Precision Agriculture at Argentina
Challenges and opportunities

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Argentina

- Argentina locates in the southern hemisphere, limits with the Atlantic Ocean, Uruguay, Brazil, Paraguay, Bolivia and Chile
- Total area of 2.78 million km²
- Population of 43.9 million
- GDP per capita $21528, Gini 42.7
- **Mostly temperate climate**, range from subtropical in the north to polar in the far south
- Agricultural area of 148.7 M ha
  - Arable land 39.2 M ha
  - Grasslands 108.5 M ha
  - Forest 27.4 M ha
Grain production in Argentina

- Argentina produces **123 million t of grains** (33% soybeans, 38% maize, and 17% wheat), on **34 million ha** (44% soybeans, 24% maize, and 16% wheat).

- Approximately **90% of grain crops** harvested area is located in the **Pampas-Chaco region**, mostly on Hapludolls and Argiudolls.

- Soils of the Pampas are generally **deficient in nitrogen (N), phosphorus (P), and sulfur (S)**.

- **Nutrient balances are negative** with removal exceeding application

- **75-90%** of the cropping area is under **no-tillage**

- **50-70%** of the cropping area is under **annual leasing**
Cotton

Rice

Sugarcane, lemon, citrus, vegetables, tropical fruits

Pampas provinces (Buenos Aires, Santa Fe, Cordoba, Entre Rios, La Pampa);
beef and dairy cattle, poultry and swine

Fruits, grapes, vegetables

Citrus, mate, tea, forestry

Sheep, wool

Peanut

Olives, nuts

Beef cattle, poultry, sheep and swine are common, at different scales, in all the country

Ag production other than field crops
### Main grain crops at Argentina

#### Area and production – Average 2015-17

<table>
<thead>
<tr>
<th>Crop</th>
<th>Area (M ha)</th>
<th>Production (M t)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soybean</td>
<td>18.4</td>
<td>50.1</td>
</tr>
<tr>
<td>Maize</td>
<td>8.1</td>
<td>43.7</td>
</tr>
<tr>
<td>Wheat</td>
<td>5.6</td>
<td>16.1</td>
</tr>
<tr>
<td>Sunflower</td>
<td>1.7</td>
<td>3.4</td>
</tr>
<tr>
<td>Barley</td>
<td>1.2</td>
<td>4.0</td>
</tr>
<tr>
<td>Sorghum</td>
<td>0.8</td>
<td>2.4</td>
</tr>
</tbody>
</table>

35.8 M ha – 119.7 M t
Precision Agriculture at Argentina

The beginning...

• 1995 - First yield map INTA EEA Manfredi.
• 1999 - First project PA - INTA
• 2006 - Creation of the Precision Agriculture Network
• 2002 - 2017 - 16 International PA Courses
Precision Agriculture Network

✓ +30 professionals of INTA
✓ 9 universities
✓ Pampas Region – grain crops
✓ Northwestern Region - sugarcane
✓ Alto Valle Region – fruit crops

Main issues

– Mechanization (planting and harvest)
– Crop management
– Precision dairy cattle production
Adoption of main agricultural technologies at Argentina 1980-2015

✓ Agrichemicals from early 80´s, 100% today
✓ Fertilization slow start by early 90´s, rapid increase from mid 90´s, at 75% today
✓ No-tillage started at early 90´s, almost 90% today
✓ Precision Ag started by mid 90´s, 60% adoption today
Evolution of sales of PA technologies at Argentina 1998-2016

Source: INTA Manfredi – September 2017
Evolution of yield monitors at Argentina 1998-2016

Yield monitoring allows to optimize harvest operations
Grain yield – Grain flow – Grain moisture – Harvest speed…

- 12,600 combines equipped with monitors
- Many of yield maps do not generate reliable information or there is no analysis of the data
Surveys of adoption of Precision Agriculture at Argentina

**GENERAL INFORMATION**
Location, age, educational level, activity, farm size

**PA AWARENESS**
How did you know about PA?
Which PA technology do you know?

**PA USE**
Do you use some PA technologies?

- yes
- no

**SURVEYED INFORMATION**

**CONTRAINTS TO ADOPTION**
Which one?, since?, motivations? How to improve the use?

**DO YOU PROCESS DATA?**
yes
no

Which are the data processed? Procedures used?

**Problems?**

Web based survey (January-April 2013) 
n = 488
(January – March 2018) 
n = 306
Limitations: Why PA is not being adopted?

- High PA costs
- Low training
- Few training courses
- Lack of specialization
- High costs of PA services
- Unknown ROI
- Lack of financial support
- Few PA services providers
- Others

PERCENTAGE (%)
Adoption of Precision Agriculture at Argentina

Sources of PA information

Users and size of farm

< 250 ha  250-1000 ha  1000-5000 ha  > 5000 ha

< 2 years  2-6 years  6-10 years  >10 years
Data processing

How information is processed?
Problems: What is needed in PA?

- More training
- More agronomic support
- Exchange and discussion with others
- More PA services
- High PA costs

Percentage (%)

2013
2018
Challenges for adoption of PA

- Require high training for data processing
- Data processing is high time consuming
- Equipment or/and software incompatibility
- Unadequate equipment description
- Low post-sale support
- Low agronomic information
- Low training
- Others

Percentage (%)

2013  2018
Challenges for adoption of PA

- The main problem is the lack of staff training

- Greater specialization for data processing
  (DATA vs. INFORMATION/KNOWLEDGE)

- Incompatibility of equipment and software
Emphasis in training and education

Courses for Farmers and Professionals
PA Software - GIS – Image Processing
Main current interests

- Site-specific crop and nutrient management
- Delineation of management zones
- Integrated web platforms
- Great scale PA services
- Site-specific weed control
INTA work in the NUE network

Experiments to develop algorithm (2004-2008)

Sensor based N prescription rate: On-farm evaluation (2006-2010)

Development of local algorithm for wheat and maize

Ask Ricardo!!!!!!
Drone images for Nitrogen prescriptions

We are working to develop a Web based system for site-specific N prescription.
Management zones

Defined according to:

- Topography
- Yield maps
- Remote sensing
- Local sensors (Veris)
- Presence of water table
- Others???

Monzón et al. (2018)
EJA

Management zones defined according to topography (soil depth, water table, frost risk)
Software tool for Zone Delineation

Aim: To develop an integrative and simple tool to assist PA end-users to Zone Delineation

Advantages:
• Import different data layers (raster, yield maps, grids)
• Optimal number of zones delineated
• Size and shape automatic adjust
• Prescription shape file output

Source: Albornoz et al., JPA, 2018
Integrated web platform for diagnosis and decision-making with PA at Argentina

Local and international companies
Site-specific weed control

CHARACTERISTICS

- Active sensor
- Identifies weeds from 2cm².
- Saves up to 90% of product
- Concentrates application on resistant weeds

Local development
Machinery PA perspectives

- Automation of agricultural machinery
- Self-regulation of agricultural machinery
- Information management by intelligent platforms
- Telemetry for georeferenced data acquisition
- Robotics in agriculture
Local interest in planting improvement

Seed distribution and control systems

Electrohydraulic  Electromechanical  Electrical
Local interest in planting improvement

Crucianelli Planter
(Electrical seed distribution)

Plantium, electro pneumatic seed distribution system

http://ecurow.com/
Annual Meeting from 2001 up today in INTA
Latin American Association of Precision Agriculture (ALAP) was founded

More information: www.aslatap.com
Segundo Congreso Latinoamericano de Agricultura de Precisión

Septiembre 2020
Córdoba – Argentina
Thank you!!

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