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AUSTRALIAN AGRICULTURAL &
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Big Data Applications and Prospects in Precision Agriculture

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Outline

- Introduction
- Overview of Precision Agriculture in Australia and Europe
- Big data applications in PA: opportunities and challenges
- Implications of Big Data for farm management
- Observations and Remarks

Introduction

- Increasingly competitive markets with rising input costs but declining agric commodity price (declining TOT)
- Climate change, resource supply constraints & changing consumer demand

⇒ Farmers seek for productivity improvement

- technology progress, on-farm innovation, resource allocation (structural adjustment), R&D

⇒ produce high quality products in environmentally sustainable way

⇒ Precision farming: managing spatial and temporal variabilities

Introduction (cont')

- Transformative technological trends:
 - **Internet of Things (IoT)**: cheaper sensors and increased inter-connectivity provide rich-data sources on agricultural production systems.
 - **Big Data (BD)**: analysis of data provides insights for better farm decision making and fast-track research.
 - **E-commerce**: targeting consumer preference
- Ability of applying BD solutions for real-time business decision will be a divide between survival and bankruptcy (Kitikidou and Arambatzis 2015).

Precision Agriculture in Australia

- Australia's agro-climatic conditions, large average farm size and low farm income subsidy provide good conditions for precision farm management (Whelan 2007)
- PA in Australia is dominated by the grains farm
 - use of auto-steering as high as 90% but yield monitor & VRT is low (Bramley and Trengove 2013)
 - VRT for P and N
- Farm Information Systems for horticulture. E.g, <https://www.youtube.com/watch?v=j-gJQXQoqX0>
- Availability & use of decision support technology platforms is at a low stage

Precision Agriculture in Australia (cont')

- Research and Robotics at University of Sydney
 - PA Lab
 - Australian Center For Precision Agriculture (CFPA)
- RIPPA(Robot for Intelligent Perception and Precision Application)
- Variable Injection Intelligent Precision Applicator (VIIPA)
 - First Autonomous on-farm field trial –Nov 2015
 - Weed management, animal monitoring & invasive pest management
- Rover Farm Trials <https://www.youtube.com/watch?v=KGfyuiUgFYQ>
 - Self reconfigurable crop row monitoring
 - Easy to transportation
- LadyBird Real-time targeted Spot Spray with image-based detection

Precision Agriculture in Europe

- Auto steering, controlled traffic farming, yield mapping, VRT (lime, fertilizer, pest), (semi)-automated irrigation management
 - Wide diversity in adoption across EU countries
- So far PF adoption in Europe is regarded as lower than expected
 - high investment cost in equipment
 - high learning cost owing to complexities of the systems (Kutter et al. 2011)
- Now Europe entering the era of PA with combined use of data (EurActiv quoting Phil Hogan, 23 October 2015)

Precision Agriculture in Europe

- Intelligent Robots and Information Systems



Big Data and Precision Agriculture

- An enabler to achieve practical need of PA, i.e., improve farm management decisions
(Brett Whelan, August 2015 to AFI)
- Target consumer needs/markets, e.g, premium markets
- Better align research and development
- Tracing and tracking
- Motivate value adding at farm and latter in the value-chain
- Facilitate embodied technology in farm equipment and hence adoption of PA

Big Data and Precision Agriculture

- Some perceive PA to flourish as 'Big Data Business' (Tien 2012)
- Objective of BD analytics (Tien 2013):
Data → Information → Knowledge → Wisdom
- Many applications in agric retail but not so in production (Sonka and Cheng 2015)
- Example areas of Big Data application in agriculture
 - robotic management
 - decision support systems
- In Europe, Food and Agriculture is identified as one of the seven societal challenges where Big Data is hoped to considerably contribute to the solutions.

Implications of BD for Agriculture

- Prospect for robotic management
 - Labor employment issues
 - Consumers' perception about agric commodities may be influenced
- Make it hard for less efficient farms to survive
- Accompanying technical and managerial capabilities
- Business model for farm consultancy
 - cooperatives vs contractors

What needs to be done?

- New methodologies for automated micro decisions in farm management
- Decision Support platforms for farmers
- Synergy between Small data and Big Data (Cheng 2015)

Remarks:

- BD is not just for Big entities
- Big chances of misled decisions, so invest in farmer/manager expertize

Questions? Comments?

Thank you.