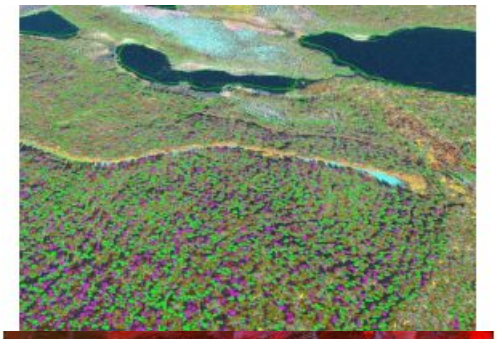
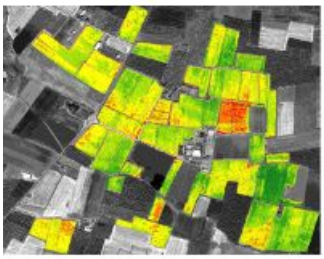
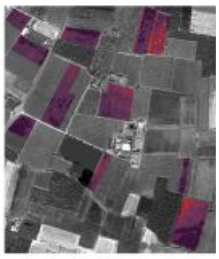
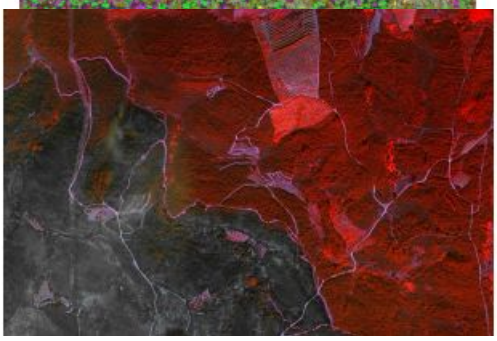
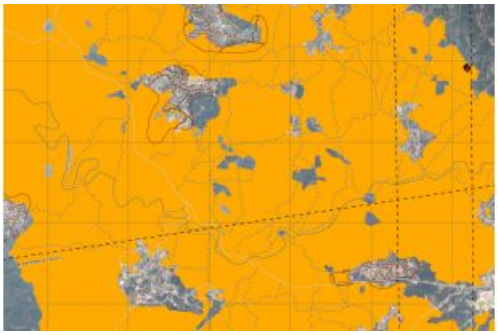
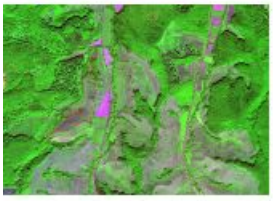
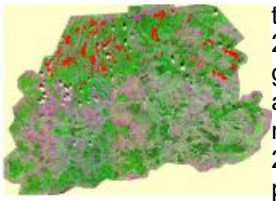
Seeing through the Trees: Monitoring Agriculture and Forestry with Satellite Imagery

There is a strong requirement for near real-time monitoring forests and crops in order to tackle the present challenges within agriculture and forestry. VHR satellite imagery provides a solution, and has already been used successfully in a number of projects.

Agriculture provides us with food, fuel, fibres and raw materials that are imperative to our everyday lives. However, food security in the face of climate change continues to challenge us. Under the 2030 UN Agenda, the FAO has highlighted the need to invest in agriculture including crops, livestock, and forestry. The world's population is rising and is expected to grow to more than 10 billion people by 2050. To accommodate this growth, it is estimated that agricultural production will need to expand to 70% by 2050. Agriculture not only plays a major role in global food security, but can also be used to combat climate change.

Globally the world emits over 36 billion tonnes of CO_2 each year. Forests are an important resource in reducing these emissions. Stopping deforestation, restoring forests and improving forestry practices could cost-effectively remove up to 7 billion tonnes of CO_2 annually. Therefore, forests are a critical factor in combating climate change and a resource that needs protection.

There is a strong requirement for monitoring forests and crops in order to tackle the present challenges within agriculture and forestry. Near real-time monitoring is crucial to react to extreme events - such as climate conditions or pest infestations - and thus minimize their impact, while also optimising management practices - such as precision agriculture - in a sustainable manner.

This article provides an overview of agriculture and forestry projects that have benefited from the use of VHR satellite imagery.

Lisse Tulip Fields in The Netherlands captured with GeoEye-1.

A Growing Infestation of Bark Beetles in Sweden

In Sweden, forestry accounts for nearly 3% of GDP and over 12% of exports. However, in recent years there has been significant problems from bark beetle infestations affecting the health of spruce forests.

Bark beetles initially only infest sick and dead trees, growing in large numbers before moving onto nearby healthy trees. To control their rapid spread, it is critical to quickly identify and remove sick and dead trees. By analysing satellite imagery, we can determine tree health and predict where new attacks may occur.

Utilizing GeoEye-1 at 50 cm resolution imagery in combination with eCognition, both tree species and its health were able to be identified across the Östersund and Sundsvall regions of Northern Sweden. This information allowed for swift tree removal to create borders around healthy trees to prevent the spread of bark beetles.

GeoEye-1 imagery after analysis.

Optimizing Wine with Data from Space

During a growing season, the maturity and quality of grapes vary across a region and even within a single vineyard. Winemakers must carefully monitor the grapes throughout the season to determine when nutrients, pesticides and additional water should be applied to optimise growth. As the harvest nears, the winemakers examine grapes for signs of maturation and sugar content to select the precise time for picking.

Optical satellite imagery can be used to capture vines during the Véraison period. Monitoring crop vigour at this stage gives the winemaker time to modify management of individual vines with the goal of optimising the harvest.

When compared to traditional methods such as ground-based measurements, the value of satellite imagery is clear. It allows for larger areas of the vineyard to be covered in a shorter amount of time providing increased cost and time savings.

Measuring the green LAI of the grapes (left). Measuring maturity of the grapes (right).

Rapid Delivery of Satellite Imagery To assess damage of Portugal Forest Wildfires

On 20 July 2019, multiple forest fires began near Castelo Branco, Portugal, under suspicious circumstances. Within hours the Copernicus Emergency Management Services Rapid Mapping Module was activated to provide First Estimate Product and Delineation maps to the National Command for Relief Operations - National Authority for Civil Protection in Portugal.

False colour image of Portugal Wildfires captured with WorldView-3.

Just after midnight on 22 July a satellite tasking order was placed with European Space Image to capture the affected areas. The ability to receive overnight orders allowed the fast collection of the data the very next day.

Partnering with GAF AG, delineation maps were rapidly created from satellite imagery acquired by European Space Imaging to provide an assessment of the fire's impact and extent. The imagery was delivered within hours of collection and the subsequent maps within 24 hours. This allowed authorities to target their firefighting efforts in order to more efficiency extinguish the blaze.

Habitat Preservation

The Hartibaciu Tableland encompasses about 2,500 square kilometers in central Romania and is home to many rare species of birds, flora, and fauna. It is an area susceptible to flooding and landslides, is subject to development pressure, and is experiencing population growth. The World Wildlife Fund (WWF), in cooperation with the Danube Carpathian program and European Union, commissioned a geographic survey to create land management plan for the region.

Delineation Map Â© Copernicus EMS, European Space Imaging & GAF AG.

To build the necessary framework for proper management and preservation of the land, species, and habitats, Muncons, a partner of European Space Imaging, utilized WorldView-2 8-band multispectral satellite imagery. The resulting images were used for automatic and semi-automatic habitat classification, including land, water courses, infrastructure, and developed areas such as buildings, roads and industrial zones.

Furthermore, an integrated GIS solution to map species and habitats was created. The supplemental web portal included interactive maps of endangered species distribution, areas of vegetation, agriculture, preservation lands and environmental hazards. This provided an accurate, cost-effective solution that has been used by the WWF and Natura 2000, the EU's nature and biodiversity policy group to raise awareness of the environmental sensitivities of the region.

Conclusion

By remotely sensing from their orbits high above the Earth, satellites provide us with much more information than would be possible to obtain solely from the ground.

In particular, Very High Resolution satellite images offer a unique view of what lays in, on and around our forests and agricultural lands. They provide a cost-effective and simple method of monitoring wide areas both locally and globally, as opposed to exhaustive ground measurements, and are an indispensable tool for managing the actions and events that impact forest management, food security and precision agriculture.

From this data you can gain insights into vegetation health, land use & land cover, biodiversity, land degradation, livestock welfare, crop management and so much more.

European Space Imaging has close to 20 years' experience working closely with a number of authorities and private companies within agriculture and forestry. Whether it is delivering archive data or planning fresh acquisitions, the team are available to assist a wide range of agriculture and forestry applications to ensure your planning goals are met.

False colour image of Romanian grasslands captured with WorldView-2