



Banana value chain profile for Ecuador: The world's largest exporter is at risk from Fusarium TR4

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HIGHLIGHTS

-  Ecuador is the fifth largest banana producer in the world and the second largest in Latin America. The banana industry significantly influences Ecuador's economy and daily life, with exports accounting for 18.1% of non-oil exports, employing over 115,000 people, and being the most consumed fruit in the country.
-  The Ecuadorian banana value chain is comprised of producers, service and input suppliers, research institutions, government institutions, and consumers. As small producers are dominant, producer associations and export companies are crucial players in the production and export of bananas.
-  Ecuador's banana sector faces the threat of Fusarium Tropical Race 4 (TR4), which has been detected in neighboring countries. TR4 in Ecuador's banana sector would cause reductions in production, exports, jobs, and agricultural value added, which would have ripple effects on the overall economy and its associated industries, such as the carton and plastic industry.
-  To protect the banana sector, Ecuador has implemented various measures, including disinfection, monitoring, and distributing biosecurity kits to producers. Ongoing vigilance, collaboration, and research are vital to safeguard against TR4 and prevent potential devastating effects on the sector and the broader economy.



Ecuador is the fifth largest banana producer in the world and the second largest in Latin America, behind Brazil (BCE, 2022).

The most produced varieties in Ecuador are Cavendish and Dwarf Cavendish, which are currently threatened by the arrival of Fusarium Tropical Race 4 (TR4) in South America, namely Colombia, in 2019 (ICA, 2019). The disease is now present in Colombia, Peru, and Venezuela which increases the risk of infection of TR4 in Ecuador since Colombia and Peru are neighboring countries (ICA, 2019; INSAI, 2023; SENASA, 2021). Given the importance of the Ecuadorian banana sector, the objectives of this profile are to describe the importance of the banana sector in Ecuador and to examine the banana value chain to understand the sector's current status, challenges, and susceptibility to TR4.

The importance of the banana sector for Ecuador's economy

Ecuador is the largest banana exporter in the world: 87% of banana production in the country is destined for export. In 2021, these exports were valued at USD 3.5 billion, which represents 18.1% of the value of Ecuador's non-oil exports. The main export destinations are Russia, the United States, Turkey, the Netherlands, Germany, Italy, Chile, Argentina, Algeria, Saudi Arabia, China, Belgium, and Ukraine (BCE, 2022). In 2021, the banana sector accounted for 17.4% of agricultural value added. The banana sector also plays a vital role in Ecuador through its generation of employment. Banana production activities employed 115,698 people, 7% of whom were producers and family members, 38% casual workers, and 55% permanent workers (MAG, 2022). Although, on average, Ecuadorians do not consume much bananas, plantains are the most widely consumed fruit in the country, with per capita consumption reaching nearly 27 kg per year (FAOSTAT, 2022).

Banana production across the country

Areas planted to bananas in Ecuador correspond to 11.8% of the country's agriculture land. In 2021, 167,893 hectares (ha) of bananas were distributed across 15,461 banana plantations (MAG, 2022) in 19 provinces located in the Costa, Sierra and the Amazonas regions. However, banana production in Ecuador is mainly in the Costa region, where 150,316 ha of bananas are planted and 94% of the bananas produced in the country are harvested (INEC, 2022). Figure 1 provides a visual of how banana production in the country has performed from 2017 to 2021. In the figure, we compare the total amount produced against the yield per hectare. As shown, banana production had an increasing trend before 2020 when planted areas and production decreased. On the other hand, while production was growing, yield was decreasing. In 2021, the banana production more than recovered, showing the highest amount of banana harvested and the highest yield (40.74 tons/ha) in the last five years despite a lower planted area.

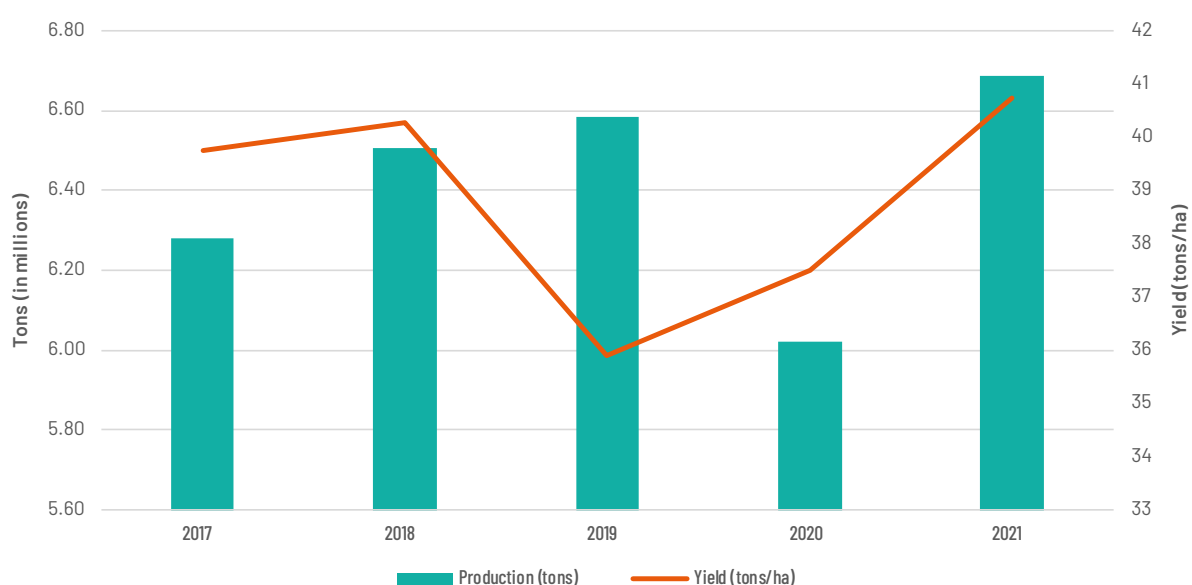


Figure 1

Production and yield of banana in Ecuador between 2017-2021

Source: Own elaboration based on INEC (2022)

Figure 2 compares planted areas and production across the provinces that produce the most bananas in Ecuador. This figure shows how banana production is distributed throughout the country. The provinces in orange are the largest banana producers. The provinces of Los Ríos, El Oro, and Guayas produce 92.3% of the bananas harvested in the country. Los Ríos is the province with the highest banana production (2,571,356 tons). This is likely because it has the largest area devoted to bananas. The province that is the second largest producer is Guayas,

which produced 2,098,274 tons in 2021 with a yield of 45.9 tons/ha. Next is El Oro with a production of 1,502,098 tons. This province also has 2,269 banana plantations, making it the province with the highest number of banana plantations in the country. The cantons¹ in this province that produce bananas for export are Machala, El Guabo, Pasaje, and Santa Rosa. Cañar province in the Sierra region stands out because although it does not have the highest production, it has the highest yield in the country with 48.8 tons/ha (INEC, 2022).

¹ Cantons are administrative units below provinces.

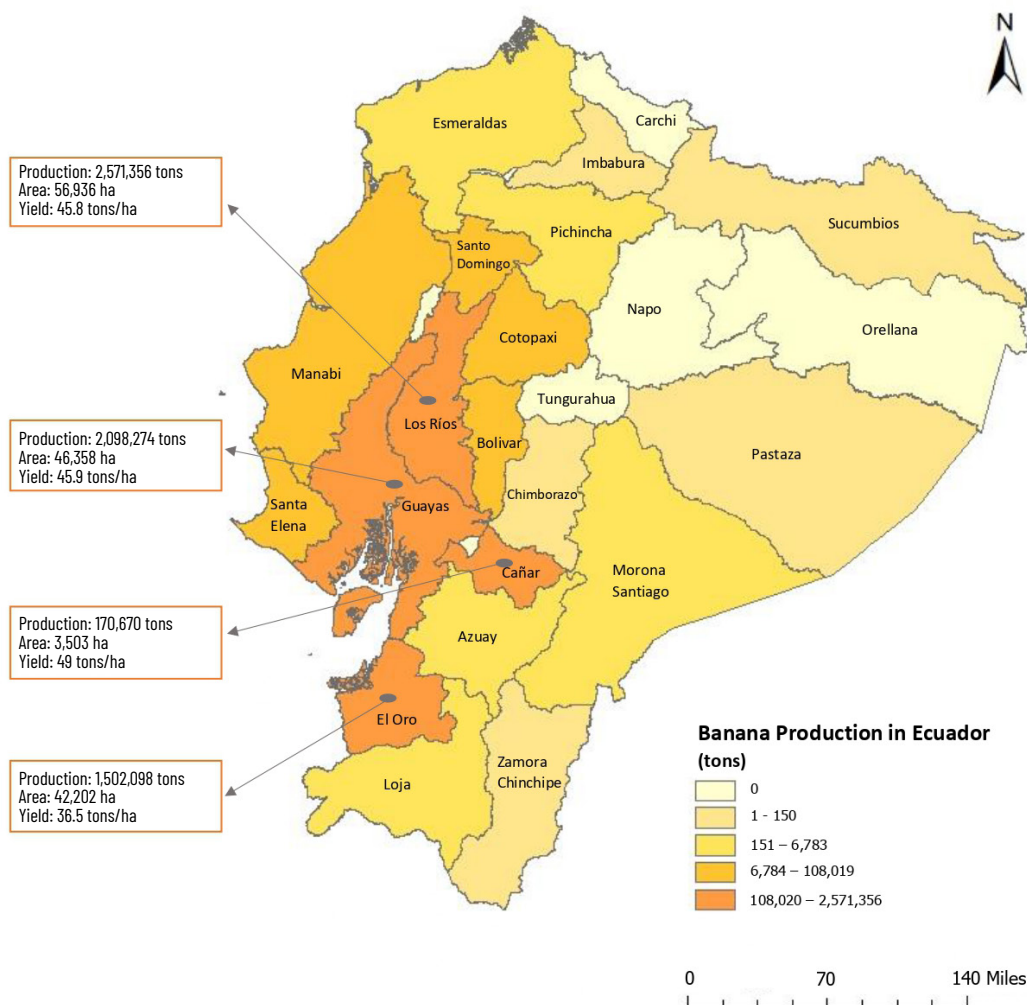


Figure 2

Banana-planted areas and production by province
Own elaboration based on INEC (2022)



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Actors in the banana value chain

The banana value chain in Ecuador involves a variety of actors from production to consumption. Figure 3 provides an overview of the banana value chain in Ecuador and the actors involved in it, which we discuss in more detail below.

Suppliers of services and inputs are necessary for banana production and can be divided into three groups. The first group consists of financial suppliers who provide economic resources that producers may need. This is done through credits and subsidies (bonds), such as the Ecuadorian Central Bank, the Ministry of Agriculture and Livestock, Banking for Rural and Urban Productive

Development, National Financial Corporation, and other private sector banks. The second group comprises actors that carry out research and transfer knowledge to producers to improve their capacities. This group includes Agrocalidad, the phytosanitary regulatory agency, which, in addition to regulating and controlling vegetal sanitation, provides programs to strengthen the agricultural sector, offers laboratory testing services to detect diseases, and provides guides on disease management. This group also includes research centers, such as the National Institute of Agricultural Research (INIAP) and universities that have agricultural research groups (e.g., Escuela Superior Politécnica del Litoral-ESPOL), Universidad Técnica de Machala, Universidad Central del Ecuador, Universidad de Cuenca, and Universidad Técnica de Manabí), entities, and NGOs are part of the Research System on Ecuador's Agrarian Problems (SIPAE). The second group also includes institutions such as the Inter-American Institute for Cooperation on Agriculture (IICA), which finances research projects and invests in knowledge transfer.

The third group consists of suppliers of inputs and machinery and includes manufacturers, importers, and suppliers of agrochemicals and machinery. In this group, carton manufacturers play a fundamental role in the post-harvest stage since bananas for export are packed in carton boxes. Banana exports use about 80 to 85% of the national production of carton boxes (AEBE, 2021). The main carton manufacturers in Ecuador are Industria Cartonera Ecuatoriana S.A, PROCARSA. S.A, Corruempaque Cía., Cartonera del Austro, and Cartonera Pichincha (Comex, 2022). The plastic industry is also important in the banana sector, since plastic covers are used on plantations to protect the fruit from insects and other animals (Vargas et al., 2010).

Producers are responsible for agricultural activities leading up to harvest. This productive stage involves not only the producers, but also laborers who carry out field activities, such as planting, fertilization, fumigation, harvest, and post-harvest activities (cleaning, sorting, and packaging). In Ecuador, 80% of banana producers are men, who are, on average, 58 years of age and have different levels of education: 36% have primary education, 19% secondary education, 35% higher education, and 10% have not completed any formal education (MAG, 2022). Based on the MAG classification, most producers in Ecuador are small: 84% of banana producers in Ecuador are small (less than 10 ha), 14% are medium producers (10-100 ha), and 2% are large producers (more than 100 ha). Some large producers, such as Dole, Reybanpac, and Frutadeli, are both direct exporters and – in some cases – buy production from medium and small producers. In contrast, small producers have to associate among themselves to export.



Producers associations help farmers reduce transaction costs and collaborate in the marketing of their products by strengthening farmers' collective bargaining power. In the case of small producers, they tend to form associations due to benefits such as access to agricultural inputs at lower prices, sales of their products for export, and training. Banana producer associations in Ecuador include the Association of Small Banana Producers El Guabo (ASOGUABO), Banana and Tropical Fruit Producers' Association (APROBAF), and Coastal Banana Farmers Association (ASOAGRIBAL). On the other hand, medium and large producers are not members of these organizations. Instead, they are associated with export companies, of which there are more than 200 in Ecuador. Export companies play different roles. One is that of the producer. Since many marketing companies have their own plantations, they also have an associative role: they partner with producers and buy their production in exchange for providing services, such as agricultural aerial spraying and access to agricultural inputs. The main role of trading companies is to export bananas. There are also associations among export companies. The Association of Banana Exporters of Ecuador (AEBE) stands out: It groups more than 70% of banana exporters in Ecuador, and is responsible for collecting, processing, and publishing statistics on the banana sector to its members (AEBE, n.d). There is also the Banana Marketing and Export Association ACORBANEC, which represents 42% of the country's banana exports (ACORBANEC, n.d). In addition to marketing companies, intermediaries are involved in the banana marketing for both national and international sales.

Certification companies intervene both in the production and marketing stages. They establish standards that

must be met in the management of the crop to grant certifications. In terms of marketing, some certifications establish guidelines for commercialization. Certifications improve market access and make the harvested banana more attractive to consumers. The most widely used certifications in Ecuador are Rainforest Alliance, GLOBALGAP, Fairtrade, ISO standards, and HACCP standards (MPCEIP, 2017). Other actors that take part in post-harvest and marketing stages are those dedicated to transport. Bananas are either transported to the port for export or to domestic markets. After bananas are exported, shipping companies are responsible for transporting the produce to the destination countries.

Bananas that are not exported due to damage or injury are sold in local markets. These bananas may be slightly bruised or have other minor defects, but they are still perfectly edible. Bananas that are more severely damaged or injured may be used as animal feed or in composting (Derks, 2015). Another use of these bananas is the manufacture of banana flour (Bananotecnia, 2014).

Finally, at the end of the value chain are both domestic and international consumers. In addition to the consumers who buy bananas, other consumers are households that grow bananas and allocate a part of their production for their own consumption. Bananas are important for the food security of these banana producers, since bananas not only contribute to income generation, but also to the daily diet as a source of essential nutrients.



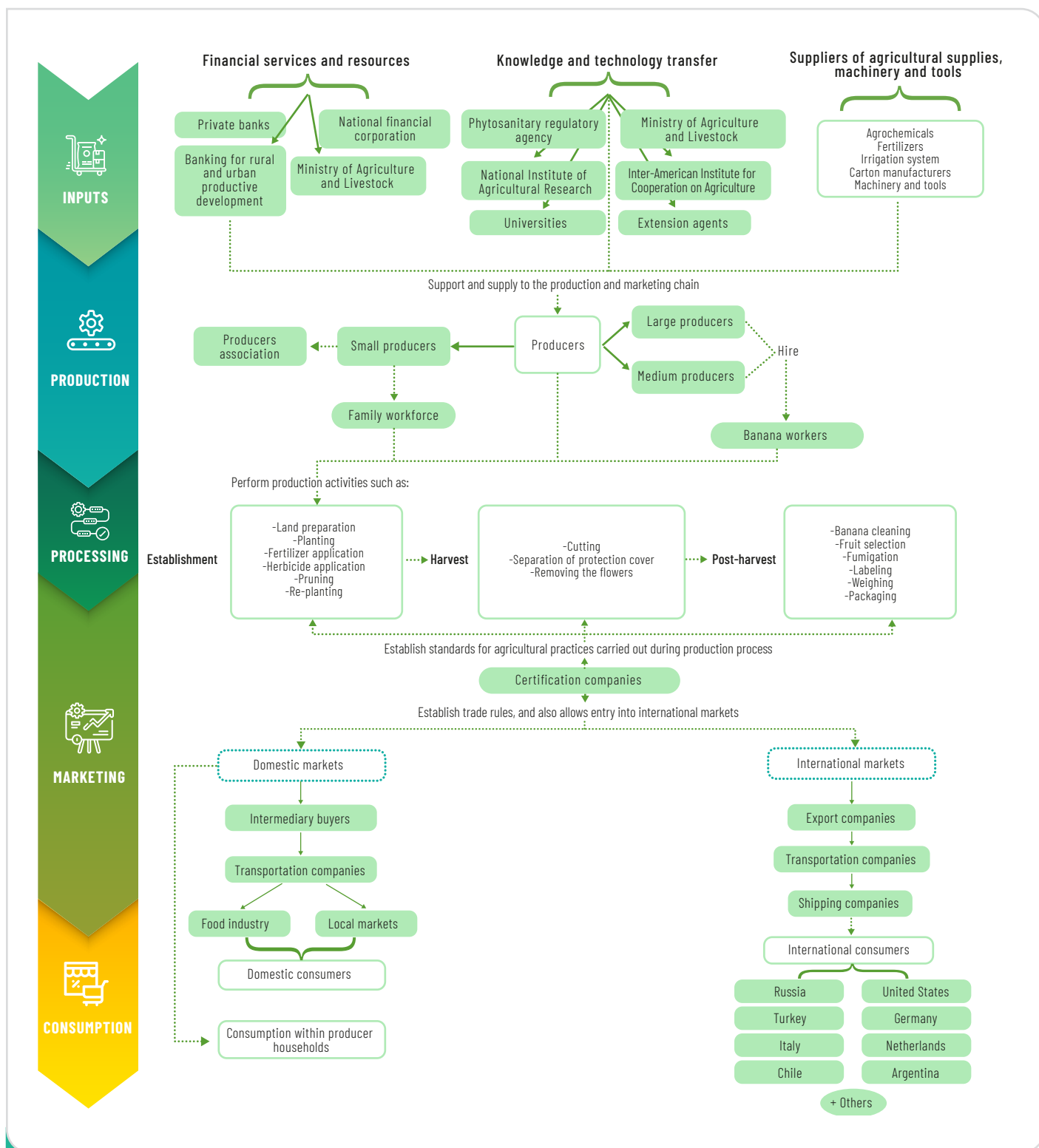


Figure 3

Actors in the banana value chain
Source: Own elaboration

Pests and diseases: The threat of Fusarium Tropical Race 4 (TR4)

Pests and diseases affect the banana sector in Ecuador. In 2021, approximately 273 hectares of bananas were lost due to pests and diseases, which accounted for about one-fifth of the total area lost. The other one-fifth of the total area lost was due to drought and frost, and the remaining losses were due to other causes (MAG, 2022). The most common diseases in banana crops are *Mycosphaerella fijiensis* (Black sigatoka), nematodes, and *Ralstonia solanacearum* race II (Moko). Black sigatoka has a high control cost, which banana producers must assume (BCE, 2022) and causes the highest losses in both area and production.

Currently, banana production in Ecuador is threatened by a spread of Moko. Government institutions have been implementing strategies to avoid the spread of this disease, such as through providing trainings about its management, disseminating an action plan, distributing informational brochures on the prevention and management of the disease, and constant monitoring. In 2021, Agrocalidad carried out 21,000 monitoring farm activities to detect the disease. In December of the same year, Agrocalidad worked together with INIAP and MAG to conduct a series of technical trainings called “Moko disease, its epidemiology and management.” According to the Ecuadorian newspaper *Expreso*, Moko disease was present in 12 provinces in February 2022 (Zumba, 2022).

Thus far, Ecuador is free of TR4. However, this does not mean that the banana sector is not threatened by this devastating fungus due to its location between two countries that have the disease, namely Colombia and Peru. Since 2011, the Ecuadorian government has been implementing strategies to prevent the entry of the fungus into the country, initially with a contingency plan and passenger and luggage control. In 2014, measures and increased requirements for in vitro plants importation (plants inside a glass jar that are grown in a laboratory setting) were implemented. Between 2015 and 2019, measures for disinfection of containers in maritime ports and disinfection of footwear in ports and airports were carried out. In 2019, a guide for phytosanitary measures and the preparation of research projects about Foc-TR4 was developed. Between 2020 and 2021, the contingency plan was updated, and the incineration of international garbage at airports was approved. This garbage includes products and by-products of animal and plant origin seized at the airport, which would, otherwise, facilitate the entry of pests and diseases into the country (Agrocalidad, 2023a). In 2022, prevention strategies focused on monitoring, disinfection, and training were implemented. For example, Agrocalidad carried out 159,589 monitoring activities to detect TR4 in *Musaceae*², conducted 9,000 footbaths and delivered 900 biosecurity kits to banana producers, and disinfected 696,723 containers, 585 agriculture machineries, and 455,068 vehicles (Agrocalidad, 2023b). Agrocalidad reports 455,068 direct beneficiaries as a result of these strategies (Agrocalidad, 2022).

As of 2022, research alliances have been created, such as that between Universidad Técnica de Manabí (UTM) and Escuela Superior Politécnica del Litoral (ESPOL) together with INIAP. International entities are also implementing projects on TR4, such as on genetic improvements, the

search for resistant or tolerant materials, and a study on climatic conditions that increase the chances of TR4 (INIAP, 2023). By taking proactive measures and investing in prevention, Ecuador aims to maintain its TR4-free status and protect the livelihoods of banana producers and the overall banana sector. Continued vigilance, collaboration with neighboring countries, and ongoing research and development will be essential in safeguarding the country’s banana industry from the threat of TR4 in the present and the future.

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² Musaceae refers to a family of plants that includes bananas and plantains.

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