Precision agriculture and the future of farming

Technology, Environment, Training
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Distribution of EU farm holdings by size

- < 20 ha: 86%
- 20-29.9 ha: 3%
- 30 to 49.9 ha: 4%
- 50 to 99.9 ha: 4%
- >100 ha: 3%
EU farmers/ farm managers by age group, 2013

- < 35 years: 6%
- 35-44 years: 15%
- 45-54 years: 23%
- 55-64 years: 24%
- 65+ years: 31%
• Smart Farming based on
• Precision agriculture the evolution of the
• Digitization of society and of agriculture

grand challenges for agriculture

• Food & nutrition security
• Climate change
• Environmental concerns
• Healthy diet for a healthy life
G x E x T x M

Precision agriculture: optimize the combination of

- Genetics
- Environment
- Technology
- Management
Smart farming: analysis and information

• Correct observation: visually, sensors…
• Correct documentation (soil, previous crops and treatment…)
• Correct analysis
Smart farming: decisions

• Correct genotype
• Correct dose
• Correct chemical/biological compound
Smart farming: actions

• Correct place
• Correct time
• Correct (climatic) conditions
• Correct (use of) equipment
Financial profit (Euro/ha)
Precision Agriculture: Management Scales & Approaches

- Conventional Farming & Traditional Management: Field scale & One rate
- Precision Farming & Site Specific Management: Sub-Field & Variable rate
- Single-Plant-Care & Robotic Management: Single Plant, Individual rate

Q. Zhang, 2012, at International Network of Precision Agricultural Centers, Richland, WA
Precision agriculture impact in EU-1

A significant contribution to food security and safety:
- offers technology solutions for producing more with less
- will enhance food safety and plant health.

More sustainable ways of farming:
- technologies already in use with positive impacts on the environment
- generate sustainable productivity gains.

Triggers/follows societal changes:
- uptake of available technologies is still low;
- influences work practices and life conditions on farms
- new farming business models are on the rise;
Precision agriculture impact in EU-2

Precision agriculture requires the learning of new skills:
- technological skills;
- environmental skills;
- managerial skills.

Can adapt to the wide diversity of agriculture in the EU
- Applicable regardless of
  - farm size, types of farms, farming practices,
  - output and employment,
- Challenge for European policy measures to take into account that opportunities and concerns around PA can vary greatly from one Member State to another.
Data capturing, monitoring, steering, managing

- PA produces ‘More with Less’ → captures variation and makes it manageable
- PA is data oriented and provides users with extra eyes, ears, noses, brains, hands → sensor technology
- Information and knowledge based decisions and actions
- PA is for all farm types
- Facilitates documented G.A.P. Good Agricultural Practices
Digitizing Agriculture: new management and chain organization

• The increasing automation and digitalisation of agriculture changes farm management
• Creates new business models, capturing the value of data.
• Implications for the family farm as a dominant organisational form
• Chain organisation: from markets towards more contracts, vertical integration
Environmental impact

• Precision agriculture tools and concepts enable reduction of environmental impact
  o Erosion prevention and flooding prevention
  o Optimal fertilizer use and ground water quality
  o Reduction in crop protection chemicals
  o Weed management
  o Reduce crop damage from pest for reduced fungal infections
• Allows efficient mixed cropping to stimulate biodiversity
Precision Agriculture: Implications for CAP

- Income support or support implementation and development of precision agriculture to reduce environmental impact
- Stimulate the conversion to precision agriculture by support for advances:
  - into feasible techniques (not necessarily only large complex machines)
  - practiced by trained farmers around the EU/world
  - irrespective of the scale of farming
Precision Agriculture: Implications for policy

• Precision agriculture, and the digitalisation of agriculture, has implications for the CAP but also for other EU policy domains:
  o Environmental Policy (better measuring)
  o Regional Policy (alternative employment)
  o Competition Policy (platforms)
  o Science and Innovation Policy
  o Digital Policy (digitization, data ownership etc.)
  o Education and training in rural areas
  o Industrial policy (machineries, Industry, Research and Energy (ITRE))
Precision Agriculture Environmental Benefits: weed control

Process:
• Weed control in field crops

PA Technology:
• Weed detection (on line/weed maps)
• Patch spraying or mechanical weed removal

Expected benefits:
• In case of herbicide use: 6 – 15 – 80 % reduction (dependent on crop type and weed type)
• Automatic mechanical weed control, even larger savings
Precision weed management

Use plant characteristics and optical reflectance and/or image analysis.

Controller

Optical detector

Action: o Herbicide
      o Mechanical

weeds, crop
Precision weed management
Precision Agriculture Environmental Benefits: N- fertilizer use

Process:
• Nitrogen fertilizer application for optimal crop growth and production

PA Technology:
• Crop vegetation index based on optical sensors
• Soil nutrient maps, crop models
• Variable rate nitrogen fertilizer application according to crop requirements and local conditions

Expected benefits:
• Improvement of nitrogen use efficiency.
• Reduction of residual nitrogen in soils by 30 to 50 %
Variable Rate Fertilizer Application

- Different technique
- Same Principle!!
Precision Agriculture Environmental Benefits: Mycotoxins and health

Process:
- Mycotoxins develop depending on weather and crop conditions
- Mycotoxins can pose health risks

PA Technology:
- Crop vegetation index based on optical sensors to derive fungal disease risk areas in a field
- Variable rate fertilizer and fungicide application according to local crop conditions and risks

Expected benefits:
- Reduction in health risks and improvement of quality for human consumption
Precision Agriculture Environmental Benefits: Orchard and vineyard crop protection

Process:
- Disease reduction in fruit or wine production based on IPM (Integrated Pest Management)

PA Technology:
- Tree size and architecture detection
- Precision IPM for more effectiveness

Expected benefits:
- Reduction in pesticide use up to 20 – 30 %
- Reduction of sprayed area of 50-80%
Selective spraying for disease control
Fungicide reduction 20-30% (max 80%)

Adapted from R. Oberti
Precision Agriculture Environmental Benefits: Integrated pest control

Process:
• Pest damage reduction in fruit or wine production based on population dynamics and IPM (Integrated Pest Management)

PA Technology:
• Detect crop damaging pests, insects
• Monitor the spatial population dynamics
• Link the level of pest to potential crop loss
• Use predators

Expected benefits:
• Reduction in pesticide use up to ? %
• Reduction of sprayed area of ? %
Thanks for your attention

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