


EYE ON FRUIT FARMS

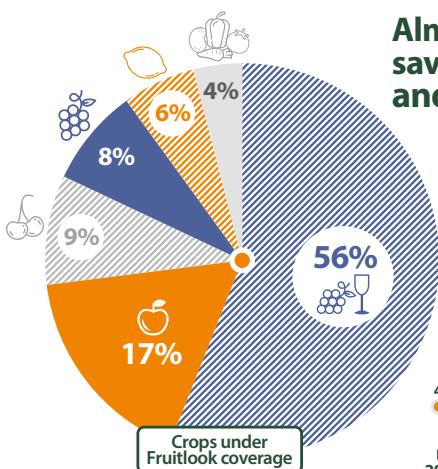
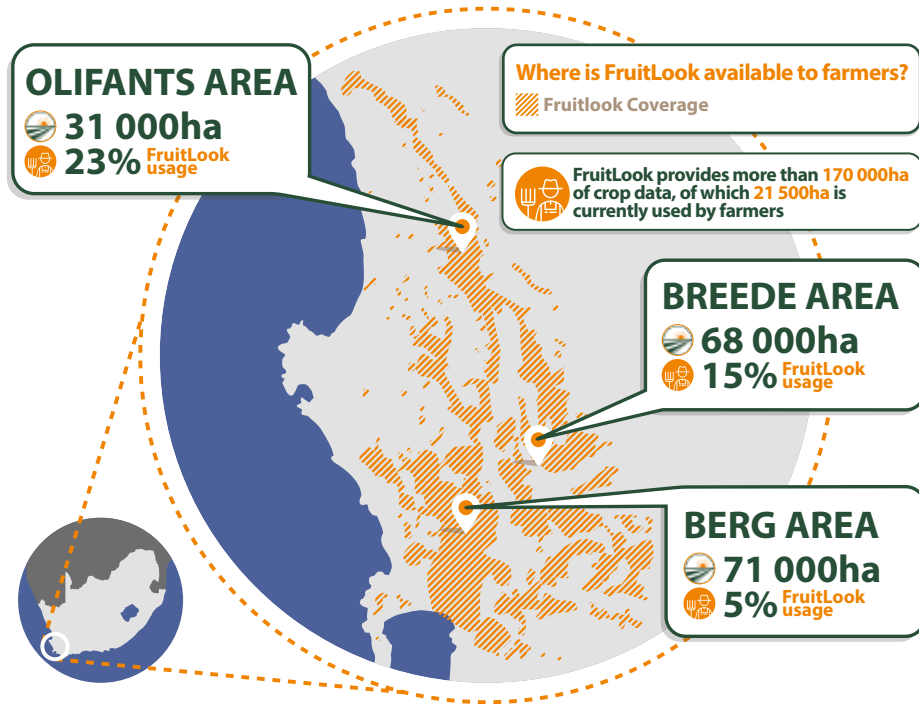
FruitLook technology assists farmers

**JORISNA
BONTHUYS**

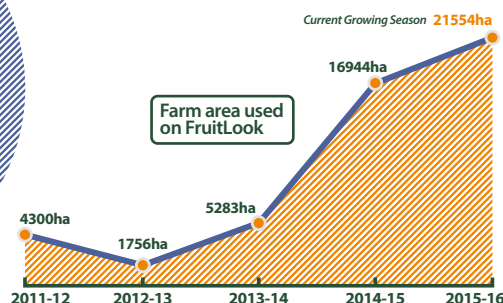
A couple of satellite eyes in the sky are casting a new look on the local fruit industry.

Together this constellation of satellites
- some orbit 800 km high up in the sky
- allows producers to look at their farms
and its management in a different light.

 **fruitlook.co.za** is helping farmers optimise water use and improve productivity by providing timely information about crops, using satellite technology



**Almost half of FruitLook users
save MORE than 10% water
and 1 in 10 saves 30%**



This is thanks to remote sensing and satellite-based spatial data products used in innovative ways, channeling data through an open web portal called FruitLook. This tool - hailed as cutting edge internationally - provides a new generation of agricultural intelligence for the fruit sector.

Says André Roux, from the Western Cape Department of Agriculture, "FruitLook is basically an online tool that uses the latest satellite technology to help farmers precisely manage crop productivity, growth and water use. It has proved to be a useful tool to enhance sustainable farming practices."

What started out as research mainly to look at how grape farmers could increase their water use efficiency in 2007, has since expanded in scope. Roux, departmental director of sustainable resource management, says the technology can be applied on other crops and across climatic regions. "The satellites can for instance tell you how well your crop is growing, how much water it is using and also how effectively it is doing that," says Roux. "The system then enables you to identify areas with weak growth or even pinpoint the particular area in your orchard or vineyard with water shortages."

This can potentially save producers lots of money, especially on irrigation costs.

Currently FruitLook is only available to fruit and wine grape producers in the Western Cape. The area under satellite scrutiny stretches roughly from Lutzville (in the north) to the Hemel en Aarde Valley (in the south) and Robertson (in the east).

"FruitLook offers producers an innovative and up-to-date service that helps them understand what is happening on their farms on a weekly basis, throughout the growing season," says Dr

Caren Jarman, an independent researcher. "It provides a complete picture of the plant within its growing environment."

This is possible thanks to FruitLook's unique architecture that integrates satellite data with geographical data and weather information in complex models (see graphic right).

The satellites zip past the fruit producing region daily, gathering growth, water and nitrogen related data for orchards or vineyards. The raw data then gets digested using various techniques, including algorithms. Local researchers also verify the data through field measurements to ensure its credibility. All this information is then integrated into user-friendly maps and graphics that can be accessed for free and online.

Roux believes FruitLook, supported by a Dutch company called eLeaf, offers win-win options for producers. His department currently subsidises its use, spending R3,8 million on it annually. Says Roux, "The optimum use of our scarce water resources will save water, reduce irrigation water return flows, reduce pollution of our rivers and streams as well as save on electricity and fertiliser costs.

"Ultimately it will make farming operations more viable."

Jarman, a specialist agricultural meteorologist, agrees. "FruitLook offers a tailor-made technology in support of precision horticulture and viticulture in the Western Cape," she says. "It provides producers with spatial data based on the latest satellite information to analyse crop growth and water status over time and space.

EYE ON AGRICULTURE

Over the past decades, technologies to assist farmers in managing their water use have advanced substantially.

There is much interest in this field, as agriculture is by far the biggest consumer of fresh water in the country. In the Western Cape 43% of the available water resources is used for irrigation. Fruit crops are in general rather thirsty. Fruit crops, for example, have a net irrigation requirement of between 7 000 m³ and

11 000 m³ water per hectare, depending on the type of crop and locality.

The indications are that farmers will in future also have to do more with less. Says Roux, "This is especially true given the increasing conflict between water users. We (agriculture) need to find ways to farm more efficiently and precisely. Within the context of climate change and the predicted changes in rainfall distribution, water wise management is key."

Jarman agrees, "It requires precision agriculture, especially given rising input costs. In order to use water efficiently, growers need solid information on crop production and water consumption."

Roux says FruitLook provides intelligent and timely adaptation responses given growing water pressures. FruitLook for instance monitors just how much water is released from the plants during evaporation and how efficiently water is being used overall. But, unlike aerial pictures taken by drones, FruitLook also overlays layers of quantitative data for every pixel at frequent intervals throughout the season.

Jarman explains, "The satellites are for instance able to do moisture readings of a high spatial resolution of 20m x 20 m blocks of vineyards or orchards. The different images captured by satellites are then merged and turned into site-specific images, graphics and rich content."

This enables producers to keep an eye on biomass production, detect diseases and use actual indicators of evapotranspiration to detect under-irrigation in their orchards or vineyards.

Currently FruitLook's data covers an area of about 170 000 ha (see graphic). More than 80% of the available area covered is however not utilised yet. Says Jarman, "We are only scratching the surface about the useful and far-reaching impacts it can have for local producers."

INTELLIGENT MAPPING

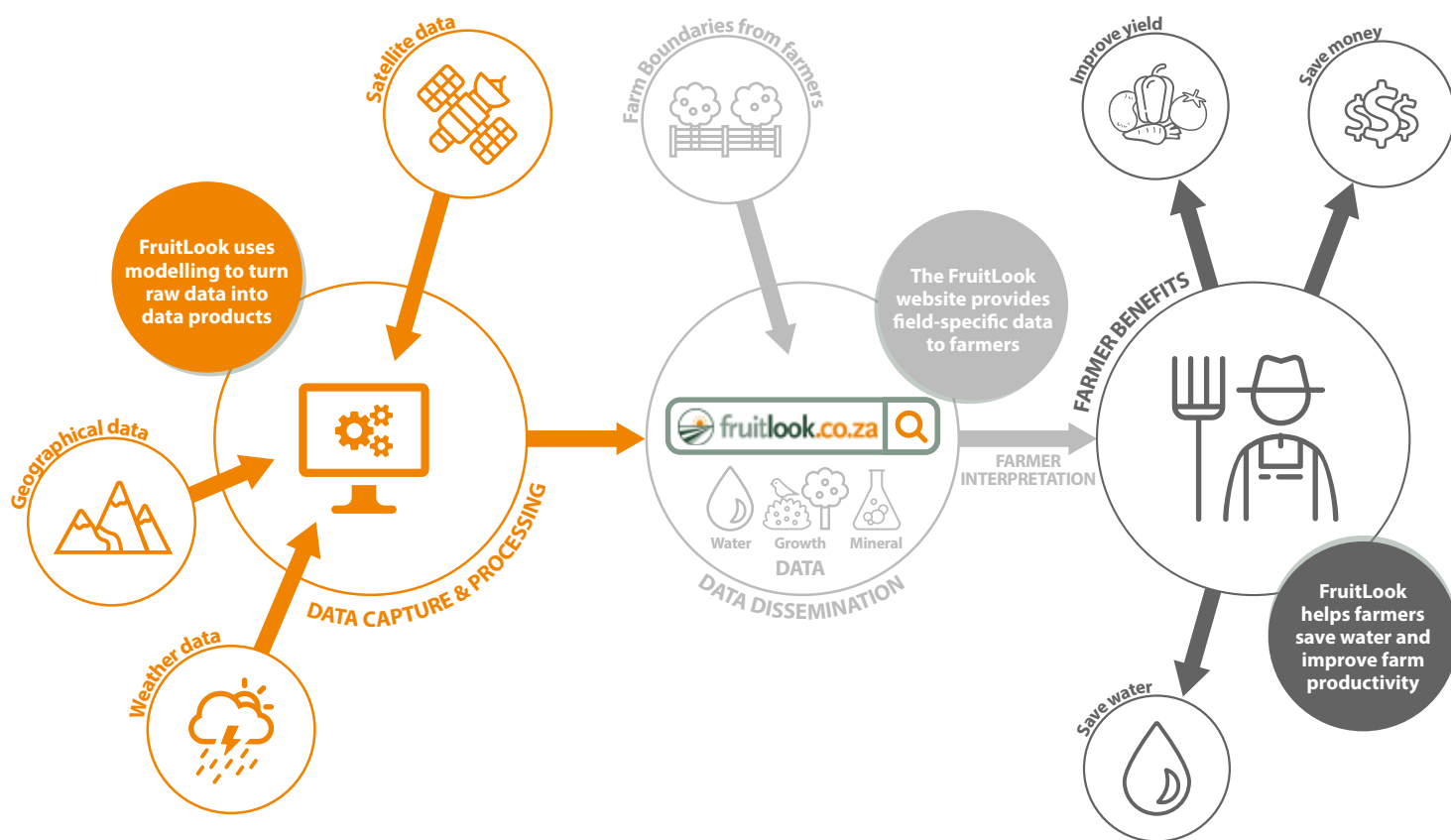
The satellites capture details that are not always visible to the naked eye.

Remote sensing outside the spectrum visible to humans therefore actually extend our visible field. This enables FruitLook to provide addi-

"You can say it is farming for the future in action already."



fruitlook.co.za is a tool that helps farmers improve crop productivity and water use by turning raw data into useful information



tional information about the physical world surrounding us. This is because remote-sensing measures the solar radiation reaching the crop, reflecting off the plants and soil surface, and being emitted from the surface.

Jarmain explains, "The satellites are taking pictures that contain much more data than what you can observe with the naked eye, for instance of surface temperatures. This can be extrapolated to see how actively plants are using and losing water and if a particular block or orchard is experiencing water stress."

Just like the pictures on your television screen the satellite imagery is made up of tiny squares called pixels. These picture elements – each have a different grey share or colour - represent the relative reflective light energy recorded for that part of the image. Every picture therefore has meaning.

Each of these 20 m x 20 m pixels for instance contain data on evaporation and plant growth. This means FruitLook can detect how much water

is lost in a pixel through transpiration. It can also document how much plant material is produced above and below the ground (in stems, leaves, fruit and roots). It can even give producers an idea of weeds and cover crops growth.

All this is done without any effort on the producer's side. Says Jarmain, "Normally farmers have to do a lot of visual assessment or have measurements done. Now they can use technology that captures information in a different way to better understand for instance water use. Rather than sticking probes in the ground to measure the irrigation applied, they now have access to satellites that capture information in the electromagnetic spectrum."

But it is not all about just taking images from the sky. The fact that FruitLook provides spatial variation in picture format is only one of its benefits.

Says Jarmain, "FruitLook offers pixel intelligent mapping as well as intelligent information that farmers can interpret and apply. This data enables

farmers to analyse their crop growth and water status over time and space. At the moment we have weekly data for the last five growth seasons from October until April, hence its offering a nice database to evaluate past seasons.

FARMING WITH TECHNOLOGY

A growing number of users say they benefit from this online tool.

Farmers are using the data in different ways. Many use it to determine how the water status on their farms relates with their irrigation plans or to strategically place soil moisture probes.

Almost half of the producers using it indicated they have cut their water use with a tenth. One in every ten producers say they are using almost a third (30%) less water than before.

This translates directly into rand and cents.

A 10% saving in input costs together with a 10% increase in production will translate into earnings of about R33 860 more per hectare for table grapes and R25 630 per hectare for deciduous fruit. This is according to estimates done by agricultural economists from the Department of Agriculture.

Anton Müller, Kromco's technical advisor, says many producers are embracing this technology as it provides new spatial dimensions and insights into production. He finds it particularly useful to identify plants under disease threat and to determine how successful irrigation management is (compared to previous seasons).

The farms in the Grabouw region using it have reduced their early-season water use with up to 30% since using the data. Says Müller, "It allows growers to see where an orchard or area of an orchard has been over or under irrigated."

Luca Bein, from Bein Private Cellar in Stellenbosch, says FruitLook also supports efforts towards precision viticulture and managing variability within his vineyard. He uses it in combination with soil moisture probes to estimate his vineyard's irrigation needs. Bein says the tool is sensitive enough to help prevent and monitor water stress, in particular to identify areas of water stress.

At Môreson Trust, situated in the Vyeboom region near Villiersdorp, FruitLook has proven

really useful to inform irrigation management in their orchards. Says manager Kobus Swanepoel, "We find the data especially useful to determine if we need to irrigate more or less and where to place the soil moisture probes. We also use it to detect drainage problems and to evaluate our irrigation practices."

Some farmers now only use about 80 litres of water to irrigate to produce a kilogram of apples, compared to 120 litres before.

PICKING THE FRUIT OF SPATIAL ANALYSIS

The growth of the industry will be limited by the amount of water it can access. says Hugh Campbell, general manager of HORTGRO Science. "We are all pertinently aware that water is our most finite and limiting resource that we will have to optimise now and into the future."

Campbell considers FruitLook as "a unique tool that allows growers to evaluate and benchmark their water use efficiency and correlate it to the performance of their block in terms of growth (biomass increase).

Says Campbell, "FruitLook is a tool that has the potential to demonstrate that water has and is being used responsibly by a particular industry or region throughout a growing season. It has the opportunity to save water but more importantly to ensure that an orchard stays within the required norms to optimise production." The challenge he believes will be the ability to address the deviations from the norm at a tree level rather than at an orchard level."

Campbell says the objective must be to maximise the productivity of every single drop of water. Research has shown that there is a correlation between water use and yield up to a point where the marginal utility per unit of water flattens off.

Says Campbell, "In the realm of water allocation per hectare we need to make sure that a high producing block is not allocated 6 000 cubic metres per hectares when it should get 10 000 cubic metres of water to optimise the productivity of the water and the other resources utilised."

Jarmain adds, "This helps farmers to get a more complete picture not widely available before. It (FruitLook) adds a new dimension to farming."



Go to
www.fruitlook.co.za
for more
information.
This is the first
article in a six part
series about
FruitLook
and how it
can be used.