Information Systems for Farm and Machinery management

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AIM OF THIS RESEARCH

- to analyze the current farm management information systems
- to propose a new farm management information system
- to harmonize information sharing between farm office and manned/robotic platforms
- Present case studies for farm and machinery information systems
Soft Systems Methodology

- Analyse human activities and identify user requirements in the studied system
- Generation of “Rich Pictures”
- Interviews with farm managers and tractor operators in Greece and Denmark
- CATWOE Analysis, Conceptual Model
Main issues addressed

- Satisfaction and expectations of new advances in farm machinery
- Information retrieval from farm machinery to be available to the farmers
- External factors that influence farm machinery performance
- Farmers needs to carry out operations more efficiently using farm machinery
Some Responses..

- Need for detailed information about farm machinery cost
- Use of GPS for optimal route planning and work efficiency
- Automated field mapping using on-the-go sensors installed on tractors and implements
- Easier to move and upgrade data from tractor to PC or server

- Wireless control of tractor functions
- A DSS to improve farm machinery management
- System to provide farm machinery data for subsidies & audit control
- Applications (smart phones, websites) for daily record keeping and automatic calculation of farm machinery usage cost
CATWOE Analysis

C: Customer: farm machinery (tractor, robot,..)

A: Actors: tractor operator / agro-robotic engineer

T: Transformation process: operational tractor/implements data through the ISOBUS protocol

W: World-view: operational tractor/implement data are easily acquired and can improve farm management

O: Ownership: farm manager as he decides on the appropriate functionalities to be included

E: Environmental constraints: micro and macro issues in the farm production system (i.e. production costs, safety regulations, environmental problems)
Root definition

- A system to do \( P \), by means of \( Q \) to achieve \( R \) or “What to do (P), How to do it (Q), and Why do it (R)”

- “A system to utilize and manage the digital data from tractor/implements through the ISOBUS, as well as external data related to farm machinery for the purpose of better farm machinery management performance”
Efficacy
Is the data easily transferred and used in the tractor/implement system?

Efficiency
How much effort is used for obtaining the data (input) and transforming it and is it all used?

Effectiveness
Does it improve machinery performance and the management of decision making?

Evaluation Criteria
“Current” Conceptual Model

Agricultural regulations, Rules & Standards
Economics
Justify
Supervise
Crop - Soil - Weather
Determine
Manage
Adjust
Measure
Estimate
Data transfer
Variable rate application
Field information
Field scout
Machinery Trade & Support
Driver
GPS
Navigation
Field monitoring
Root planning
Field Sensors
Isobus
Field Maps
Energy Consumption
PTO torque
Draft
Machinery Equipment
Field Operations
TRACTOR
SYSTEM BORDER
“RoboFarm” Conceptual Model
Case Study I: Working Efficiency for farm Machinery

- Time
- Data at 0.5Hz
- Coordinates
- Plot the route

41 fields for cotton residue collection

Thanks to PhD student Panos Dogoulis
CUTTING OPERATION
RAKING OPERATION
BALLING OPERATION
MEASURED RESULTS OF THE EFFICIENT TIME

- Mower: 69% of the Field time
- Rake: 68% of the Field time
- Baler: 60% of the Field time
- 12% less fuel if we follow a better sequence of the 41 fields
Case Study II
Use of ISO BUS & draft forces for farm management

Thanks to PhD student Zisis Tsiropoulos
Three-point hitch Dynamometer
Spatial analysis tool
It is more economical to drive the tractor in lower rpm and lower speed.
This is Precision Agriculture...
or. Is this the FUTURE...?
Thank you..

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