Population – 635 million
Area - 19,197,000 km² (13% of the world)
Chile

There is no (official) numbers available

In viticulture adoption is around 60% of the export market companies

In horticulture adoption is around 30% of the export market companies

In traditional agriculture (grains) maybe 15% or lower

The main activities: grid sampling & VRT; expanding images and sensors

Stanley Best
Agricultural and Bioresources Eng., MSc., PhD.
Director Nacional Programa Agricultura de Precisión
INIA Quilamapu

Agritech Chile, announced last year and presented in this meeting
Chile

Agritech Chile

Stanley Best
Agricultural and Bioresources Eng., MSc., PhD.
Director Nacional Programa Agricultura de Precisión
INIA Quilmapu
Argentina

15º CURSO INTERNACIONAL DE AGRICULTURA DE PRECISIÓN Y MÁQUINAS PRECISAS
28 y 29 de septiembre de 2016
INTA E.E.A. Manfredi

- Agricultura y ganadería de precisión.
- Novedades en manejo por ambiente.
- Nuevas herramientas tecnológicas de AP: robótica, sensores, drones, cámaras, software, Big Data, automatismo y telemetría de la maquinaria agrícola.
- Manejo de Buenas Prácticas Agrícolas, Ganaderas y Agroalimentarias.
- Innovaciones y tendencias mundiales de la maquinaria agrícola.
- Casos exitosos de la agricultura de precisión y el agregado de valor en origen de las principales cadenas agroalimentarias argentinas.
- Mesa de bioenergía distribuida, cambio climático, sus efectos y alternativas de mitigación.

Entrada gratuita
- Tres salones simultáneos (Agricultura de Precisión y Agregado de Valor en Origen).
- Expo de máquinas precisas con todas las empresas líderes del sector.
- Distribución gratuita del material técnico específico del curso en un libro y acceso online.
- Dinámicas con transmisión en simultáneo en pantalla LED.

Informes: INTA E.E.A. Manfredi. Ruta 9, km 636 (5988) Manfredi. Córdoba. Tel: 03572 - 493039 / 53 / 58
www.inta.gob.ar | www.agriculturadeprecision.org

Prof. J. P. Molin
Evolución de agrocomponentes de Agricultura de Precisión en Argentina
INTA Manfredi- Mayo 2014

- **Guías Automáticas** (Auto pilots)
- **Dosificadores Variables** (VRT controllers)
- **Monitores de Rendimiento** (Yield monitors)
- **Monitores de Siembra** (Planter monitors)
- **Banderilleros Satelitales** (Light bars)

Bragachini, M (2015)
Participación de los productos nacionales en el mercado interno
INTA Manfredi - Mayo 2014

Prof. J. P. Molin
En Argentina, una de cada 4 hectáreas se trabaja con dosis variable

Paraguai

Paraguay agriculture is very similar to Brazil

Technical influence is from Argentina and Brazil

PA is highly influenced by the neighbors

Importing is facilitated

We have no data related to PA adoption
Colombia

The main area with PA is in Cauca Valley

Around 220,000 ha of sugarcane (13 mills), predominantly furrow irrigated

Practices:
grid sampling
VRT
Yield mapping (three mills)
Prof. J. P. Molin Mosquera, C.A. (2011)
Figura 6. Caso 3 sobre experiencias en el manejo de mapas de productividad.
Our perception

For those that are in the first step of PA (countries and regions)

PA is presented and offered as just technology

The major players are from ag. machinery industry

Information & knowledge still in a basic level
Brazil

Equator Line

Capricornio Tropic Line

www.google.com.br
A recent survey done by: KLEFFMANN GROUP

**SAMPLING**

992 interviews: 429 in the South (1), 415 in the Cerrado (2), 148 in the “New Cerrado” (3)

**TARGET GROUP**

Soy & corn producers (involved on ag machinery acquisition & decision making)

**TIME**

From Aug. 31 to Sept. 30, 2013

**HOW**

Interview by phone

**ESTIMATED ERROR**

Total 3% | (1) 5% | (2) 5% | (3) 8%

Only on grain production!
Municipalities: total area of soy, corn and wheat (ha)

- Green circles: <2,000 ha
- Yellow: 2,000 - 13,000 ha
- Orange: 13,000 - 48,000 ha
- Red: 48,000 - 179,000 ha
- Brown: >179,000 ha

[Sampling map of Brazil showing the distribution of soy, corn, and wheat cultivation areas across municipalities.]
CROPS: 2012 AND 2013

Data in % of the total sample

- Soy
- Corn af/soy
- Corn (1st crop)
- Wheat
- Others

Total
- 2012: N=992
  - Soy: 99%
  - Corn af/soy: 42%
  - Corn (1st crop): 31%
  - Wheat: 14%
- 2013: N=992
  - Soy: 99%
  - Corn af/soy: 38%
  - Corn (1st crop): 30%
  - Wheat: 13%
  - Others: 33%

South (1)
- 2012: N=429
  - Soy: 99%
  - Corn af/soy: 24%
  - Corn (1st crop): 45%
  - Wheat: 29%
- 2013: N=429
  - Soy: 98%
  - Corn af/soy: 22%
  - Corn (1st crop): 41%
  - Wheat: 28%
  - Others: 35%

Cerrado (2)
- 2012: N=415
  - Soy: 99%
  - Corn af/soy: 67%
  - Corn (1st crop): 13%
  - Wheat: 2%
- 2013: N=415
  - Soy: 99%
  - Corn af/soy: 59%
  - Corn (1st crop): 13%
  - Wheat: 2%
  - Others: 29%

“New Cerrado” (3)
- 2012: N=148
  - Soy: 99%
  - Corn af/soy: 22%
  - Corn (1st crop): 42%
- 2013: N=148
  - Soy: 99%
  - Corn af/soy: 24%
  - Corn (1st crop): 43%
  - Others: 37%

KLEFFMANNGROUP

Prof. J. P. Molin
**AG. MACHINERY COMBINATIONS**

Data in % of the total sample

- **Total**
  - N=992
  - TR+PU+PL+CO*: 80%
  - TR+PU+PL: 17%
  - TR+PL: 11%
  - PL: 1%
  - TR+CO+PL: 1%
  - Others: 3%

- **South (1)**
  - N=429
  - TR+PU+PL+CO*: 68%
  - TR+PU+PL: 26%
  - TR+PL: 3%
  - PL: 1%
  - TR+CO+PL: 1%
  - Others: 21%

- **Cerrado (2)**
  - N=415
  - TR+PU+PL+CO*: 88%
  - TR+PU+PL: 10%
  - TR+PL: 1%
  - PL: 1%
  - TR+CO+PL: 1%

- **“New Cerrado” (3)**
  - N=148
  - TR+PU+PL+CO*: 89%
  - TR+PU+PL: 11%
  - TR+PL: 1%
  - PL: 1%
  - TR+CO+PL: 1%

*TR – Tractor, PU - Sprayer, PL – Planter, CO - Combine*
All indications in %. Base: number of machines reported by respondents.

<table>
<thead>
<tr>
<th>Category</th>
<th>Up to 100 h.p.</th>
<th>100 h.p. to 150 h.p.</th>
<th>More than 150 h.p.</th>
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<td>Tractors</td>
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<tr>
<td>N=4.425</td>
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<tr>
<td></td>
<td>35</td>
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<td>Sprayers</td>
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<td></td>
<td>40</td>
<td>40</td>
<td>20</td>
</tr>
<tr>
<td>Harvesters</td>
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<tr>
<td>N=1.686</td>
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<tr>
<td>Planters</td>
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<tr>
<td>N=2.025</td>
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<td>Mechanics</td>
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<td>N=1.337</td>
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<td></td>
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<tr>
<td>Pneumatics</td>
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<tr>
<td>Others</td>
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</tr>
<tr>
<td>N=13</td>
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<tr>
<td></td>
<td>1</td>
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</tr>
</tbody>
</table>
Do you use some technique?

N = 992

- No: 55
- Yes: 45

N = 443

- Variable rate seed application: 28
- Variable rate chemicals application: 30
- Variable rate fertilizer application: 58
- Soil fertility mapping: 79

All indications in %. Based on number of interviews.
Do you use some technique?

- **No**: 55%
- **Yes**: 45%

**N = 992**

- **Field**: 58%
- **Grid**: 42%

**N = 348**

All indications in %. Base: respondents who do mapping of soil fertility.
GRID SIZE

All indications in %. Base: respondents who perform soil fertility mapping by GRIDs. N = 148

<table>
<thead>
<tr>
<th>Grid Size</th>
<th>Up to 1</th>
<th>1,1 - 2</th>
<th>2,1 - 3</th>
<th>3,1 - 4</th>
<th>4,1 - 5</th>
<th>6,1 - 7</th>
<th>7,1 - 9</th>
<th>Higher than 9,1</th>
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<td>Total</td>
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<td>14</td>
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<tr>
<td>South</td>
<td>27</td>
<td>24</td>
<td>22</td>
<td>4</td>
<td>6</td>
<td>2</td>
<td>14</td>
<td></td>
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<tr>
<td>Cerrado</td>
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<td>12</td>
<td>24</td>
<td>6</td>
<td>26</td>
<td>11</td>
<td>16</td>
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<tr>
<td>“New Cerrado”</td>
<td>3</td>
<td>7</td>
<td>31</td>
<td>3</td>
<td>45</td>
<td>10</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Equipment & Technology**

Do you use some equipment?

- **No**: 62%
- **Yes**: 38%

Base: all respondents

N = 374

- **Autopilot**: 60%
- **Planting Monitor**: 55%
- **Lightbar**: 36%
- **Fertilizer or chemical variable rate controller**: 34%
- **Harvest monitor**: 31%
- **Seed variable rate controller**: 12%
- **Precision farming software or applications**: 9%

Base: respondents who have some equipment of precision farming.

All indications in %.
GNSS

Base: all respondents

N=992

Yes: 29
No: 71

Signal
N=702

Open signal: 88
Differential or correction signal: 5
RTK (with ground station): 3
RTX: 3
Do not know: 2

Base: Who use GPS

All indications in %.
GNSS

All indications in %. Base: respondents who have some equipment of precision farming.

1000 to 2000 ha

N=178

- Open signal: 96%
- Differential or correction signal: 4%

2000,1 to 5000 ha

N=85

- Open signal: 98%
- Differential or correction signal: 2%

Higher than 5000 ha

N=34

- Open signal: 91%
- Differential or correction signal: 9%
**ADOPTION**

All indications in %. Based on number of interviews.

**Technique x Equipment**

N=992

- Use technique and equipment: 19
- Only equipment: 11
- Only technique: 26
- Do not use technique nor equipment: 44

- Price: 62
- Do not see benefits: 29
- Lack of skilled labor: 17
- Lack of machinery or equipment: 7
- Complexity: 5
- Others: 10

N=434
**ADOPTION**

intend to invest or continue investing

All indications in %. Base: all respondents.

<table>
<thead>
<tr>
<th></th>
<th>No</th>
<th>Yes</th>
</tr>
</thead>
<tbody>
<tr>
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<td></td>
<td>N = 374</td>
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<tr>
<td>Do not have the equipment</td>
<td>54</td>
<td>46</td>
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<td></td>
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<tr>
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</table>
ADOPTION
Benefits you see

All indications in %. Base: respondents who do not have technique or equipment of precision farming.

Lightbar

<table>
<thead>
<tr>
<th>Region</th>
<th>Total</th>
<th>MAPITOBA</th>
<th>Midwest</th>
<th>South</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N=29</td>
<td>N=4</td>
<td>N=10</td>
<td>N=15</td>
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<tr>
<td>Productivity gains</td>
<td>62</td>
<td>50</td>
<td>60</td>
<td>67</td>
</tr>
<tr>
<td>Production costs reduction</td>
<td>55</td>
<td>50</td>
<td>60</td>
<td>53</td>
</tr>
<tr>
<td>Farming modernization</td>
<td>17</td>
<td>25</td>
<td>10</td>
<td>20</td>
</tr>
<tr>
<td>Services more precise</td>
<td>10</td>
<td>25</td>
<td>10</td>
<td>7</td>
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<tr>
<td>Do not know</td>
<td>33</td>
<td>25</td>
<td>7</td>
<td>7</td>
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</table>

Autopilot

<table>
<thead>
<tr>
<th>Region</th>
<th>Total</th>
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<th>South</th>
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<tbody>
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<td>45</td>
<td>55</td>
<td>62</td>
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<tr>
<td>Production costs reduction</td>
<td>40</td>
<td>36</td>
<td>45</td>
<td>38</td>
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<tr>
<td>Farming modernization</td>
<td>20</td>
<td>27</td>
<td>14</td>
<td>22</td>
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<td>Use of inputs reduction</td>
<td>16</td>
<td>18</td>
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<td>11</td>
</tr>
<tr>
<td>Services more precise</td>
<td>16</td>
<td>9</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Practicity</td>
<td>3</td>
<td>11</td>
<td>3</td>
<td>3</td>
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<tr>
<td>Do not know</td>
<td>11</td>
<td>9</td>
<td>5</td>
<td>3</td>
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</table>
ADOPTION
Benefits you see

All indications in %. Base: respondents who do not have technique or equipment of precision farming.

Planting Monitor

<table>
<thead>
<tr>
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<th>Total N=52</th>
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<td>Productivity gains</td>
<td>58</td>
<td>57</td>
<td>53</td>
<td>62</td>
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<tr>
<td>Production costs reduction</td>
<td>44</td>
<td>43</td>
<td>42</td>
<td>46</td>
</tr>
<tr>
<td>Farming modernization</td>
<td>23</td>
<td>14</td>
<td>21</td>
<td>27</td>
</tr>
<tr>
<td>Use of inputs reduction</td>
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<td>29</td>
<td>16</td>
<td>19</td>
</tr>
<tr>
<td>Services more precise</td>
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<td>14</td>
<td>10</td>
<td>4</td>
</tr>
<tr>
<td>Practicity</td>
<td>24</td>
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<td></td>
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</table>

N=52

Harvest Monitor

<table>
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<th>Total N=35</th>
<th>MAPITOBA N=4</th>
<th>Midwest N=11</th>
<th>South N=20</th>
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</thead>
<tbody>
<tr>
<td>Productivity gains</td>
<td>60</td>
<td>25</td>
<td>55</td>
<td>70</td>
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<td>Use of inputs reduction</td>
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<td>Services more precise</td>
<td>33</td>
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<td>18</td>
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</tr>
<tr>
<td>Practicity</td>
<td>6</td>
<td>5</td>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>

N=35
ADOPTION
Benefits you see

All indications in %. Base: respondents who do not have technique or equipment of precision farming.

Fertilizer or chemical variable rate controller

Seed variable rate controller
All indications in %. Base: respondents who have some equipment of precision farming

Reasons for Adoption

- Productivity gains
- Production costs reduction
- Decrease labor
- Increase machine efficiency
- Do not know
- Others

**Total**
- N = 374

**South**
- N = 101

**Midwest**
- N = 198

**“New Cerrado”**
- N = 75
MARKET EVOLUTION

All indications in %. Base: respondents who own Lightbar

With an agricultural machine

N = 133

Purchase year

Yes | No

2000: 44 | 56
2001: 1 | 1
2002: 1 | 1
2003: 2 | 3
2004: 4 | 4
2005: 1 | 1
2006: 4 | 4
2007: 4 | 4
2008: 5 | 6
2009: 11 | 8
2010: 11 | 9
2011: 8 | 11
2012: 5 | 8
2013: 8 | 7
Não Sabe: 19 | 19

N = 1 | N = 1 | N = 4 | N = 4 | N = 1 | N = 2 | N = 10 | N = 5 | N = 21 | N = 19 | N = 27 | N = 17 | N = 19

KLEFFMANNGROUP

Prof. J. P. Molin
Market Evolution

All indications in %. Base: respondents who own Autopilot.

Autopilot

N = 223

With an agricultural machine

<table>
<thead>
<tr>
<th>Year</th>
<th>Yes</th>
<th>No</th>
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<tbody>
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<td>2012</td>
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<td></td>
</tr>
<tr>
<td>2013</td>
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</tr>
</tbody>
</table>

Purchase year

N = 3  N = 3  N = 2  N = 2  N = 10  N = 11  N = 19  N = 52  N = 59  N = 41  N = 21

All indications in %. Base: respondents who own Autopilot.
Market Evolution

All indications in %. Base: respondents who own planting Harvest monitor.

Harvest Monitor

N=116

With an agricultural machine

<table>
<thead>
<tr>
<th>Year</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
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<td>2013</td>
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<td>17%</td>
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Purchase year

N=103

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</tr>
</tbody>
</table>

KLEFFMANN GROUP

Prof. J. P. Molin
**Market Evolution**

All indications in %. Base: respondents who own variable rate controller (fertilizers /chemicals).

**Fertilizer or chemical variable rate controller**

N = 127

**With an agricultural machine**

<table>
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</tr>
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**Purchase year**

<table>
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<th>Year</th>
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<th>No</th>
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<tbody>
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</tr>
<tr>
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<td>5%</td>
<td>10%</td>
</tr>
</tbody>
</table>

KLEFFMANNGROUP

Prof. J. P. Molin
Market Evolution

All indications in %. Base: respondents who own Seed variable rate controller.

Seed variable rate controller

N = 45

With an agricultural machine

N = 67

Yes  No

Purchase year

N = 2  N = 3  N = 4  N = 12  N = 10  N = 7  N = 7  N = 45


Yes  No

Q21. Was the equipment purchased with an agricultural machine? (spontaneous)

Q19. What is the year of purchase for each equipment? (spontaneous)
## Precision Farming Equipment Interaction

All indications in %. Base: respondents who have some equipment of precision agriculture. N=374.

<table>
<thead>
<tr>
<th>Equipment Type</th>
<th>133 Lightbar</th>
<th>133 Autopilot</th>
<th>204 Planting monitor</th>
<th>116 Harvest or productivity monitor</th>
<th>127 Variable rate controller (fertilizers/chemicals)</th>
<th>45 Variable rate controller (seed population)</th>
<th>33 Software or applications to precision farming</th>
</tr>
</thead>
<tbody>
<tr>
<td>Autopilot</td>
<td>62%</td>
<td>62%</td>
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<tr>
<td>Planting monitor</td>
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<td>56%</td>
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<tr>
<td>Harvest or productivity monitor</td>
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<td>38%</td>
<td>37%</td>
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<tr>
<td>Variable rate controller (fertilizers/chemicals)</td>
<td>39%</td>
<td>38%</td>
<td>35%</td>
<td>47%</td>
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<tr>
<td>Variable rate controller (seed population)</td>
<td>12%</td>
<td>15%</td>
<td>16%</td>
<td>19%</td>
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<tr>
<td>Software or applications to precision farming</td>
<td>15%</td>
<td>12%</td>
<td>11%</td>
<td>14%</td>
<td>20%</td>
<td>16%</td>
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</tr>
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</table>
Precision Farming is already used by 45% of commercial farmers;
   This is expected to grow to more than 55% in the next two years;
   This growth will be driven mainly by variable rate applications (fertilizers, chemicals and seeds);
Currently the most common Precision Farming solution is fertilizer maps and fertilizer variable rate application:
The main reason for farmers not to use Precision Farming solutions is the limited availability of skilled labor to deal with this technology:
Open GPS signal is still the most common signal used by farmers;
Close to 20% of the farmers outsources precision farming activities, mainly soil maps and variable rate fertilizer application.
Productivity (kg/ha or ha/h) and cost reduction are the major drivers for farmers to invest in Precision Farming;
Currently the most common equipment is auxiliary driving systems (light bars and auto steering);
   Self propelled sprayers is the most common equipment to use auxiliary steering solutions;
There is no dominant brand in the Precision Farming market;
Steering Systems and Seed Monitors are the most common equipment integration.
Precision Agriculture (in a strict sense)

- Spatial variability in the agricultural fields
  - Investigation and mapping
    - Tools for sampling and sensing, GIS
  - Management and decision making
    - Site-specific treatments (“Site-Specific Crop Management”)

- Technologies related to GNSS and automation
  - Auto steering, telemetry, controlled traffic, sections control (sprayers, seeders) etc...
Local history

1995 - first harvesters with yield monitor
1995 - light bars on agricultural aircrafts
1996 - PA Seminar at University of São Paulo (USP/ESALQ)
1998 - first service providers
PA class field visit in 2001
Local history

1995 - first harvesters with yield monitor
1995 - light bars on agricultural aircraft
1996 - PA Seminar at University of São Paulo (USP/ESALQ)
1998 - first service providers
1999 - undergraduate course
2001 - local equipment for VRT
2001/2002 - first consultants
2003 - automatic steering systems (in sugarcane)
2004 - Brazilian PA Conference
2012 - PA Committee at the Ministry of Agriculture
2016 – Brazilian Association of Precision Agriculture
PA status

- The large majority of PA use is on VRT based on grid soil sampling

- A few users of “second generation” tools:
  - Management zones based on
    - soil electrical conductivity
    - yield maps
    - RS images
  - Crop sensors for N management and growth regulators
  - Site specific application of agrochemicals
Goiania, GO
Approximately 1.5 million people
We expect:
• above 400 attendees
• 20 to 30 companies on exhibits

We will have:
• 4 general panels
• 3 concurrent sessions
• 5 technical panels and 135 papers
For contact please e-mail to:

J. P. Molin (jpmolin@usp.br)
P. Magalhães (pedro@abpsap.org.br)
Thank you!