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Bananas

Where they come from, how they reach your table, and the disease that could change them forever

Thanos Papageorgiou
Consultant in fresh tropical fruit



WHO IS TALKING

27 years between the farm and the ripening room

1. Agricultural engineer, postharvest training at UC Davis
2. 27 years in quality assurance for a European fruit importer, on production farms across Central and South America
3. Today an independent consultant for growers, importers and retailers



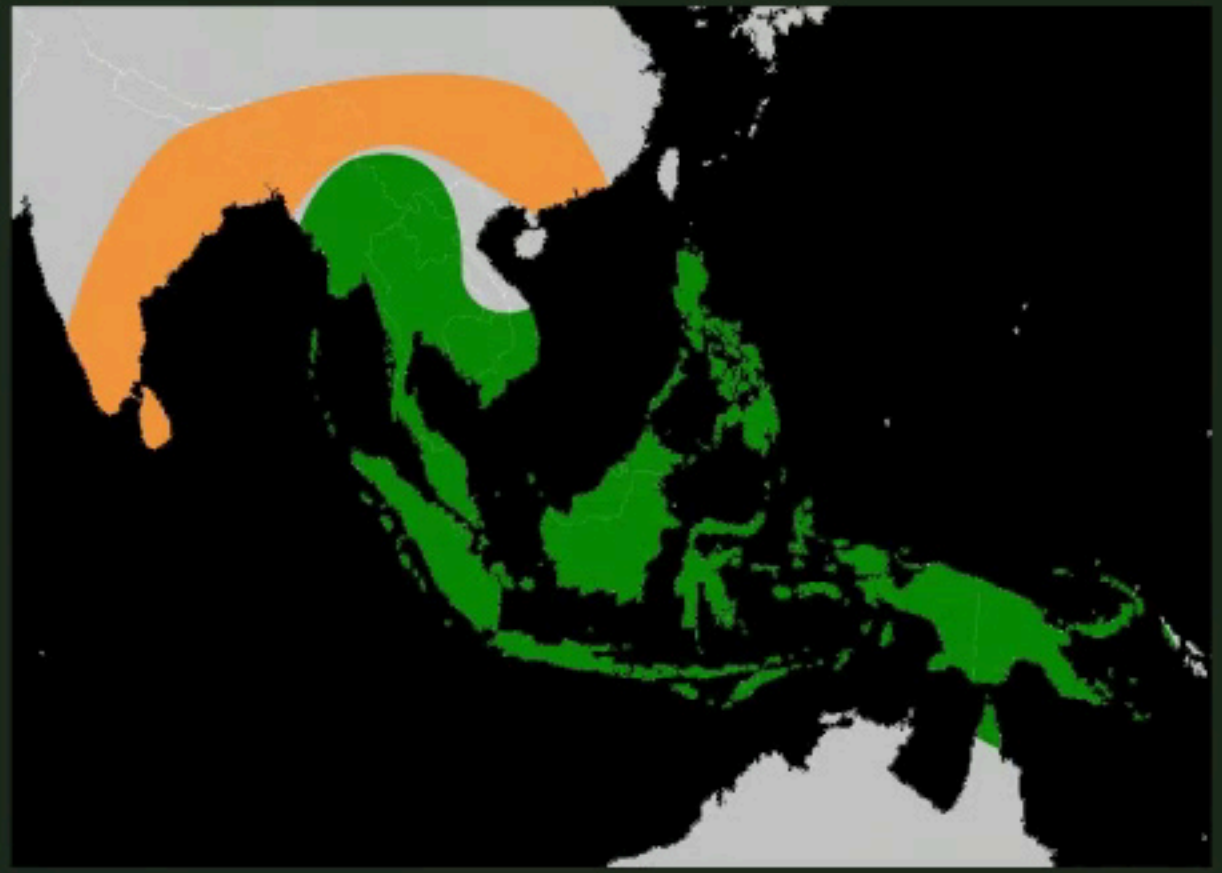
ORIGIN

Born in the forests of Southeast Asia

Green: *Musa acuminata*, the A genome

Orange: *Musa balbisiana*, the B genome

Carried by traders to Africa, then by the Portuguese and Spanish to the Americas



Map: native ranges of the wild ancestors, Wikipedia (Ancestors of M. × paradisiaca)



A wild banana is mostly seeds

Hard, stone-like seeds and little pulp. Nobody would buy this at the supermarket.

Photo: "Inside a wild-type banana", Warut Roonguthai

THE TRICK

Every Cavendish on Earth is the same plant

3 **Three chromosome sets (AAA).** Meiosis fails, so the plant is sterile.

0 **No seeds needed.** The fruit grows without fertilisation (parthenocarpy).

1 **One genotype.** Propagated from suckers and tissue culture: a global clone.



Photo: A. D'Hont, CIRAD (musarama.org)

IT HAPPENED BEFORE

The banana your grandparents ate is gone

Gros Michel was the export banana until the 1950s.

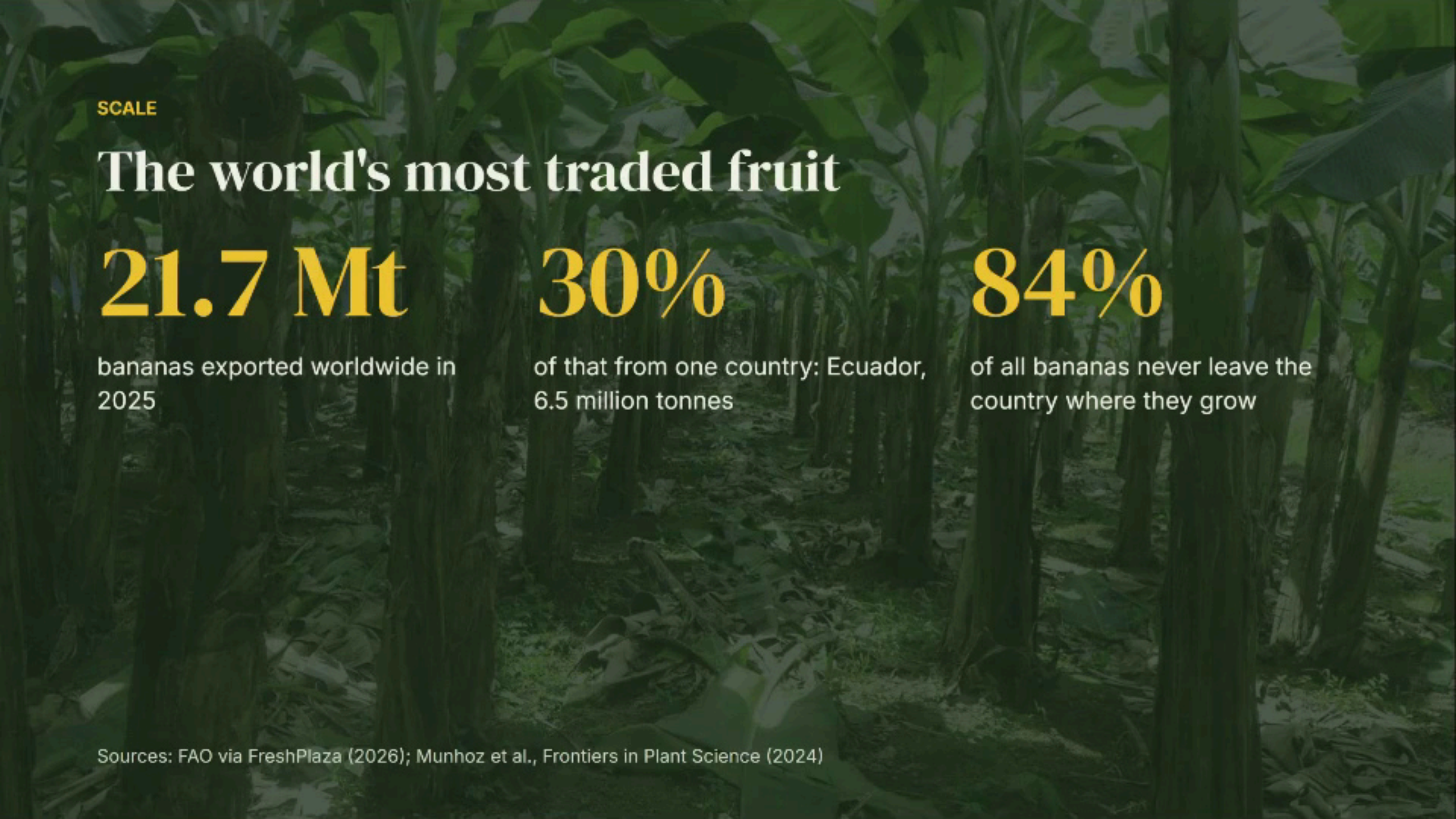
Panama disease (*Fusarium* Race 1) destroyed plantations across Central America. The industry switched to Cavendish, which resisted Race 1.



GROS MICHEL

A Gros Michel plantation beside the railway, early 20th century





SCALE

The world's most traded fruit

21.7 Mt

bananas exported worldwide in 2025

30%

of that from one country: Ecuador, 6.5 million tonnes

84%

of all bananas never leave the country where they grow

Sources: FAO via FreshPlaza (2026); Munhoz et al., Frontiers in Plant Science (2024)

ON THE FARM

A plantation never stops producing



Flower to harvest

About 12 weeks from flowering to a bunch ready to cut



Bagged bunches

Blue bags protect the fruit from insects and scarring



Cut green, by hand

Harvested green; the mother plant fruits once, then a daughter takes over

THE PACKING STATION

From stem to box on the same day



Clusters are washed in long water tanks to stop the latex, then treated and packed



The people behind every box

COLD CHAIN

Shipped asleep at 13–14 °C

1. **Green life** is the time a green banana takes to start ripening on its own. At 20 °C: anywhere from 5 to 30 days.

2. **The clock starts at harvest.** Two to three weeks at sea use up a large part of it.

3. **When it runs out**, fruit ripens in the container: yellow clusters in a green box.

Green life at 20 °C: Peacock & Blake (1970)



RIPENING

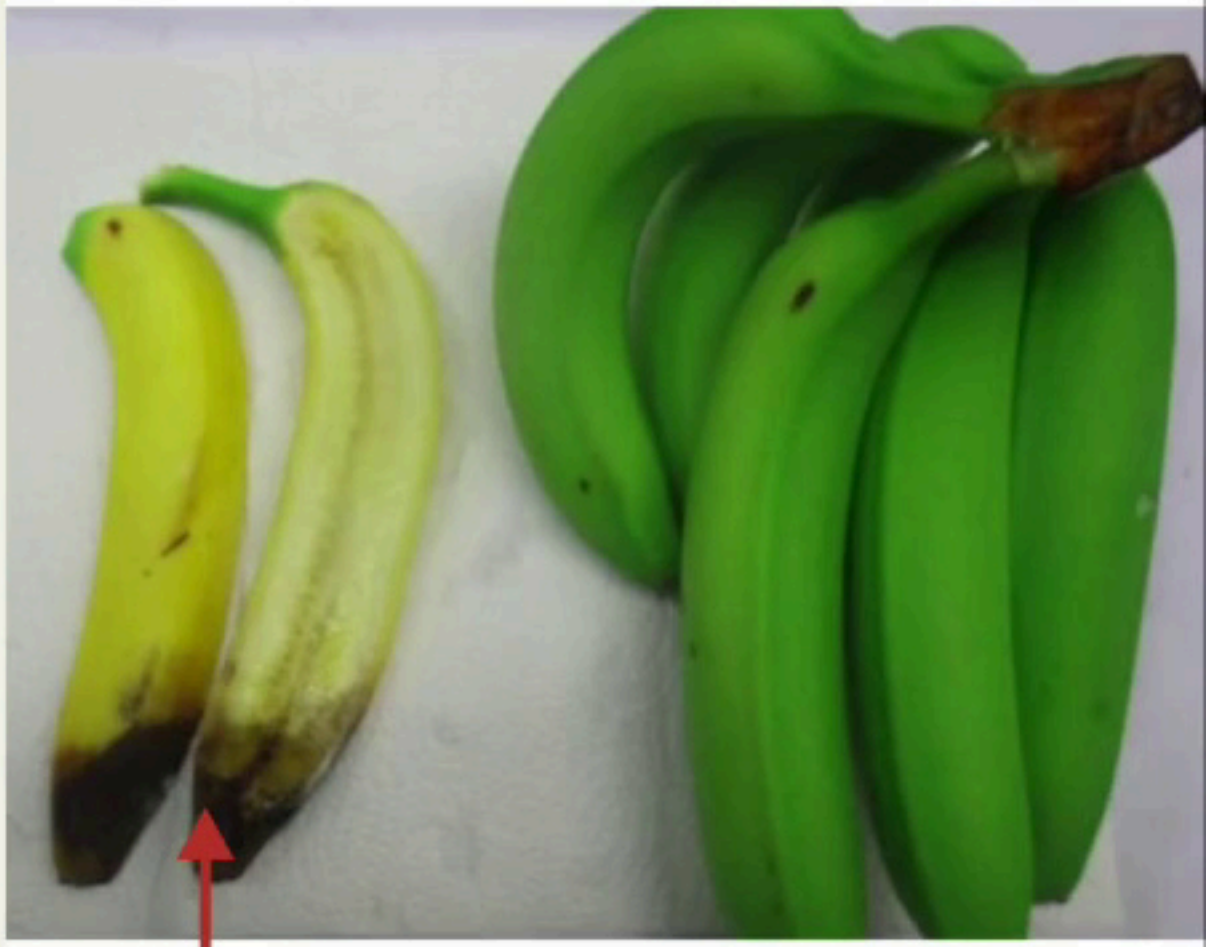
Ethylene: one gas starts it all

C_2H_4, the plant's own ripening hormone. Once triggered, bananas make their own and ripen by themselves.

STARTS AT	FULL EFFECT
0.1 ppm	**10 ppm**

Works best at 15–25 °C. Carbon dioxide above 1% blocks it.

Source: Reid, M. S., Biology of Ethylene Production and Action in Fruits, UC Davis Postharvest Technology Center



One finger from this cluster rotted at one end and produced ethylene. It ripened (here cut lengthwise); the rest of the cluster is still green.

THE RIPENING ROOM

A programme, not a switch

1. Open the bags and bring every pallet to the same pulp temperature
2. Ethylene and warmth for 24 hours
3. A 4- to 8-day programme, steering pulp temperature between about 14.5 and 18 °C
4. Fresh air to keep CO_2 down, and a check every day, better twice



COLOUR STAGES

From grass green to sugar spots

1 All green

2 Green, trace of yellow

3 More green than yellow

4 More yellow than green



5 Yellow, green tips

6 All yellow

7 Yellow with sugar spots

1 1 2 3 4 5 6 7

Day 0 · hard, starchy

About day 6 · soft, sweet

INSIDE THE FRUIT

Six days from starch to sugar

SWEETNESS

Starch is broken down into sugars

COLOUR

Chlorophyll breaks down; the yellow carotenoids underneath appear

TEXTURE

Pectin in the cell walls dissolves; the pulp softens

AROMA

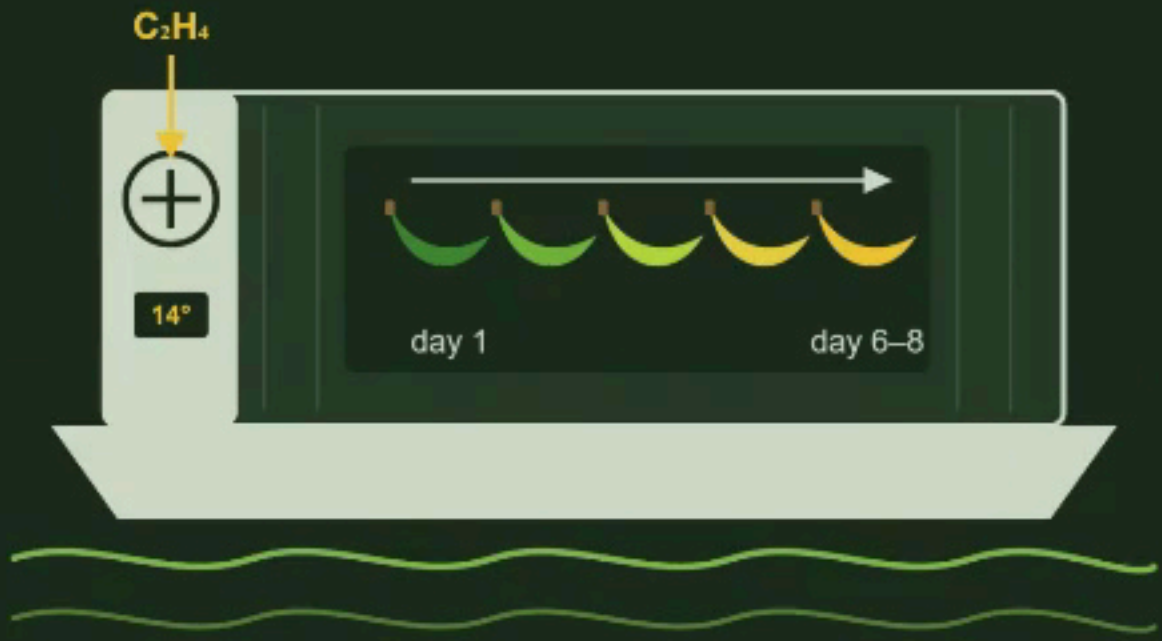
Esters form: the smell of banana

Ripening bananas breathe and heat up: a 24-pallet room at 20 °C releases about 129,000 kcal (≈150 kWh) a day

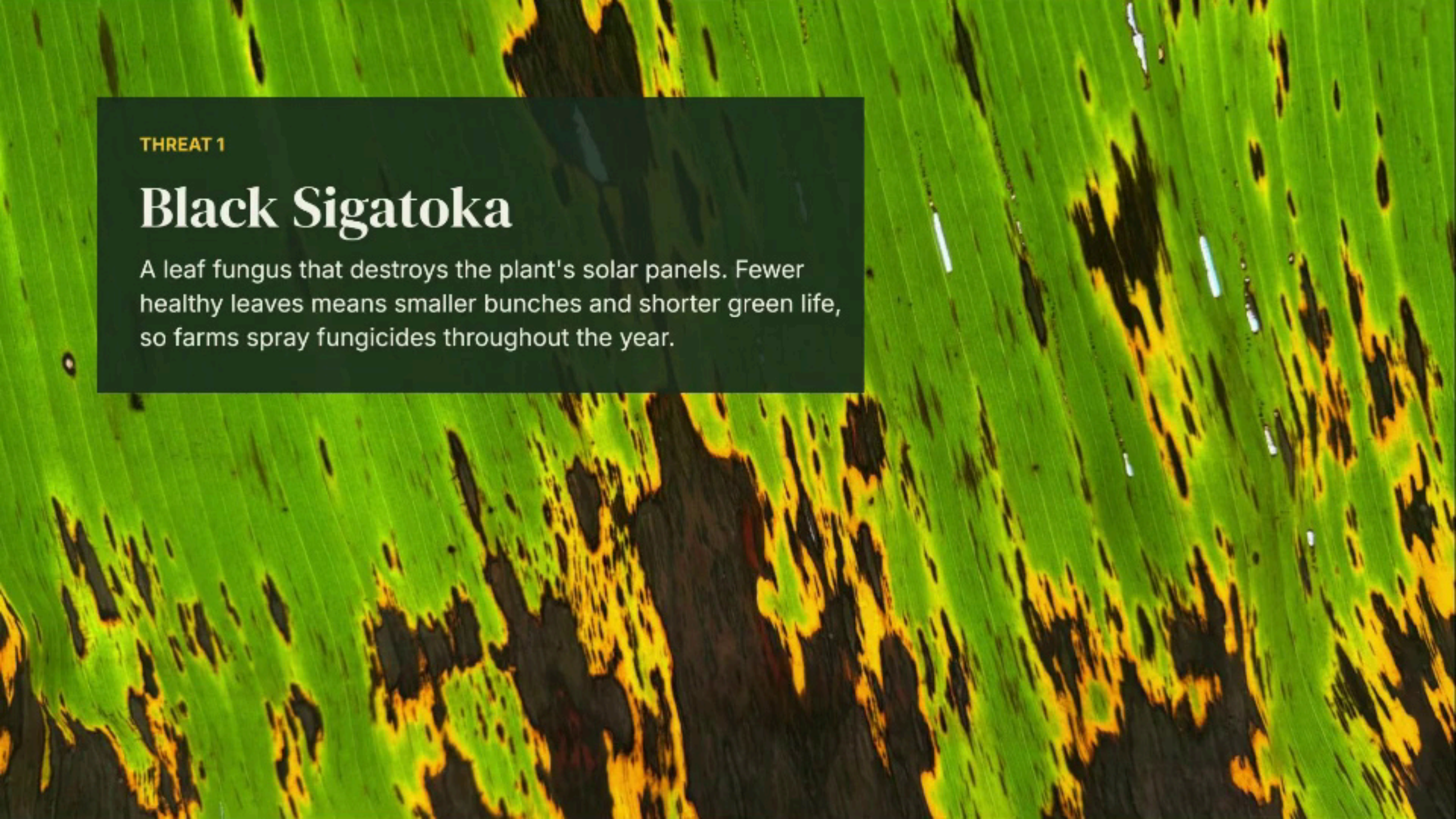
WHAT'S NEXT

The ripening room goes to sea

1. New reefer containers ripen bananas during the voyage, e.g. Maersk StarRipe
2. Colour stage, finish date, temperature, O_2 and CO_2 are set at booking
3. Six to eight days of ripening, at sea or at the terminal, instead of 3–5 days in a ripening room



Source: Maersk, "How in-transit ripening is transforming Europe's banana trade", 30 July 2025



THREAT 1

Black Sigatoka

A leaf fungus that destroys the plant's solar panels. Fewer healthy leaves means smaller bunches and shorter green life, so farms spray fungicides throughout the year.

THREAT 2

Tropical Race 4 has reached Latin America

A soil fungus that kills Cavendish. No cure, no resistant variety on the market, and it stays in the soil for decades.



1990s
Southeast Asia

2019
Colombia

2021
Peru

2023
Venezuela

2025
Ecuador, the world's #1 exporter

Sources: Munhoz et al., Frontiers in Plant Science (2024); EPPO Reporting Service 2026/015; IPPC pest alert (Dec 2025)

THREAT 3

Climate: too much water, then too little



El Niño floods drown roots and spread soil-borne disease



Both drought and waterlogging shorten green life, so more fruit ripens on the ship

WHAT IS BEING DONE

Three ways out, none of them finished

GENETIC MODIFICATION

QCAV-4

A Cavendish with a resistance gene from a wild banana. Approved in Australia in 2024, the world's first GM banana, kept as a safety net.

CONVENTIONAL BREEDING

Yelloway One

A non-GM hybrid resistant to TR4 and partly to Black Sigatoka. Chiquita aims for shelves in 2028–30, if field trials hold.

TODAY

Biosecurity

Footbaths, clean tools, quarantine, healthy planting material. Slow, unglamorous, and the only thing that works right now.

Sources: FSANZ A1274 (2024); FreshFruitPortal, Feb 27, 2026; Wageningen University & Research

A FOURTH WAY

Break the monoculture in the field

Agroforestry: bananas grown together with trees, on the same land.

1. More life in the soil and around the plants
2. Shade and shelter for the crop
3. A second income: two timber species, harvested after about 10 and 15 years

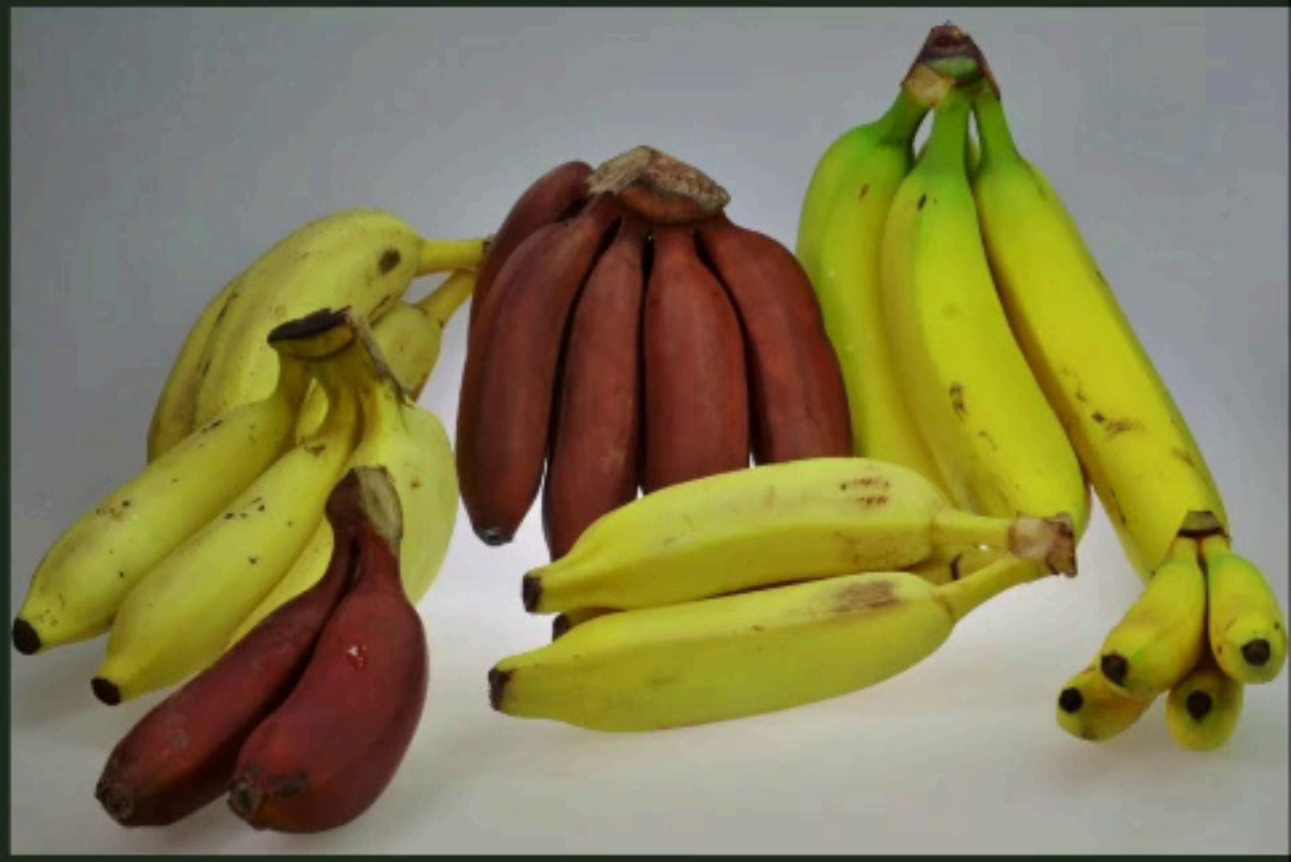


Xavier Lazo and Thanos Papageorgiou at Cluzon, Ecuador

BANANAPOCALYPSE, 20 YEARS LATER?

The crisis came, slowly. Farm by farm, not overnight.

The lasting fix is not one more perfect clone. It is diversity: in the field, in the gene pool, and on the shelf.



Thank you

Questions about the farm, the ship or the ripening room are welcome.

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