Imagery changing agriculture: experiences in Argentina, Brazil & South Africa

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Who we are
GeoAgro…

Company born in USA (2001) and Argentina (2004), leader in facilitating the implementation of AGRO technologies.

Strong points:
- Development and integration of GIS systems
- Geoprocessing of geographic information
- Experience and local support to ensure implementations through its network of Regional Partners> In Brazil: PLANTEC
GeoAgro: Central office team
GeoAgro: Regional Partner Network
GeoAgro: Market
GeoAgro: Customers Distribution
GeoAgro
Open innovation model
Better decisions
Have key information at the right time

• Field visiting and scouting
• Support for monitoring weeds, pests and diseases
• Support for plant counting and re-seeding decisions
• Waterlogging delineation
• Variable nitrogen fertilization on corn and wheat
• Yield estimations
1) Productivity Maps
The Productivity Map represents, with different colors, the historical productivity of the different zones within a field.

This "history" is obtained based on the analysis of previous years of NDVI satellite images.

The map has to be checked with field visit and other layers.
PRODUCTIVITY MAPS

Google maps image
DIRECTED SOIL SAMPLING

Low productivity

Average productivity

High productivity
We prioritize more samples at the areas of low productivity.
ORGANIC MATTER

LOW O.M.

BUT HIGH pH

pH
More resolution
Improved level of detail!

NDVI – Landsat
07/02/2016

NDVI – Rapideye
07/02/2016
More frequency
A new image every month, every week, every day!

Sentinel
17/03/2016

13 days later >>>

NDVI – Rapideye
30/30/2016
2) Satellite crop monitoring with Planet or RapidEye imagery
Clearing stones from agricultural land

Fazenda do Leão
Field: Escolinha
NDVI: 11/09/16
Evaluation: 16/09/16

Poor drainage

Clearing stones from agricultural land

Strip tillage
Clearing stones from agricultural land

Clearing stones from agricultural land

Natural drainage way

Standard black oat production site

Fazenda do Leão
Field: Sede
NDVI: 11/09/2016
Evaluation: 16/09/16
Fazenda do Leão
Gleba: Lagoa Azul
NDVI: 11/09/2016
Avaliação: 16/09/16

Poor drainage site

Pasture under grazing
Road in the middle of the crop.

Lowland with poor drainage

Site where we take off a stone fence

Fazenda do Leão
Field: Frade
NDVI: 11/09/2016
Evaluation: 16/09/16
GP: Daniel Baranski

Location: Departamento, San Pedro, Paraguay

Use: Optimizing field monitoring

Which decision was made?
The series of images corresponds to 5 farms that add up to 8000 has, divided in more than 30 fields distributed in a radius of more than 25 km; all fields were monitored in 3 days, together with the farm staff.

What was achieved?
- High efficiency in the use of monitoring time
- Effective implementation of the technology from the client’s side
NDVI evolution during crop season - Soybean example
NDVI Sentinel
30/03/2016
Use: Logistics in wheat harvest

Which decision was made?
Based on the NDVI on Nov. 21st, field 5c was harvested first, then field 8c, and finally 2c.

What was achieved?

● Gain time! we dont need to go to the field to control humidity.
● Harvest efficiency: harvest with the correct percentage of humidity to avoid losses.
3) Detecting issues
Drainage issues / Sugarcane farm / Venezuela / 5mt resolution
Irrigation issues
Corn crop
South Africa
30mt resolution
4) Yield estimations: NDVI Rapideye / Yield maps
Soybean Yield Map - Fields 5 and 7
25/04/2016

NDVI Rapideye
14/01/2016
Yield estimation in wheat - Zimbabwe

Estimated yield: 6.75 ton/ha
5) Spatial resolution comparison and damage detection by phytotoxicity
Damage by phytotoxicity in alfalfa crop (glyphosate)
Productivity map
Field scouting

Damage due to herbicide spread

NDVI Rapideye
23/01/2016
Recovery of damaged area after hormonal application
6) Plant counting
NDVI Rapideye
09/11/2015
7) Crop and weeds monitoring
Crop variability produced by weeds
8) Pastures grazing monitoring
Location: Santo Domingo Farm
Salta - Argentina

Use: NDVI for Grazing Management

**Which decision was made?** Based on weekly NDVI images, rotate grazed parcels to avoid over/under grazing

**What was achieved?**
- Manage grazing in order to achieve maximum harvest efficiency
- Plan grazing loads and timing, according to each parcel’s capacity.
Location: Tierra Nueva - Salta - Argentina

Use: NDVI evolution analysis in tropical pastures

**Which decision was made?** estimate dry matter production, receptivity and quality throughout the year.

**What was achieved?**
- Predict amount of dry matter to be extracted from each parcel.
- Carry out mechanical harvesting when a surplus non-extractable by grazing was detected, allowing to maintain the average number of rations through the year.
Pastures grazing - North of Argentina - Feb 2016

NDVI 19Dec2015 - Pasture
30 DEC 2015
NDVI AVERAGE: 0.25
9) Weeds
**Location:** CERES, SANTA FE, ARGENTINA.

**Use:** Weed detection. Sectorized application of herbicides

**Which decision was made?**
In a field of 82 ha, it was possible to detect weed presence, using the NDVI. The weed growth represented approximately 50% of the total area, thus, a sectorized treatment was applied.

**What was achieved?**
More efficient weeds control, with less input cost.

The input cost per Ha = u$ 10/ha + Application per Ha: u$/Ha 5 => 15 U$/Ha
10) Hail damage evaluation
Rapideye (5mt), prior to hailstorm (16/12/2015)

Red color indicates crop activity
Red color indicates crop activity

Rapideye (5mt), after hailstorm (25/12/2015)
NDVI comparison - before and after hailstorm
11) Evaluation of tillage in the winter and soybean development
Tillage - Oats, poor grow

Better soybean development

Soybean arrives faster in maturity
12) Evaluation of root and nematode diseases in soybean
Death of soybean plants in toll
*Rhizoctonia solani.*
Pictures: Ingrid Arns
DRONE

• Pixel 1 x 1 m
  (15/03/16)
Rapid Eye - NDVI

- Pixel 5 x 5 m
  (12/02/16)
10.56% loss of area

Spray application of biological control
01 dosis/ha to 120 ha x 10 dosis/ha to 12 ha
Use: delineating low areas using NDVI

Which decision was made?
The image from 13-12-2016 shows how soybean is emerging. When a field validation was done (using G-Go in the smartphone), it was noticed the existence of weak or dead plants due to the presence of nematodes.

What was achieved?
● Detect a serious problem and start thinking about differential management in the field.
● Initiate an early nematode detectio program in the entire farm.
● Monitoring efficiency
13) Nitrologic – Variable N rate using NDVI of high resolution satellite images
VARIABLE NITROGEN RATE IN WHEAT - YARABELA 27%N

Taxa-alvo (Massa) (kg/ha)
- 200,0 (45,21 ha)
- 150,0 (91,82 ha)
- 100,0 (14,98 ha)

Produção: Danto Paganoli e Outros
Fazenda: Fazenda do Leão
Campo: Pedro Jr Frade
Ano: 2016
Operação: Prescrição para fertilização (seco)
Colheita / Produto: Ureia
Instância Operacional: Instância - 1
Área: 152,15 ha
Quantidade Total: 24,336 kg
Taxa Média: 159,94 kg/ha
Taxa Mínima: 100,00 kg/ha
Taxa Máxima: 200,00 kg/ha
VARIABLE RATE OF UREA IN CORN FROM NDVI REDISTRIBUTION OF THE NITROGEN RATE

YIELD 12,420 kg / ha - INCREASED UNIFORMITY OF YIELDS IN THE FIELD
14) Use of images to assess the effects of flooding at the field level
PRECIPITATIONS OCCURRING THROUGHOUT THE CULTIVATION CYCLE

Cumulative rainfall from the date of planting (18-11-16) until 16/5: 319 mm.

www.hi-terra.com
This image, taking into account the date of sowing of the crop of peanuts (18-11-16), allows to observe the degree of coverage and distribution of weeds in the field.
19-12-16

NDVI

The growth of the crop is observed as a function of the heterogeneity of the lot.
The negative NDVI (white color) marks the pathways of runoff, where the soil saturates, accumulate salts, etc. And the culture does not develop normally.

www.hi-terra.com
NDVI 19-12-16

TOTAL SURFACE: 1331 ha
Conclusions...

This is just starting…..
Huge opportunity (and need) for collaboration - growers/service providers/ag organizations /agronomists/research institutions
⇒ implement effective applications
⇒ more sustainable/profitable agriculture

The big data age… where will data be coming from?
- farm/field operations / data collectors
- imagery
- ag equipment (automated data collection)
- weather
- in the future, field sensors
The Big Challenge: Implementing

"70% of projects fail to execute"

Stephen Covey
Thanks!

Questions?
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