La Hornilla – Fundo Santa Inés

One Step Ahead with Sustainable Agriculture

Bayer Forward Farming

Why I am a ForwardFarmer

I´ve been involved in fruit production for 35 years. In 1995, I decided to start my own business and dedicate myself completely to an entertaining and dynamic job that is different every day, where I´m in contact with the land and people. It´s a job that motivates me, especially because I can produce tasty foods that people enjoy.

Since 2012, I have grown and cultivated fruit at the Santa Inés farm, located in Calera de Tango, 25 km from Santiago. This is a bountiful area for our stone fruits and grape plantations, and my sons and I are incorporating new high quality varieties to export, helping to improve the image of Chilean products among consumers around the world.

Our central mission is to produce more with less, in a sustainable way, to meet our goal of exporting 90% of our production. By the year 2050, global food production will need to double due to population growth, and we will have to achieve this with the same – or even less – farm land. Therefore, we are obliged to increase productivity per hectare and use our resources in a very responsible way. To do this, we must innovate and introduce new technology without sacrificing quality, and train our workers properly.

We aim to produce the best cherries, peaches, plums, nectarines and grapes in the market. ForwardFarming helps us fulfill our vision. The partnership with Bayer allows us to incorporate state of the art technologies that increase both our productivity and sustainability. This progress is important not only for us, but for Chilean agriculture as a whole, in order to remain competitive worldwide. We hope that the innovations we are making at Santa Inés will encourage other farmers to follow this path, which we believe is the road to the future.

Cristián Allendes, farmer and manager of Santa Inés farm, belonging to Agrícola La Hornilla.

“Our main challenge is producing more with less”
Cristián Allendes, manager of the Santa Inés farm

Sustainable Farming at La Hornilla – *Fundo Santa Inés*

Farm Profile

Location:
Calera de Tango, near Santiago, Chile

History:
Agrícola La Hornilla was established in 1986 in Melipilla and grew to include the Santa Inés farm in 2012. Today, Cristián Allendes manages the fields with his children, Cristián Jr. and Benjamín.

Farming Land:
Mainly sandy loam

Crops:
Table grapes, cherries, plums, peaches, nectarines and sunflowers

Partners:
AgroSucces, Agroservicios TecnoTrans-Billo, Fraunhofer Chile Research, Agroriego, CDTEC, LBTRACK

Key Elements

1 ***Integrated crop protection solutions***
Integrating crop protection products in a sustainable way with modern agricultural techniques.

2 ***Pest monitoring***
Continuous pest monitoring allows accurate applications and only when necessary.

3 ***Weed monitoring***
Established weed resistance monitoring, in order to implement control programs that prevent the buildup of resistant weeds.

4 ***Efficiency in agricultural tasks***
Platforms to facilitate and improve thinning, pruning and harvesting, ensuring greater efficiency and safety in agricultural tasks.

5 ***Weather and irrigation monitoring***
Real-time information on weather conditions assists in achieving the correct use of crop protection products and optimal irrigation.

6 ***Satellite monitoring***
The satellite photographic spectrophotometric information helps determine orchard health throughout the season.

7 ***Operator safety***
Maximizing user safety throughout all stages of crop protection with personal protective equipment.

8 ***Targeted applications***
Efficient product application with electrostatic machines, which achieve better coverage, use less water, cause less drift and increase user safety.

9 ***Water protection***
Phytobac®: sustainable management of wastewater from cleaning equipment in a in a process that biologically breaks down crop protection product residues.

10 ***Preserving biodiversity***
Planting of flower strips for feeding and proliferation of pollinators and other beneficial organisms.

11 ***Healthy hives for pollination***
Demonstrating good hive-management practices for healthy bees, ensuring optimal pollination services to the farm.

12 ***Partnerships***
Bringing together skills and expertise to demonstrate successful and modern sustainable farming in a holistic way.

Tailored Solutions | Proactive Stewardship | Partnerships

Producing more *with less*

Part of the success of the Santa Inés farm is due to its distinctive design of high density planting. Cristián Allendes knows that one of the future's great challenges will be to feed the growing population with less arable land, and this method adapts to that reality. The system allows for between 2.5 and 4 times more plants per hectare than in a traditional orchard and achieves production quickly.

High density means more plants per hectare, but fewer fruits per tree due to the thinning of certain parts of the fruits during incipient growth, which are incorporated into the soil as organic matter. This process reduces the competition between the fruit of the same tree, and thus, increases the fruit's quality. At the same time, the lower production volume is offset by the greater number of trees per hectare.

Another factor that affects quality with this type of planting is the location of the farm: an area with a Mediterranean climate ideal for the production of grapes and stone fruit, and with sandy loam soil, considered the best in Chile. To achieve the best quality, Cristián is also incorporating new varieties of fruit trees and vines. "The market demands us to be dynamic and we must adapt to the new varieties and genetics that are required," he explains.

Good fertilization is also essential if you want to keep the crops healthy. For this, a drip irrigation system has been incorporated on the farm, which controls and distributes the necessary amount of fertilizers, avoiding the contamination of surface waters.

To meet all customer demands and ensure compliance with all export requirements, Agricola La Hornilla, invests significantly in certifications by GLOBALG.A.P., Tesco, Walmart and HACCP. Cristián aims for production to reflect the best that Chilean agriculture has to offer.

"Through certifications we seek to ensure and corroborate that our practices are sustainable, that we respect the safety of our workers, and that our fruit meets the necessary levels of quality and safety."

Cristián Allendes, manager of the Santa Inés farm

Tools to make *good decisions*

Good management is vital to ensure the quality of fruits. To protect crops, cutting-edge methods and technologies are used to monitor and make strong decisions.

Weather station

This helpful technology allows to monitor temperature, humidity and wind speed (among other factors) in real time, and thus collect climate data to make timely decisions. For example, it allows the farmer to anticipate frosts and know the right moment to apply crop protection products. Before these tools were introduced, this work was done manually with thermometers that had to be monitored at dawn in situ. Today, the information can be reviewed at any time from a smartphone.

- The information delivered by the weather station has been essential for frost control. The farm uses wind towers to combat frost, avoiding the use of burners or other polluting sources. Thanks to the station, Pablo González, the farm administrator, can know the exact moment in which to activate the towers and protect the production.
- Monitoring for pests and diseases is key to avoid losses and ensure that the fruit reaches its destination in excellent condition. The weather station has also been of great help in this regard, providing information that suggests the perfect time to apply crop protection products depending on the weather conditions, and helping predict environmental conditions to prevent the spread of diseases. This is essential to comply with all export quality requirements and the demands of national supermarkets.

The control of pests and disease in the farm integrates agronomic techniques that use chemical and biological crop protection products. Thanks to appropriate application and the advisory and monitoring work done together with Bayer, crops are protected in a way that is most safe for people and the environment. Thanks to integrated management, innovative technologies and more efficient, safe and modern products, it's possible to optimize the number and type of control measures.

Integrated Weed
Management

One of the greatest challenges that farmers face is the spread of weeds, which can have a major impact on production. Therefore, one of the main goals on the farm is to reduce the amount of weed seeds and prevent them from becoming resistant, using an integrated management strategy with practical and sustainable methods.

Currently, three main weeds have been identified on the farm: wild carrot (Daucus pusillus), hairy fleabane (Conyza bonariensis) and common mallow (Malva sylvestris). They are controlled with a monitoring program that determines which herbicides are suitable for use at different times throughout the year. Application is based on the rotation of active ingredients with different modes of action during the season. Cristián Allendes, manager of the La Hornilla – Fundo Santa Inés farm, also has the support of Bayer, who deliver specialized advice, tailored solutions and collaboration in the supervision of results.


Wild carrot


Hairy fleabane


Common mallow

"Technology gives us relevant information in real time to make accurate decisions on the farm."

Pablo González, administrator of the Santa Inés farm

A scarce resource

Protecting water is essential. Climate change has had a strong impact in Chile. According to the University of Chile, almost 80 % of the national territory is affected by drought. Faced with this situation, measures have been taken on the Santa Inés farm to ensure efficient use of water.

On the farm, a drip irrigation system was implemented supported by information provided by probes with sensors. The data is displayed in real time on a smartphone application that accurately shows the irrigation actions that have been carried out, the opening and closing of pumps and valves, the amount of water used, and the detection of equipment problems.

This system optimizes the frequency and duration of the irrigation, depending on the hydric state of the soil. At the same time, the information is viewed remotely and helps the farmer make good decisions regarding water use.

This is a spot-on system that allows direct irrigation to the root of the plant, which is ideal in situations of water scarcity. Previously, irrigation was carried out superficially by furrows, and the amount of water applied to the trees was not controlled accurately or efficiently. Since the implementation of the new monitoring system with probes on the Santa Inés farm, irrigation is carried out in a more timely and efficient manner.

Protecting **water**

The team at the Santa Inés farm is constantly looking for sustainable technologies and processes that adapt to the challenges of climate change and manage water efficiently.

One example of this is Phytobac®, an innovative system for cleaning the water used to wash machines after the application of agrochemicals in the farm. The operation is simple: the water used for rinsing the machines is accumulated in a buffer tank and then reprocessed by Phytobac®, which is made of of recycled containers filled with a mix of soil, straw and vegetable waste where microorganisms biologically degrade the chemical residues. In parallel, the water is evaporated within the Phytobac® system, which prevents pesticide residues from contaminating the soil and underground currents. The system also eliminates the costs of removal and disposal of waste.

The Phytobac® system also reduces the amount of water usually used in rinsing equipment by one third. Before Phytobac®, 400–500 liters of water were used per wash on the Santa Inés farm. Today, with the new system, they only use 100.

Cristián Allendes, manager of the farm, hopes to implement this technology on more of his farms. “A great advantage of this system is that it is easy to use and needs little maintenance. It has been very useful on the farm because it helps us to be more sustainable and increase our water use efficiency”, he says.

Happy
pollinators

Biodiversity is essential for agricultural production. Although one third of the crops that are fundamental to humans are pollinated by bees, there are many other wild pollinator species that also contribute to this task. On the Santa Inés farm, concrete measures have been taken to enrich the habitat of pollinators, improve their diet and help them proliferate:

- Sowing of 1,000 square meters with rows of various wildflower species, such as bloomers – a mix of 30 species of annual and perennial flowers – to ensure that pollinators have food throughout the year.
- Installation of healthy hives in strategic places to pollinate.
- Special concern for the correct application of phytosanitary products, according to the manufacturer's instructions and always considering the health of pollinators.
- Biodiversity study of pollinators conducted by the Fraunhofer research organization with support from Bayer.

Beyond contributing to the care of pollinators on the farm, Bayer has also developed two Bee Care Centers - one in Germany and one in the U.S. Here they promote the exchange of scientific information and the connection of key stakeholders committed to bee health.

"At Bayer we are working together with the Fraunhofer Institute in Germany to investigate and improve the health of bees in Chile. The objective is to generate protocols to take care of them and increase their performance as pollinators."

Alan Lüer, Agricultural Affairs & Sustainability

Working
efficiently and safely

On any farm, work with diverse crop protection products and machines is essential, so safety in application and handling is one of the central focus points at the Santa Inés farm.

"Training is essential so that all our workers are safe and perform their activities in the proper way", says Cristián Allendes, manager of the Santa Inés farm.

Farm workers participate regularly in trainings to improve standards in handling and safe use of products and machinery, and to minimize risk to human health and the environment.

Various measures have been taken to prevent accidents and ensure the safety of all:

- Training in regulation, calibration and use of application machines.
- Training in the correct use of crop protection products and application regulations, provided by Bayer.
- Constant presence of risk prevention professionals who train personnel on safety issues.

At the same time, the farm has mobile platforms that move between the orchards to improve thinning, pruning and harvesting. This technology allows people to do their work comfortably and safely, reducing the possibility of accidents by avoiding the use of stairs. The platforms also save time and increase productivity.

Partnerships
with experts

Partnerships are essential to advancing sustainable and quality-based agriculture through the exchange of knowledge and development of collaborative networks.

The joint work between Bayer ForwardFarming and the Santa Inés farm has led to the implementation of new sustainable technologies that improve quality, productivity and resource protection. This collaboration has served to solve problems, improve processes and exchange expert advice in control, use of products, management of technology and protection of biodiversity.

Bayer is always looking to collaborate with various groups to address the challenges of moving towards truly sustainable agriculture. One of these instances is the National Association of Manufacturers and Importers of Agricultural Crop Protection Products (AFIPA A.G.), an association that brings together the leading companies in research and technology transfer and whose role is focused on the proper management and efficient use of crop protection products.

Another very important partnership is that of Bayer with Fraunhofer Chile Research to improve beekeeping practices, spread knowledge and protect the health of pollinators. Together, they are developing the Healthy Hives 2020 Project, which seeks to create a Latin American network for the care of bees and pollinators. This alliance will also carry out a study on the Santa Inés Farm aiming to determine the biodiversity of pollinators on the farm to promote their proliferation in a model that is replicable on other farms.

Technology for *a modern agriculture*

Taking advantage of new agricultural technologies is essential to address the new challenges that are presented every day on the farm.

For this reason, the Santa Inés farm has implemented various technologies that adapt to modern agriculture and facilitate its management. These include satellite images and an electrostatic machine to apply crop protection products:

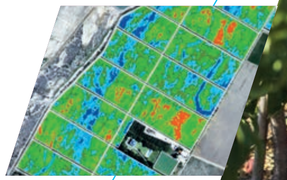
Satellite monitoring

This system provides timely photographic satellite information to permanently monitor fruit trees and identify, quantify and locate problem areas.

The images help determine the state of the biomass, and identify problems with fertilization, irrigation, pests or diseases throughout the growing season of the fruit trees on the farm. This allows the farmers to implement corrective actions to improve yields and increase quality.

Efficient application of crop protection products

The use of low water volume machines is essential on the Santa Inés farm. They allow the application of crop protection products in an easy, sustainable and efficient way, as they are using less water (on average 500 liters per hectare versus 1,000 liters in conventional applications), and providing better coverage and adherence of the products. There is also an economic benefit, as more hectares are covered per day, the same effectiveness is achieved and, at the same time, the farmer and the environment are protected. The decision to use crop protection products is always based on strong monitoring and diagnosis of weeds, diseases or pests.



Low water volume application machines

Bayer ForwardFarming

makes sustainability tangible

Bayer ForwardFarming provides an up-close look at how farmers are practicing modern and climate-smart sustainable agriculture around the world. Unique in its global reach the Bayer ForwardFarming network serves as platform for knowledge sharing and dialogue. ForwardFarmers deploy technologies and best practices to improve productivity, reduce agriculture-related greenhouse gas emissions, decrease the environmental impact of crop protection, promote biodiversity and conserve natural resources.

On the ForwardFarms, progress towards the Crop Science sustainability commitments truly comes to life.

Bayer ForwardFarming demonstrates solutions that support sustainability in agriculture across the following three components:

// ***Care for Crops –*** Every farm is different, and every field within a successful farming operation is unique. **Tailored Solutions** are needed to meet the needs of the individual farmer and their specific field – from the right seeds and traits to the correct type and amount of crop protection, to the digital tools and services that allow for good decision making and precision.

// ***Care for the Planet and People –*** Bayer ForwardFarming promotes and demonstrates **Proactive Stewardship** to protect human health and preserve the environment. Examples include addressing the safe and responsible use of crop protection products; soil health, biodiversity, and water conservation; and offering training in all of these areas.

// ***Care for Partnerships –*** Bayer FowardFarming fosters Partnerships with value chain actors, research centers, universities, and other institutions to strengthen sustainable farming development.

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