



**BUILDING RESPONSIBLE
GLOBAL VALUE CHAINS
FOR SUSTAINABLE
TROPICAL FRUITS**

Technical webinar series on avocado and pineapple value chains

Webinar #11: Sustainable Soil Management

Summary report

Wednesday, 1 February 2023, 16.30-18.00 Rome (UTC+2), on Zoom.

Background

This webinar is part of a series of technical webinars organized by FAO's [Responsible Fruits project](#) in response to the priorities and interests of participants from the private sector. The webinars provide an opportunity for peer learning on precompetitive issues and the identification and sharing of good practices. To facilitate open discussion, there is no webinar recording and the event's report follows the Chatham House Rule of not identifying individual speakers, except for the industry speakers identified in the agenda who have consented to share information in advance.

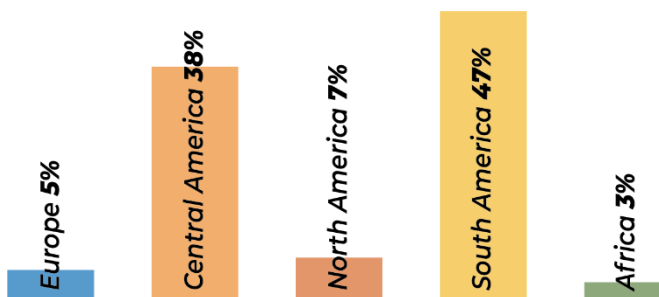
Participation

Fifty-eight participants joined the webinar.

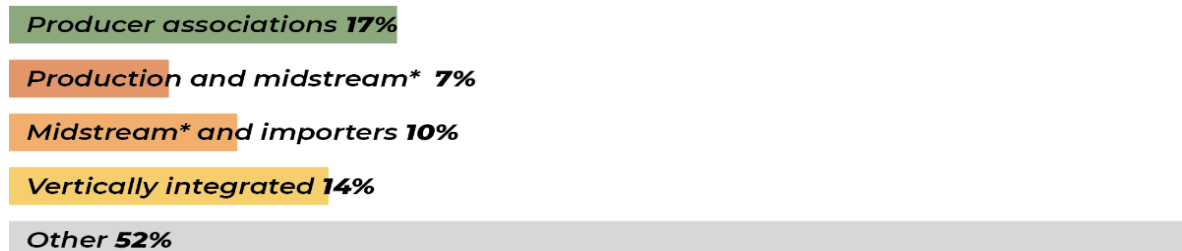
Gender



Geographic origins



Industry groupings



*Companies active in the "middle" part of the value chain, including packers, processors, exporters and transporters.

Organizing this event online avoided the greenhouse gas (GHG) emissions that would normally be associated with travel for a face-to-face event. A preliminary estimate using the ICAO Carbon Emissions Calculator¹ indicates that this event saved over 57 622 kg of CO₂ emissions.

Summary

The event agenda is presented in the Annex. All presentations are available by sending a request to Responsible-Fruits@fao.org. The event and its context in the framework of the Responsible Fruits project were introduced by FAO. After this, FAO familiarized participants with the specific topic of soil health, highlighting its importance for tropical fruit value chains and its alignment with sustainable practices and responsible business conduct (Part 1). In Part 2, the Asociación de Productores de Piña del Monte de Plata (ASOPROPIMOPLA) in the Dominican Republic presented agronomic practices the association is adopting to preserve soil health and biodiversity. The association also talked about the work they are doing on circular economy to minimize waste generated from pineapple production, and the efforts taken to improve the social sustainability of their operations. In Part 3, Westfalia Fruit Peru provided an overview of the soil management techniques the company is using in avocado plantations. The company highlighted the link between soil and water management in avocado production.

- **Welcome and introduction**

María Hernández Lagana, FAO

Soil provides multiple ecosystem services, which are fundamental to the continuity of life on the planet. Healthy soils constitute the basis of food production, including tropical fruits. Healthy soils play a key role in preserving water and air quality while increasing the resilience of farming systems and reducing vulnerability in the face of extreme climatic events. Despite the importance of soil, it has been frequently mismanaged and overexploited, leading to the degradation of 33 percent of soils worldwide.

To address increasing degradation, the use of sustainable soil management practices represents an opportunity to address challenges observed in the avocado and pineapple production systems. Moreover, the use of these practices can contribute to reversing environmental degradation and promoting biodiversity conservation.

In this webinar, FAO, producer organizations, associations and companies from the avocado and pineapple sectors discussed about the use of sustainable practices for soil management to preserve soil health.

- **Part 1: Sustainable soil management**

Ronald Vargas, Secretary, Global Soil Partnership, FAO

The speaker began by highlighting the need to protect soil as an important element of improving agricultural production, as well as environmental outcomes and water quality. As such, the speaker mentioned the importance of including soil health in the "one health" approach, recognizing the interconnection between people, animals, plants, and their shared environment for achieving optimal health outcomes for all.

He also noted that soil conservation is directly connected to the Sustainable Development Goals (SDGs). Healthy soils provide several ecosystem services, which not only contribute to increasing production and maximizing yields, but also support biodiversity conservation, resilience and climate change mitigation. Moreover, given that 95 percent of food is produced by farmers, protecting soils is vital to ensuring food security and nutrition for all.

¹ See <https://applications.icao.int/icec/Home/Index>

However, globally soils show signs of degradation, driven mostly by the increased use of nutrient additives (e.g. synthetic fertilizers) and unsustainable practices. To stop these trends, a change in soil management is needed before 2050 to halt soil erosion and compaction, acidification, pollution, and the loss of soil organic carbon, among others. Degradation can also have negative effects on food quality and safety. On one hand, soils with poor fertility and nutrient content translate into lower macro and micronutrients provided to food crops. On the other hand, polluted soils with pathogens and contaminants from agriculture or other industries can prevent the production of safe crops for human and animal consumption.

The speaker also referred to the technical summary of the [Status of the world's soil resources](#) where the ten threats to soil were outlined, such as waterlogging or soil sealing. He stated the importance of referring to both the [Voluntary guidelines for sustainable soil management](#), which establishes principles to avoid practices causing degradation, and to the [Code of conduct for the sustainable use and land management of fertilizers](#) to prevent nutrient imbalances with the use of fertilizers.

In relation to fruit production, the speaker highlighted four points regarding soil management and production:

- i. Crop nutrition can be enhanced by preserving biodiversity and scaling-up the use of biofertilizers, including mycorrhizas, stimulants or organic waste.
- ii. Disease management, particularly integrated disease management, promotes the conversion of soils to become more biodiverse, and thus, suppress the proliferation of soil pathogens.
- iii. Water use efficiency can be maximized by improving green water (water held in soil and available to crops). Thus, enhancing soil structure can promote water infiltration from rainfall and irrigation.
- iv. Healthier soils have climate change adaption and mitigation potential, as non-degraded soils have the ability to store organic carbon and GHG emissions.

During the discussion session, different ways to improve the soil structure were covered. One instance is the incorporation of cover crops, which can enable water retention in the soil, since cover crops promote biological action and their roots can help increase soil organic matter content and reduce compaction. By improving soil structure, water runoff is decreased, and both the infiltration rate and moisture are enhanced. It was also mentioned that in arid zones, the selection of cover crops should favour crops with a low water-demand. The speaker mentioned that in orchard plantations, such as avocado, cover crops can be placed in the tree lines to cover tree roots, ameliorate soil health and regulate soil temperature and moisture. In systems with perennial cultivars, cover crops are grown in association with the perennial plants (e.g. avocado and pineapple) without creating water and/or nutrient competition, and are rotated with other seasonal crops, instead of with the main product.

Finally, the speaker mentioned that soil health can be measured with the use of indexes. FAO is currently developing index-based measures that will be published soon.

- **Part 2: Producing pineapple in harmony with biodiversity**

Joelin Santos Contreras, President and executive director of the Pineapple producer association from Monte de Plata (*Asociación de Productores de Piña del Monte de Plata – ASOPROPIMOPLA, S.A.*)

Biodiversity was pointed out by the speaker as a key element to ensure high-quality and reliable pineapple production.

The speaker mentioned that the Dominican Republic has been working with the German Agency for International Cooperation (GIZ) and with some companies and universities from Costa Rica to incorporate better agricultural practices for pineapple production. This includes the establishment of living fences, i.e. adding a line of trees and shrubs along pineapple plantations to reduce the use of agrochemicals, while minimizing GHG emissions and climate change impacts.

The practice is reported to have positive contributions to soil health, by enhancing water drainage when heavy rains occur, minimizing topsoil runoff and preventing waterlogging, which can be very damaging for pineapple production.

Another soil management practice presented by ASOPROPIMOPLA was contour planting, a technique that consists of planting crops considering the leveling curves and the favorable slopes that already exist in the watershed. According to the association, this is a positive practice to reduce soil erosion and improve water drainage, especially after heavy rains. Additionally, the speaker emphasized that the use of fertilizers should be reduced to prevent soil pollution, and if used, producers should select those with the minimum toxicity. The incorporation of the appropriate biofertilizers, depending on the type of soil cultivated, was another option.

The speaker also referred to practices used by the association to manage water in a way that prevents soil pollution and biodiversity conservation. Excess rainfall is collected by ditches and transported to sedimentation or filtration lagoons to treat the water before disposal. This action prevents potentially contaminated water by excess agrochemicals and other pollutants from ending up in natural water bodies or springs, where it could affect soil and biodiversity. The speaker also pointed to the importance of wastewater treatment to improve environmental management. The association treats water used to wash spraying equipment and disposes it in a safe place to ensure that wastewater does not pollute the local ecosystems.

Lastly, the speaker mentioned the association's engagement in activities to promote a circular economy. For instance, the company is currently working to transform pineapple stubble into fiber to produce handicrafts, such as shoes, lamps, jewelry, decoration and pots. This approach has reduced agricultural waste from pineapple production and has avoided the burning of plant residues, both with positive contributions to climate mitigation. Moreover, the activities have promoted engagement from the local community, reportedly enabling social and economic sustainability.

During the discussion section, participants asked about the function of biofertilizers. The speaker mentioned that these can be applied to improve soil fertility and vegetation health, and to promote a more deliberate use of agrochemicals. In response to a question about the minimum distance needed for living fences on pineapple plantations, the speaker mentioned that living fences should be placed on the existing natural paths and slopes so they can protect the plantations. Another question referred to the incorporation of cover crops in pineapple plantations. The speaker suggested that the use of these crops requires particular deliberation, as pineapple can be very sensitive to coverage (e.g. changing fruit quality). The speaker also mentioned that although pineapple has its own protection, the crop needs shielding from sun rays particularly during the development and ripening phases, as sunburn can affect the quality of the fruit and reduce the market potential. In addition, the speaker advised on protecting pineapples from weeds, as these are a major problem.

The speaker reiterated the importance of taking a more social-sensitive approach in pineapple production, by engaging with communities and working with other population groups.

Finally, the speaker mentioned that ASOPROPIMOPLA is hosting the 10th International Pineapple Symposium in the Dominican Republic. The Pineapple Symposium is an activity of the Tropical and Subtropical Fruits and Nuts Division of the International Society for Horticultural Sciences (ISHS).

- **Part 3: Sustainable management of the land and soil's health in Avocado sector**
Carlos Caballero Pickmann, Senior researcher and development, Westfalia Fruit Peru.

The speaker started by introducing Westfalia and describing the avocado producing regions in Peru:

- i. Coastal area, which is characterized by dry weather with less rain than 50 mm/year, and
- ii. Mountain area, which has clay or loamy soils with its rainy season during the summer months.

The speaker mentioned that given the difference in agroecological conditions and climate impacts in the two producing areas, Westfalia Peru implemented different soil management practices for avocado production. The coastal areas can be affected by El Niño events. The event increases temperature and rainfall, leading to flooding that can cause soil compaction and erosion in avocado production areas. To respond to these effects, Westfalia aims to address flooding by working hand-in-hand with the Government to clean and ensure the correct formation of drainage basins. On the other hand, Westfalia is working in the mountain areas (Sierra region) to protect the basins through reforestation programmes, which aim to minimize flooding events produced by heavy rainfalls. The company supports this by producing tree seedlings in its nurseries and donating them to local communities for planting.

The speaker also referred to the use of cover crops in avocado orchards as a practice to preserve soil quality and prevent degradation, with other environmental benefits. For instance, the company uses corn, beans and *Vigna* sp. to protect avocado trees against wind erosion given their suitability to be planted in sandy soils. Likewise, the company uses the crops as mulch to add organic matter to the soil after the cropping cycle is completed. Another example of a cover crop used by the company is the grass *Chrysopogon zizanioides*, which helps to reduce soil temperature, maintains the superficial moisture of soil, and can reduce water consumption in desert areas.

Another good practice to promote soil health is intercropping. The speaker suggested that *Cajanus cajan* can be intercropped with avocado trees and the leaves can be used as organic matter. *Crotalaria* was also recommended, as it reportedly creates symbiosis with the roots of the avocado tree, enabling Nitrogen fixation in the soil and thus, fertility. When it blooms, *Crotalaria* can also act as a pollinator-attracting plant in avocado orchards. Other species from the family *Trifolium* can be planted in the avocado planting lines reportedly to promote the development of roots and regulate humidity, preventing the avocado roots from suffocating with excessive soil humidity. Shrubs can also be placed alongside planting lines, which can also serve as biological corridors and to attract pollinators.

In terms of irrigation, the use of technical systems such as drip irrigation is important to control humidity levels (less than 1L/h of flow) and prevent saturation, which is crucial in avocado cultivation. By doing so, avocado producers report avoiding soil compaction, oxygen reduction and the proliferation of root diseases, such as *Phytophthora cinnamomi*. Better water management also has an impact on water consumption. Through the use drip irrigation, Westfalia Peru reports saving almost 10 000 m³ of water per year, reaching a total water use of 7 000 m³ per year. This amount is significantly lower than the quantity reported by avocado companies without technical irrigation of approximately 18 000 m³ per year.

During the discussion section, the participants asked about the potential competition between avocado trees and cover crops such as *Trifolium repens*. The speaker confirmed the importance of prioritizing the avocado plant, selecting cover crops that will not hamper the development and production of avocado. He also highlighted that selected cover crops should ideally be native species to ensure their adaptation to the local ecosystem. The speaker mentioned that the use of corn, as a wind barrier and as mulch in young avocado crops, as well as vetiver species, produced positive effects on reducing soil degradation and herbicides use.

Finally, the effects of using white clover as a cover crop were discussed. It was affirmed that the relationship between nitrogen-fixing bacteria and legumes has been observed. However, the speaker mentioned that there has not been significant influence on the reduction of fertilization application so far. Based on their experience, white clover is recommended to increase organic matter content and serve as bio-stimulants for the crop.

As always, the project team welcomes suggestions or questions on the project's activities at any time. Please contact us at: Responsible-Fruits@fao.org. For more information about the project or the webinar series, please refer to the same e-mail address.

Annex 1Working languages

English and Spanish with simultaneous interpretation.

Agenda

| Section title | Speaker/Facilitator |
|---|--|
| Housekeeping, welcome and introduction | María Hernández Lagana , Responsible Tropical Fruits (RTF) Project |
| Part 1: FAO: Sustainable soil management | Ronald Vargas , Secretary Global Soil Partnership, FAO |
| Part 2: Producing pineapple in harmony with biodiversity | Joelin Santos Contreras , Former president and executive director of the Pineapple producer association from Monte de Plata (ASOPROPIMOPLA, S.A.) |
| Part 3: Sustainable management of the land and soil's health in Avocado sector | Carlos Caballero Pickmann , Senior researcher and development, Westfalia Fruit Peru. |
| Q&A and discussion | María Hernández Lagana and Jesper Karlsson , RTF Project |
| Wrap up | Jesper Karlsson , Responsible Tropical Fruits (RTF) Project |
| Closing | María Hernández Lagana , RTF Project |

For more information about the project or the webinar series, please contact: Responsible-Fruits@fao.org