUTE (ICCRI)	3
KENYA	KENYA AGRICULTURAL & LIVESTOCK RESEARCH ORGANIZATION (KALRO)	2
LAOS	OLAM	1
MALAWI	DEPARTMENT OF AGRICULTURAL RESEARCH SERVICES (DARS)	1
NICARAGUA	ECOM	2
PERU	CENFROCAFE	2
PHILIPPINES	PHILCAFE	1
PUERTO RICO	PUERTO RICO COFFEE ROASTERS	1
DEMOCRATIC REPUBLIC OF CONGO	INERA, UCB	2
RWANDA	NATIONAL AGRICULTURAL EXPORT DEVELOPMENT BOARD (NAEB) & RWANDA AGRICULTURE BOARD (RAB)	3
UGANDA	NATIONAL COFFEE RESEARCH INSTITUTE (NACORI)	2
ZAMBIA	OLAM	1
ZIMBABWE	COFFEE RESEARCH INSTITUTE (CRI)	1



# 31 varieties being tested at 29 test plots in 16 countries



## MAP KEY

 Countries that are variety recipients/  
host trials

 Countries that provided seeds  
only

# About the Varieties

The trial includes 31 top-performing varieties are provided by 11 public or private coffee research entities from around the world. Countries may also add their own varieties into their IMLVT site. Due to some constraints in shipping, not all varieties are able to provided to all countries.

The trial follows a careful protocol to ensure that plant material being moved around the globe is disease-free. Beginning in 2014, seeds of the 31 varieties were shipped from donor countries to a phytosanitary, in vitro tissue culture lab in Florida, so that disease-free in vitro plantlets could be safely sent to participating countries. Each time a new trial is established, the varieties for the site are replicated in Florida. This also ensure that plants sent to participating countries are genetically pure. Varieties are shipped in vitro to each country.

When this basket of varieties is shared with trial participants, WCR promotes the respect of breeder's rights when they exist. Breeder's rights are a form of intellectual property protection afforded to the creators of new plant varieties. The granting and protecting of plant

breeder's rights encourages the development of new varieties of plants, for the benefit of society.

We consider the three following categories of breeder's rights:

- The variety is in the public domain.
- The variety is protected under the International Union for the Protection of New Varieties of Plants (UPOV), an international gold-standard framework for recognizing plant breeders' rights. When a variety is protected under UPOV, the breeder of record is granted a limited term of control over how the variety may be used or commercialized.
- The variety is not protected under UPOV but the breeder is well known and deserves acknowledgment.

## Dissemination of Evaluated Varieties

Once countries have evaluated varieties in the trial, they may decide it would beneficial to make one or some of the varieties available to coffee producers in their country. World Coffee Research will ensure that breeder's rights, when they exist, are respected. **See table 2 for details by variety.**

*For detailed variety profiles visit: [varieties.worldcoffeeresearch.org](http://varieties.worldcoffeeresearch.org)*



# 31 varieties were provided by 11 suppliers from around the world

## Varieties Provided Through the Trial

VARIETY NAME	BREEDER	HABIT	GENETIC GROUP	TYPE
CATIGUA MG2	Embrapa	Dwarf	Introgressed Catimor	Line
CATUAI V IAC144	Embrapa	Dwarf	Typica + Bourbon Group	Line
COL1	Cenicafe	Dwarf	Introgressed Catimor	Line
COL2	Cenicafe	Dwarf	Introgressed Catimor	Line
COL3	Cenicafe	Dwarf	Introgressed Catimor	Line
COL4	Cenicafe	Dwarf	Introgressed Catimor	Line
COL5	Cenicafe	Dwarf	Introgressed Catimor	Line
CENTROAMERICANO	Promecafe	Dwarf	Introgressed F1 hybrid	F1 hybrid clone
EC15	ECOM	Dwarf	Introgressed F1 hybrid	F1 hybrid clone
IPR103	Embrapa	Dwarf	Introgressed via Icatu	Line
IPR107	Embrapa	Dwarf	Introgressed Sarchimor	Line
KARTILA 1	ICCRI	Dwarf	Introgressed Catimor	Line
LEMPIRA	IHCAFE	Dwarf	Introgressed Catimor	Line
MARSELLESA	ECOM	Dwarf	Introgressed Sarchimor	Line
MUNDO MAYA	ECOM	Dwarf	Introgressed F1 hybrid	F1 hybrid clone
ORO AZTECA	INIFAP	Dwarf	Introgressed Catimor	Line
PACAMARA	PROCAFE	Dwarf	Typica + Bourbon Group	Line
PARAINEMA	IHCAFE	Dwarf	Introgressed Sarchimor	Line
PARAISO	Embrapa	Dwarf	Introgressed Catimor	Line
RUIRU 11	CRI	Dwarf	Introgressed complex hybrid	Complex hybrid
S4808	CCRI	Dwarf	Introgressed Catimor	Line
AB3	ICCRI	Tall	Ethiopian landrace	Line
BATIAN	CRI	Tall	Introgressed Catimor	Multiline
BLP10	ICCRI	Tall	Typica + Bourbon Group	Line
BP432A*	ICCRI	Tall	Introgressed Catimor	Line
GEISHA	F. Serracin	Tall	Ethiopian landrace	Line
K7	CRI	Tall	Bourbon Group	Line
MUNDO NOVO 379/19	Embrapa	Tall	Typica + Bourbon Group	Line
S795	CCRI	Tall	Introgressed Liberica	Line
SL28	CRI	Tall	Bourbon Group	Line
SLN5B	CCRI	Tall	Introgressed Liberica	Population
SLN6	CCRI	Tall	Introgressed Arabusta	Population

\*BP432A is included in some distributions of plantlets, but is not formally a part of the International Multilocation Variety Trial

### Definitions

**Habit:** What is the growth habit of the plant, tall or dwarf/compact?

**Genetic group:** "Introgressed" means possessing genes introduced from another *Coffea* species through breeding; typically signifies resistance to coffee leaf rust. **Catimor:** Descending from a cross between Caturra x Timor Hybrid. **Sarchimor:** Descending from a cross between Villa Sarchi x Timor Hybrid. **F1 hybrid:** The first generation offspring resulting from the crossing of two parents of different genetic origins. **Introgressed Liberica:** Descending from a cross between two parents, one of which possesses genes from *C. liberica*. **Bourbon + Typica:** Descendant

from the traditional varieties Bourbon and/or Typica. **Ethiopian landrace:** A domesticated, locally adapted, traditional variety originating from Arabica's birthplace, Ethiopia.

**Type:** **Line:** Set of individuals uniform with one another and able to reproduced uniform progeny through self-fertilization. **Multiline:** Mix of different lines. **F1 hybrid clone:** First-generation offspring resulting from the crossing of two parents of different genetic origins, propagated through tissue culture cloning. **Complex hybrid:** The result of the crossing more than two parents of different genetic origins. **Population:** Set of individuals which are composed of a mix of genetics.

For detailed variety profiles visit:  
[varieties.worldcoffeeresearch.org](http://varieties.worldcoffeeresearch.org)



# The trial

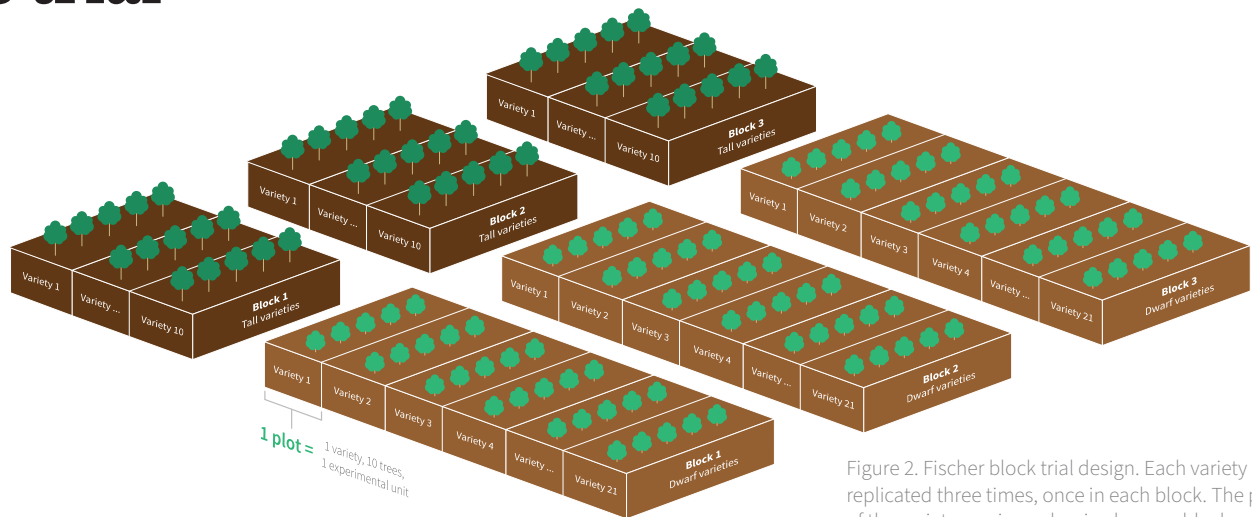


Figure 2. Fischer block trial design. Each variety is replicated three times, once in each block. The placement of the variety row is randomized across blocks.

## Trial Design

Each trial site is arranged in 3 Fischer blocks. In each block, each variety is represented by a row of 10 trees. In each different plot, the layout is made after randomization of each variety in each block.

Around each trial should be planted at least one coffee row as external border.

The experimental unit is the row of 10 plants in each block. Hence, 3 experimental units per variety.

## Trial Maintenance

The partner is responsible for maintaining the trial. Maintenance should be conducted according to the cropping practices used in the country / region where the trial is located, including fertilization, coffee tree planting density, shading or full sun, pest and weed control, pruning, irrigation, as well as other cropping practices.

## Monitoring and Evaluation

As soon as the trial is installed, the IMLVT Coordinator trains the partner on baseline data collection requirements and processes, including everything described below. The partner collects baseline data as soon as possible after country farm sites are chosen, and then reports data quarterly. All data is entered into a database called Map2farm by the IMLVT coordinator.

**Baseline data.** Includes trial location, date of planting, Geographic coordinates, elevation (meters above sea level), soil type, annual rainfall (mm/year), annual average temperature (°C), planting density (number of trees per ha), pest control, shading system (or full sun), fertilization program.

**Climate and weather data.** Each site either has a weather station that collects data on key weather variables such as average temperatures and rainfall, or weather data is provided to WCR through a third-party weather monitoring data service called aWhere.

**Agronomic performance.** Data on agronomic, production, and cup quality performance are collected regularly and reported to WCR quarterly. This includes vegetative early growth every six months for the first two years rust observation each year according to the a visual scale, other pest and disease observations on demand according to occurrence.

**Production data.** Includes cherry weight and visual evaluation of cherry maturity.

**Beans and quality data.** Includes bean size (weight of 100 beans at 12 % humidity), bean grading (% of grade I and II), % of peaberrys, and cup quality.



Figure 3. Examples of vegetative early growth measurements.

## Data storage, analysis, and sharing

**Data collection and storage.** The IMLVT coordinator trains the partner on data collection methods. Data is submitted to the IMLVT coordinator for entry into database software.

**Data sharing.** Partners have access to all data from their trial site. Partners may request data from the global trial network. Partners also have access to quarterly and annual reports.

**Analysis and reporting.** Partners may prepare any reports they like together .



## HOW IT WORKS

Build Trust

1



Gather 31 top-performing coffee varieties

2



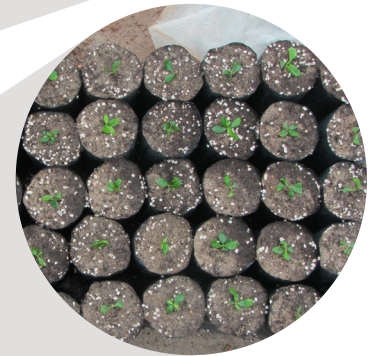
Replicate in sterile in-vitro environments

3



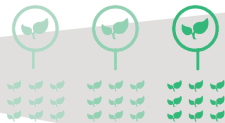
4

Send varieties to participating countries



5

Each country plants varieties on test plots



6

Monitor performance under local conditions



7

Best-performing coffees

Selected



Distributed to producers



Multiplied