Remote sensing applications

Practical invention for (Re)insurer`s underwriting

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Innovations in agricultural / weather data management
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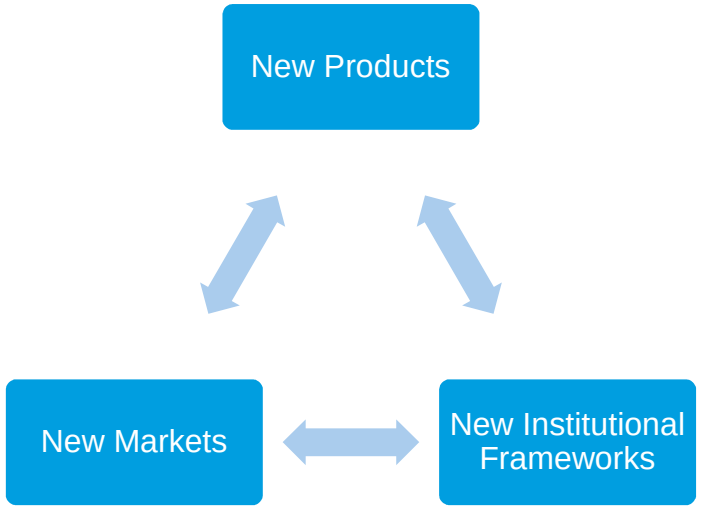
Agricultural Business - Global Megatrend

Production is growing and related investments need protection

Agriculture plays an important role in achieving the goals set by developing economies in the next decades

Managing agricultural risks become more important and (Re)insurance plays an key role

The (Re)insurance business facing:



Innovation is a key contributor of growth

- New processes and applications in underwriting
- Loss adjustment
- Exposure control
- Portfolio management
- Rate making

Our clients seek not only reinsurance support but also advice and expertise

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Remote Sensing Technology

Increasingly a basis and accompaniment for agricultural (Re)insurance

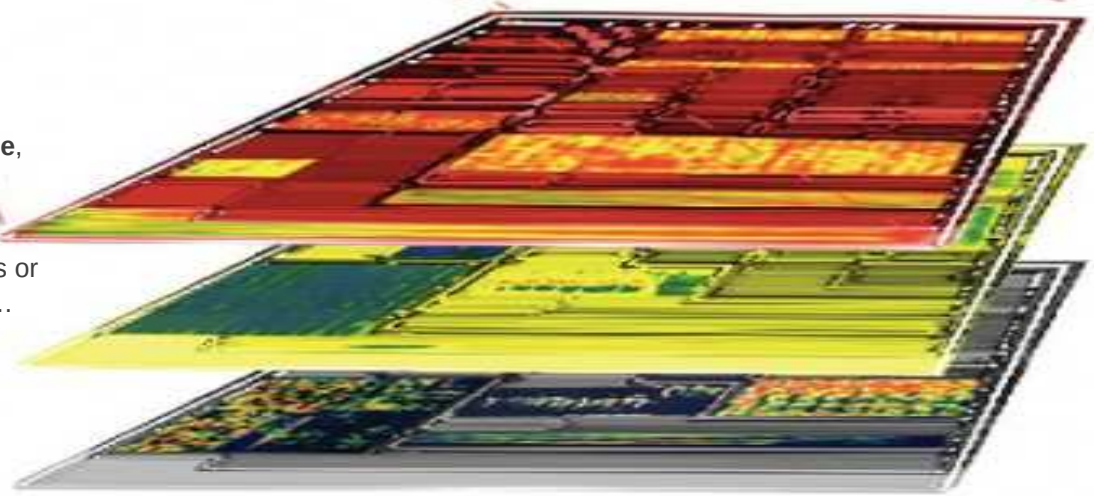
Advances of new and more RS technologies are supposed to upscale product development and loss adjustment

- **Plot identification** (distinguishing between agricultural and non-agricultural land by satellite imagery)
- **Crop identification** (inference on crop type by satellite imagrey)
- **Crop monitoring** (field inspections by satellite imagery)
- **Yield estimation** (crop growth models with satellite imagery and weather data)
- **Loss event monitoring** (event monitoring by radar or optical sensors)
- **Risk assessment and underwriting** (supported by digital evaluation models)
- **Insurance products** (regional yield forecast models and area yield insurance)

Basis for insurance instruments, yield and damage monitoring and forecast applications…

- **NDVI** (Normalized Difference Vegetation Index)
  - Groundcover applications, **Grassland insurance**, etc…
- Imagery based **crop growth models**, combined with historical yield and weather data for regional applications or geo-referenced via **GIS** as plot specific applications etc…
  - National/regional **commodity forecasts** etc…

…but, limited due to it`s early stage



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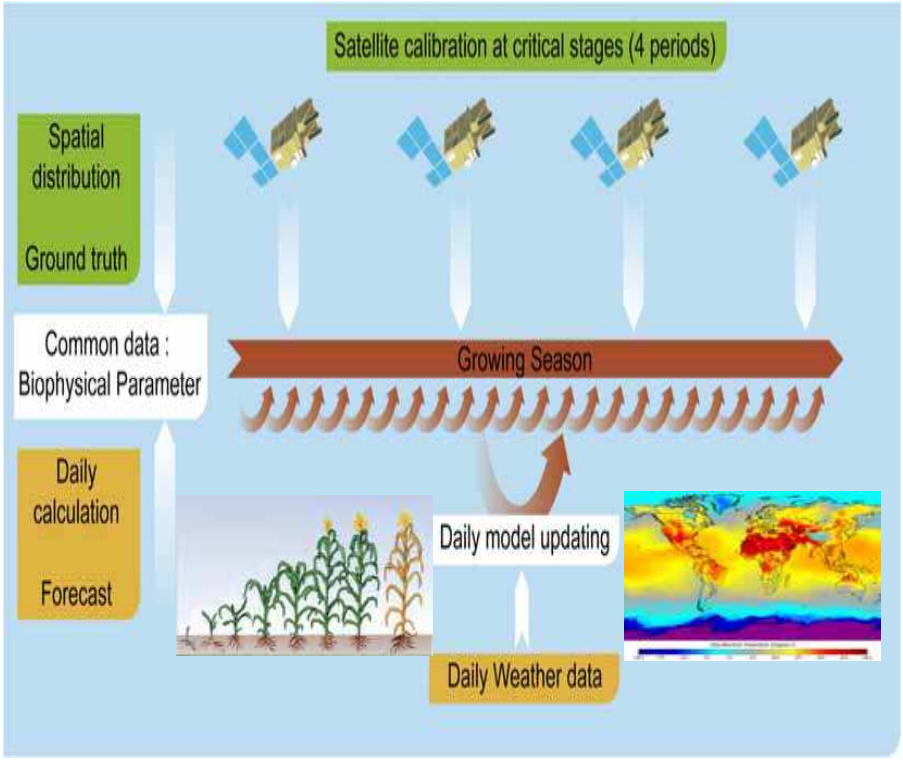
HR Pioneer Cooperation with Astrium Airbus (EADS)

Exclusive Pilot Project with CropForecaster and Yield Monitoring

Astrium, the largest commercial earth observation satellite constellation in the world

- Astrium provides
  - Satellite based Agriculture Services > 10 years
  - Modeling, software that allows a combination of measured biophysical parameters and deterministic agro meteorological model – **Crop Growth Model** (**GRAIN** Global Risk Agriculture Intelligence)
  - Imagery that allow real and stable **measurement of the vegetation** with biophysical parameters
  - **Weather forecast** with state of the art grid modeling
- Worldwide application at local and large scales



Our intension: Advanced crop growth model

Project in 2013 in the Ukraine with our clients and partners to analyze reliability of data on field level and on regional yield level of corn and soybean`s

Lesson learnt

- We receive yield indicators for the insured areas
- Claim monitoring per region/field with high resolution maps

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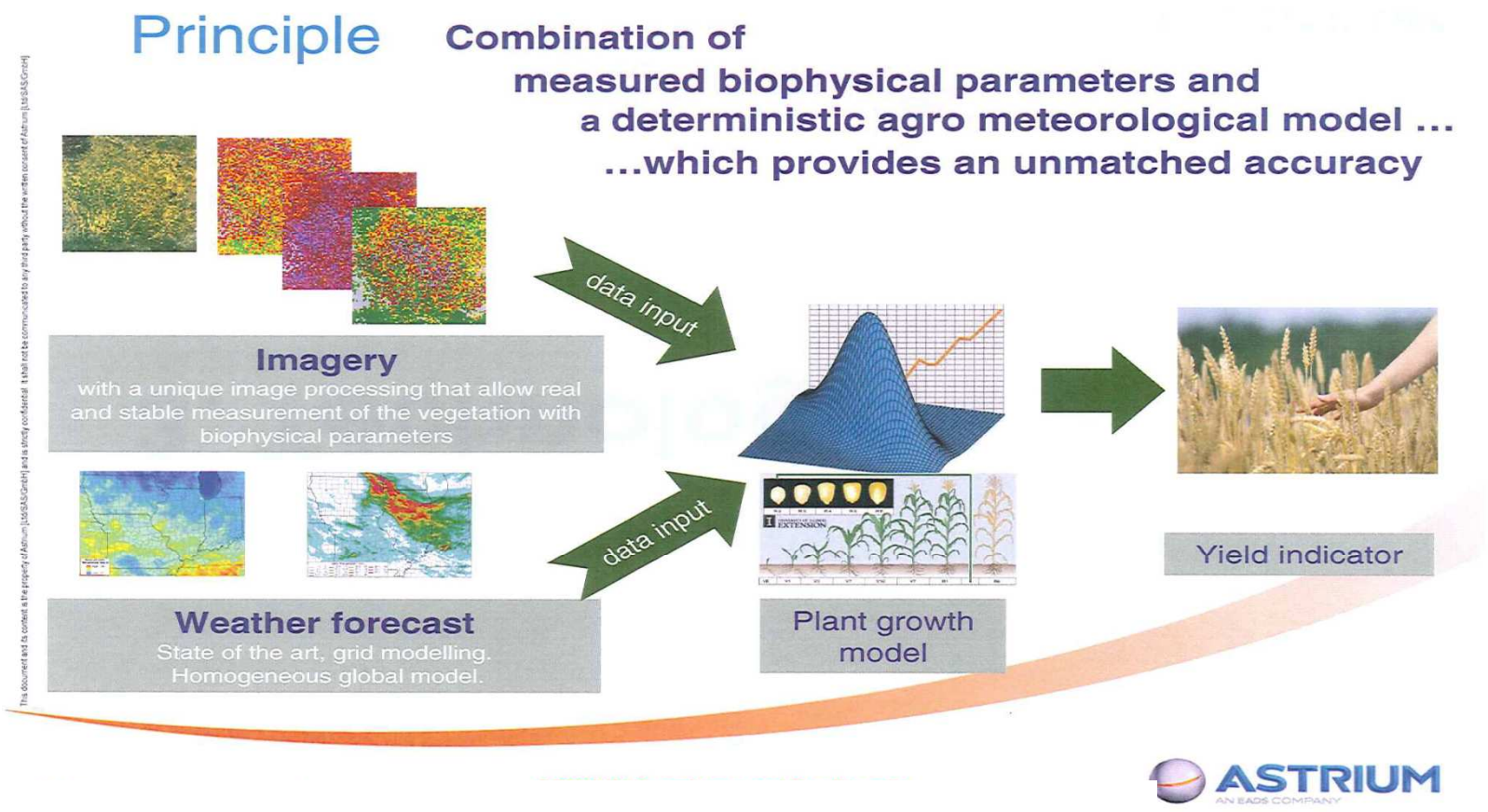
Astrium CropForecaster and Yield Monitoring

Technology Overview



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HR Pioneer Cooperation with Ecoclimasol

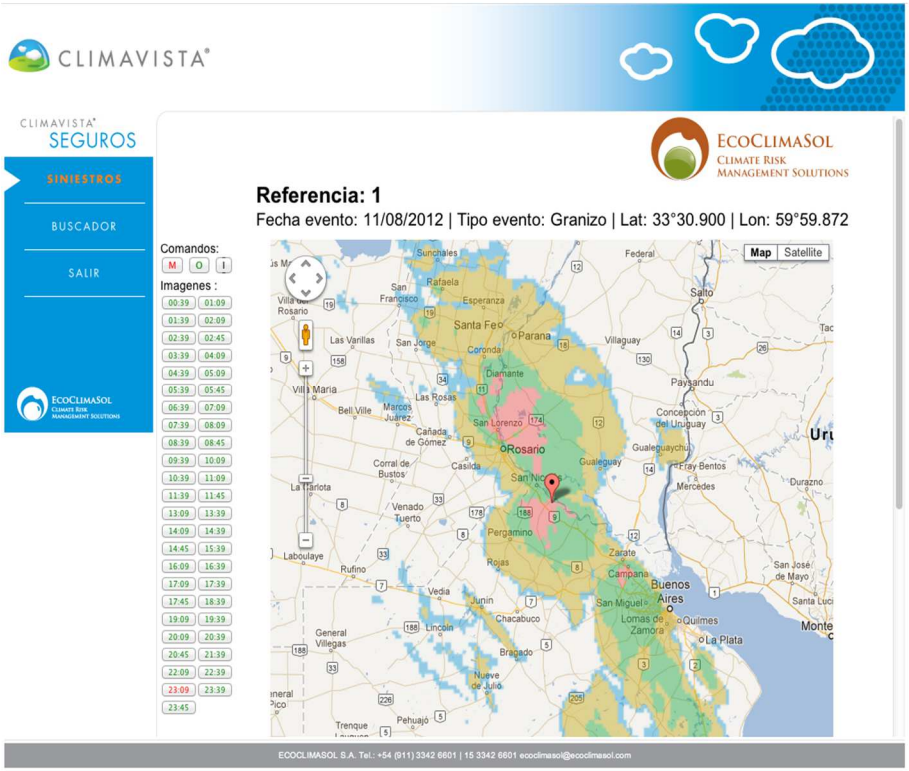
Exclusive Pilot Project with Yield, Weather and Damage Monitoring

Ecoclimasol, provides a wide range of risk management solutions

- Operational **forecasts for weather parameter**
- Agroclimate reports
- Imagery processing
- **Agricultural yield and weather forecasts**
- **Claim verification, claim mapping**
- **Loss event monitoring**
- Possebility to **distinguish climate impacts from bad management**

▶ Worldwide application at local and large scales

Our intension: Loss event monitoring



Project 2013 in south american countries to assess technology in crop insurance

Lesson learnt

- Some of our clients already use Ecoclimasol technology
- We optimize the audit analysis of clients
- We are able to convict unauthorized claims and detect frauds and poor management of clients portfolio
- High potential to introduce system worldwide to our clients

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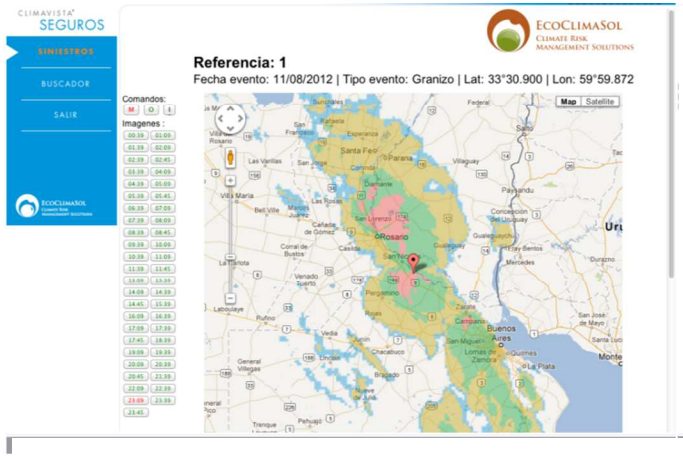
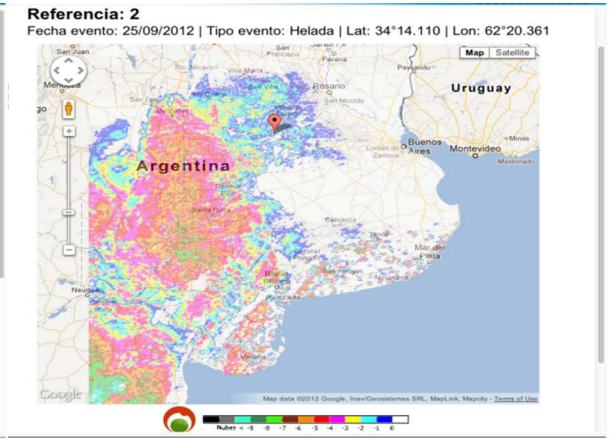
Ecoclimasol applications on regional and plot level

Technology Overview

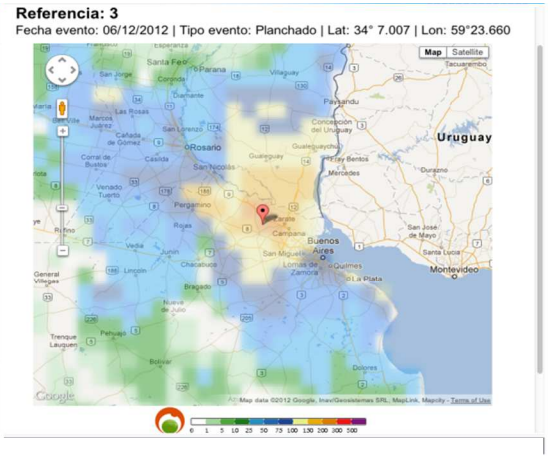
Hail Monitoring



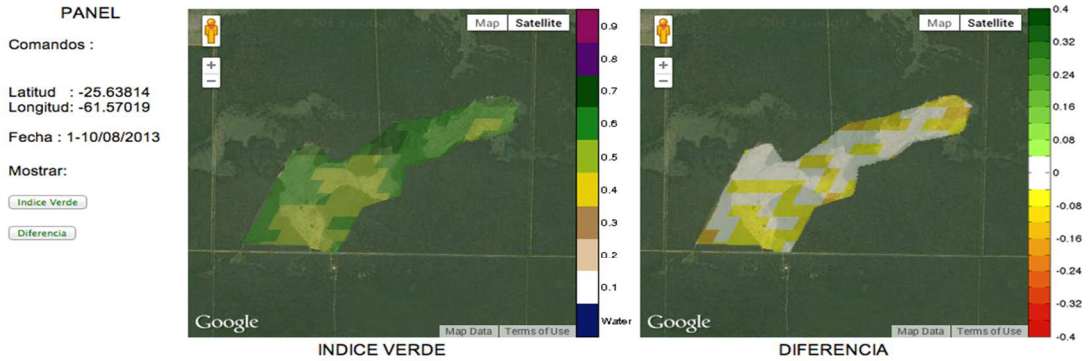
Temperature Monitoring



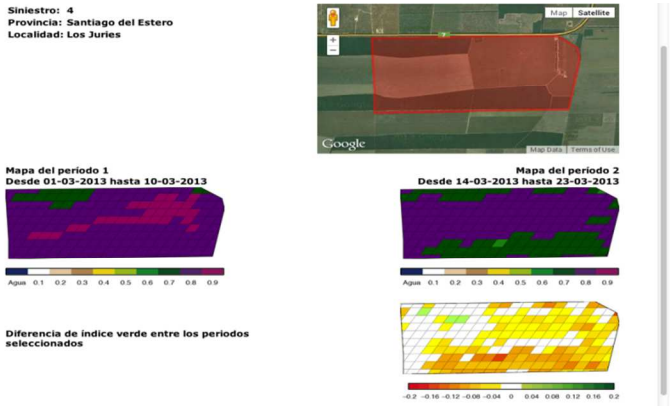
Precipitation Monitoring



NDVI Application



Field Specific Application



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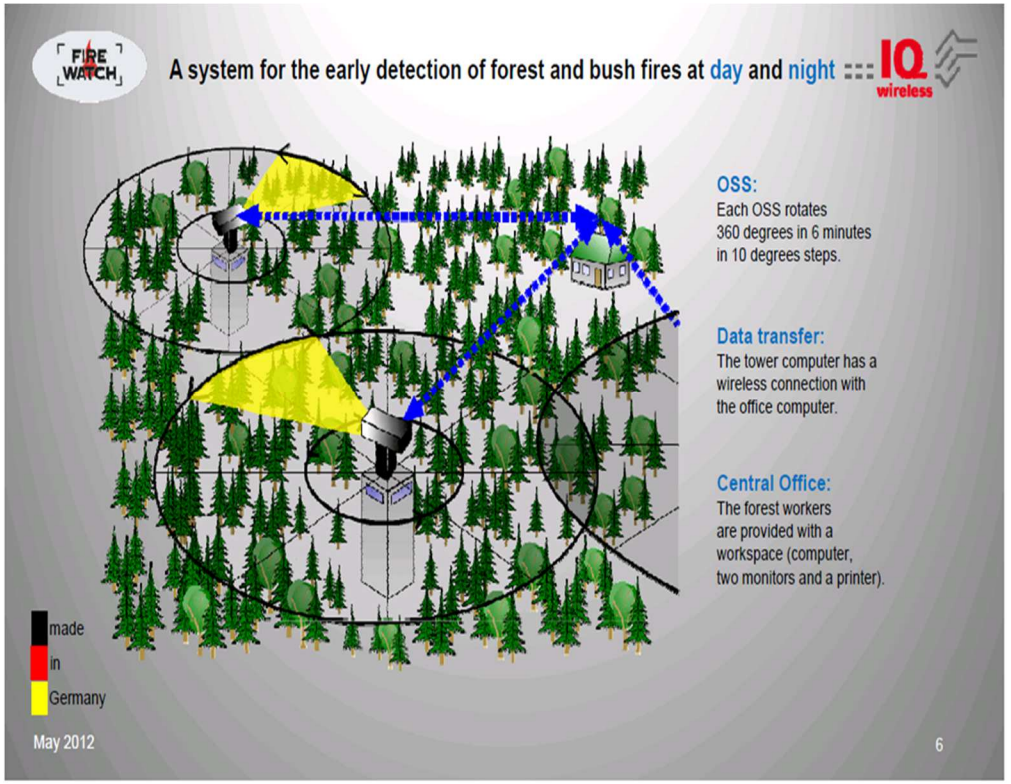
HR Pioneer Cooperation with IQ Wireless

Exclusive Pilot Project with Optical Sensor System

IQ Wirless, provides Optical Sensnor System for the early detection of fire in forest and bush areas

- Reliable determination of the exact location and immediate alerting of the fire department
- The technology based on a sensor developed by the NASA to detect gases from meteorite in order to conclude their composition (IQ Wireless developed the analyzing software and the data transmission)
- This system can replace human power on the fire observation towers (high potential of errors)
- Data and images are analyzed (on monitors) in a central office by professionals who coordinate the fire brigade with precise data

Our intension: Early detection of fire



Project in 2012 in Chile
to asses the technology with our clients in forestry

Lesson learnt

- We can achieve a win-win situation
- Prevention of losses
- Environmental contribution (reduction of CO_2 pollution)
- High potential to introduce system worldwide to our clients

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IQ Wireless Optical Sensor Application
Technology Overview

FIRE WATCH

A system for the early detection of forest and bush fires at day and night

IQ wireless

- Optical Sensor System
- 16,384 gray scales ensure fastest smoke detection time
- Automatic recognition of smoke clouds by the day and the night
- Same resolution by the day and by the night
- Tower-based automatic & reliable early recognition of forest fire
- Fast supervision at a distance of up to 15km – 70,000ha (700km^2)
- Detection accuracy: Smoke clouds of 15m x 15m in 15km distance
- Night mode with increased sensitivity in NIR
- Increased contrast for smoke detection
- Night filter blots out artificial lights
- Quick response times even under night vision
- Proof of concept throughout real life operation in Germany throughout the last 10 years

made in Germany

May 2012

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Conclusion and Outlook

RS technologies increasingly entering agricultural (Re)insurance business

New and more RS technology drive along new challenges for (Re)insurers regarding processes and applications in underwriting, loss adjustment, exposure control, portfolio management, rate making, etc..

Even current obstacles, **there is a considerable potential to enhance (Re)insurance applications** based on RS technology.

HR continuously works with innovative products and service providers to provide not only reinsurance support, but also advice and expertise for our clients worldwide.

Our specialists possess know-how in agronomy, agr. economy, agr. ecology, tropical agriculture, forestry, veterinary science (including epidemiology and animal production). We also have experts in price and yield models and index products to serve our customers with unique knowledge.

The know-how of our underwriters is the basis for an optimal selection of profitable business and ensures fostering and development of customer-oriented and innovative solutions.

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