Robots in Agriculture
... around the world
Legaleze...

1. I will NOT cover the 🇺🇸 USA, nor animal agriculture

2. A lot is happening there as well. Present next year?

3. I do not know everything about this subject

4. Even if I did, there is a lot I could not share

5. Most omissions are not deliberate. (See 3.) My apologies.

6. Some are. (See 4.)

7. This presentation is already obsolete
With low online sales of food & beverages, the sector is due for a catch up
Jobs at risk by Automation

Technically, food & agricultural jobs are amongst those that could most rapidly be automated
## Ag Tech France

### Mapping des start-ups Agritech en France

<table>
<thead>
<tr>
<th>Ressources</th>
<th>Production</th>
<th>Débouchés</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marketplace agricole</td>
<td>Logiciels de gestion</td>
<td>Commercialisation</td>
</tr>
<tr>
<td></td>
<td>Production industrielle innovante</td>
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<tr>
<td></td>
<td>- Protéine végétale (algues)</td>
<td>- Négociant 2.0, SA Ferme</td>
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<tr>
<td></td>
<td>- Protéine animale (insectes, œufs, coquillages)</td>
<td>- Logistique innovante</td>
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<tr>
<td></td>
<td>- Valorisation énergétique</td>
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<tr>
<td>RH/reseau social</td>
<td>IoT de collecte de données agricoles</td>
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<tr>
<td></td>
<td>- par coeur dans les champs</td>
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<tr>
<td></td>
<td>- par drone</td>
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<tr>
<td>Crowdfunding</td>
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<tr>
<td>Hardware de production agricole</td>
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<tr>
<td></td>
<td>- Matériel spécifique</td>
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<tr>
<td></td>
<td>- Equipements tracé autonomes</td>
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<tr>
<td>Biotech</td>
<td>Agri Data analytics / OAD*</td>
<td></td>
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<td></td>
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<tr>
<td>Agriculture urbaine</td>
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</tbody>
</table>

*UAD : Outil d’Aide à la Décision  *IoT : Internet of Things


Tens of thousands...

- Are drones like … ‘flying robots’ ?

- If so… DJI (China), Parrot (France) and Yamaha (Japan) sold thousands of units, operational in the field NOW

- Main uses:
  - pesticide spray: > 10 k in China and ~ 2 k in Japan
  - scouting / sensing: (0,000)’s across the world
  - professional uses (00,000)’s and toys (millions)

- And… more to come
Crops run by robots

• Harper Adams University, UK, 2017
  • demonstration hectare (2.5 ac), completed cycle in 2017

• Ausy Group & AgreenCulture (Belgium & France), 2017-18
  • 50 hectare (120 acre) maize crop
    • Oct 2017: soil sampling & soil map
    • March 2018: soil preparation
    • April 2018: 1st fertilizer treatment, planting seed
    • May 2018: 2nd fertilizer treatment, weeding
    • Further treatments: weeding passes, harvest
A few names …

- **Bonirob**, platform, several applications in development, (Bosch, Stuttgart, Germany)
- **Vinescout**, platform, commercial prototype ready in 2019, (U. Polytechnica, Valencia, Spain)
- **Naio**, 4 different weeding robots, vegetables, vineyards, filed tests FR, UK, US, > 100 units sold, (Toulouse, France)
- **Zasso**, electric weed control, near commercial, (Aachen, Germany)
- **Ecorobotix**, selective spray (Lausanne, Swiss)
- **Bilberry**, selective weed control, field tests in FR, NL, Aus, (Paris, France)
- **Jacto**, AgriBot platform, JAV II autonomous orchard sprayer, commercially used in Eucalyptus, (Pompeia, SP, Brazil)
- **Octinion**, soft fruit harvesting, world leader in performance, closest to commercial, (Leuven, Belgium)
- **Cerescon**, asparagus harvester, test market in 2018, orders in hand for 2019, (Eindhoven, Netherlands)
Real Innovation…
Convenient,
Low cost,
Mobility &
Traceability,
From Field to Market.
## Outsiders coming in…

<table>
<thead>
<tr>
<th>Who?</th>
<th>$ Bn</th>
<th>Home base</th>
<th>Skill base</th>
<th>Entry in Ag.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BOSCH</strong>&lt;br&gt;Invented for life</td>
<td>~$90</td>
<td>Stuttgart, Germany</td>
<td>Automotive, Appliances etc</td>
<td>Bonirob, Greenhouse management</td>
</tr>
<tr>
<td><strong>AIRBUS</strong></td>
<td>~$80</td>
<td>Toulouse, France</td>
<td>Aerospace, Remote sensing</td>
<td>Remote sensing, robots…</td>
</tr>
<tr>
<td><strong>ENGIE</strong></td>
<td>~$75</td>
<td>Paris, France</td>
<td>Energy production, efficiency</td>
<td>Processing plants, orchard automation</td>
</tr>
<tr>
<td><strong>Panasonic</strong></td>
<td>~$65</td>
<td>Osaka, Japan</td>
<td>Plant factories, refrigeration in retail</td>
<td>Seed-to-fork integration vegetables</td>
</tr>
<tr>
<td><strong>ABB</strong></td>
<td>~$35</td>
<td>Zurich, Switzerland</td>
<td>Engineering, automation, Energy grids, robots</td>
<td>Processing plants, automation</td>
</tr>
</tbody>
</table>

Outsiders ... Chips... for autonomous vehicles...

NXP, 🇳🇱 Eindhoven, Netherlands
Infineon, 🇩🇪 Munich, Germany
U-Blox, 🇨🇭 Zurich, Switzerland
Melexis, 🇧🇪 Belgium

Commercial, construction and agricultural vehicles (CAV)
- Autonomous driving for commercial, construction and agricultural vehicles, automotive 24GHz radar
- 24V body applications for trucks and agricultural vehicles
- Low voltage motor control for trucks and agricultural vehicles
- Hybrid electric solutions for construction, commercial and agricultural vehicles
- Valve control for trucks and...
Ag Engineering / Robots

- 🇩🇪 U. Aachen: LemnaTech, Zasso
- 🇨🇳 CAU Beijing: sensors, sensor networks, IoT
- 🇨🇳 SCAU Guangzhou: agricultural aviation, drones
- 🇬🇧 Harper Adams: Robot Field
- 🇯🇵 U. Hokkaido: generations
- 🇯🇵 U. Kyoto: Shibuya Seiki
- 🇨🇭 Polytechnique Lausanne: Ecorobotix
- 🇧🇪 KU Leuven: Octinion
- 🇧🇷 U Sao Paolo: JAV II
- 🇪🇸 Politecnica de Valencia: VineScout
- 🇳🇱 Wageningen: Lely etc…
Generic Innovation Cluster

- Sector Companies
- Innovation Communities Incubators
- Broad Research Capabilities
- Networking Assets
- Investors & Capital Markets
- Broads Companies & Institutions
- Sector R & D & E Partners / Facilities
# Ag Tech Clusters

(ex USA - Not ranked)

<table>
<thead>
<tr>
<th>Location</th>
<th>Education</th>
<th>Ag Tech / Cos</th>
<th>Broader Tech.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stuttgart, Germany</td>
<td>U. Hohenheim</td>
<td>Bosch</td>
<td>Bosch, M-B, Porsche</td>
</tr>
<tr>
<td>A-B-L (Aachen-Bonn-Leverkusen), Germany</td>
<td>U. Bonn, U. Aachen</td>
<td>Bayer, Lemnatech, Zasso</td>
<td>Mascor Institute</td>
</tr>
<tr>
<td>Mannheim, Germany</td>
<td>Heidelberg U.,</td>
<td>BASF, John Deere</td>
<td>Kaiserslautern I.T. hub Max Planck &amp; Fraunhofer</td>
</tr>
<tr>
<td>The Netherlands</td>
<td>U. Wageningen, Eindhoven U. Technology</td>
<td>Coops, Greenhouses, Cerescon,</td>
<td>Philips, TNO</td>
</tr>
<tr>
<td>Location</td>
<td>Education</td>
<td>Ag Tech / Cos</td>
<td>Broader Tech.</td>
</tr>
<tr>
<td>------------------</td>
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</tr>
<tr>
<td>Toulouse, France</td>
<td>U. Montpellier,</td>
<td>Naio, De Sangosse, ITV, AgreenCulture, GeoSys</td>
<td>Airbus,</td>
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<tr>
<td>Switzerland</td>
<td>ETH Zurich, Polytechnique Lausanne,</td>
<td>Ecorobotics, Syngenta</td>
<td>ABB, U-Blox,</td>
</tr>
<tr>
<td>Belgium, Flanders</td>
<td>U Gent, K.U Leuven, U. Liege / Gembloux</td>
<td>Plant biotech Gent, Prophyrio, Octinion, Boerenbond, Greenway</td>
<td>VIB, IMEC, VITO, Make, Sonaca, Chemical cluster Antwerp…</td>
</tr>
</tbody>
</table>
# Ag Tech Clusters
(ex USA - Not ranked)

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<th>Location</th>
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<th>Broader Tech.</th>
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</thead>
<tbody>
<tr>
<td>Sao Paolo, Brazil</td>
<td>Universidade de S.P.</td>
<td>Embrapa, Jacto, Stara, Sugar/ethanol, juice, meat, timber, coffee, 3G Capital</td>
<td>Embraer</td>
</tr>
<tr>
<td>Santiago, Chile</td>
<td>U. Technologica de Chile, U. Tecnica S Maria,</td>
<td>INIA, Agrobolt, fruit packers/exporters</td>
<td>Engie Factory, Telefonica I&amp;D</td>
</tr>
<tr>
<td>Israel</td>
<td>Technion, Israel Institute of Technology</td>
<td>Netafim, Adama, many start ups</td>
<td>Many start ups</td>
</tr>
<tr>
<td>Bologna, Italy</td>
<td>U Bologna,</td>
<td>EIMA Expo, Parma Dairy, Cheese, Wine …</td>
<td>Car tech (Modena) Packaging, Tetrapack</td>
</tr>
<tr>
<td>Location</td>
<td>Education</td>
<td>Ag Tech / Cos</td>
<td>Broader Tech.</td>
</tr>
<tr>
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</tr>
<tr>
<td>Guangzhou, China</td>
<td>SCAU (South China Ag. University)</td>
<td>Agricultural Aviation</td>
<td>DJI, Tencent</td>
</tr>
<tr>
<td>Hangzhou, China</td>
<td>Zhejiang U.</td>
<td>Quality control sensors</td>
<td>BYD, Geely/Volvo, Alibaba,</td>
</tr>
<tr>
<td>Beijing, China</td>
<td>CAU (China Agricultural U.)</td>
<td>NERCITA, CAAMS,</td>
<td>Baidu, Didi</td>
</tr>
</tbody>
</table>

- **Meicai** (2014, Beijing, 252.60M USD): Agricultural product/fruit and vegetable B2B mCommerce site
- **Tony’s Farm** (2009, Shanghai, 39.00M USD): Asset heavy farm to home retailer
- **DFs168** (2014, Shenzhen, 29.28M USD): Marketplace for farming supplies
- **Cloud Farm** (2013, Beijing, 26.00M USD): Online platform for farm-related products and equipment
- **KesuCorp** (2014, Hangzhou, 22.50M USD): P2P agri loans, e-commerce and logistics distribution product
- **YMT.com** (2011, Beijing, 20.00M USD): Online B2B agro products marketplace
- **Gfresh** (2014, Shanghai, 20.00M USD): Online global marketplace platform for users to sell seafood in China
- **Nongfenqi** (2014, Nanjing, 14.47M USD): Online purchase finance platform for farmers to buy agricultural equipment
- **Easy Flower** (2014, Beijing, 12.00M USD): B2B platform between flower growers and florists
- **Beijing Goldenway Bio-Tech** (2001, Beijing, 12.00M USD): Developer of technology for producing soil nutrients from food waste
- **Haishangxian** (2015, Ningbo, 10.18M USD): Online B2B platform for seafood
- **Anxindeli** (2014, Beijing, 10.00M USD): Online P2P lending platform for agri businesses
- **Sufarm** (2014, Chengdu, 10.00M USD): Online platform for agro products
- **PhageLux** (2013, Shanghai, 10.00M USD): Developer and Supplier of phage products for agriculture and health industry in China and Canada
- **Jiage** (2014, Beijing, 8.72M USD): Cloud-based data aggregation and analytics platform for precision agriculture decision support
- **Bicaijia** (2013, Shanghai, 8.40M USD): Mobile app based B2B platform for vegetables
- **FarmFriend** (2016, Beijing, 7.35M USD): Mobile-only marketplace for connecting farmers with agricultural drone service providers
- **Zhaonongzi** (2014, Shenzhen, 5.00M USD): Online B2B marketplace for agro products
- **Emubao** (2015, Beijing, 4.60M USD): Sheep husbandry investment venture
- **The First Farm** (2011, Nanjing, 3.12M USD): Private label for organic agricultural products
- **Okquo** (2015, Guangzhou, 3.10M USD): B2B retailer for fruits and vegetables
- **AIRAg** (2015, Guangzhou, 2.99M USD): Developer of integrated platform for farm data and analytics
- **Yzyy365** (2015, Beijing, 2.91M USD): Online platform for agricultural related queries
Conclusions

1. The Future came faster than anticipated…

2. Expect the Future to accelerate… even more

3. Robots have arrived, today and now.

4. Robots have many shapes & forms… many are invisible

5. This presentation is already obsolete