Demonstration activities of the Ecofert Project for the application of the DSS GesCoN on processing tomato: preliminar results

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Objectives

1) The comparison in commercial fields of GesCoN DSS vs farmers’ conventional methods

   the request to the farmers was to create:
   - a field plot within their farm autonomously managed with the DSS (farmers had always the chance to modify the daily suggestion);
   - a lateral field plot managed with their usual fertigation procedure (with the same cultivar and transplanting date).

2) The evaluation of the farmers’ response in the use of the GesCoN DSS

   - 9 farmers were selected considering different levels of education, age and experience.
2018 GesCoN demonstration trials location
Farm: A
GesCoN plot: 2.5 ha
Comparison plot: 2.5 ha
Plants/ha: 29412

Farm: B
GesCoN plot: 1.3 ha
cv. Taylor
Comparison plot: 12.5 ha
Plants/ha: 31864
Mulched

Farm: C
GesCoN plot: 6 ha
cv. Taylor
Comparison plot: 6 ha
Plants/ha: 31250

Farm: D
GesCoN plot: 2 ha
cv. Docet
Comparison plot: 8 ha
Plants/ha: 31250
Mulched

Farm: E
GesCoN plot: 1.5 ha
cv. Docet
Comparison plot: 3.5 ha
Plants/ha: 31250

Farm: F
GesCoN plot: 0.5 ha
cv. SV 5197
Comparison plot: 4.5 ha
Plants/ha: 32895

5 meteo stations
- Processing tomato (peer shaped type)
- Drip irrigation in all cases
- Transplanting from 15 Apr. to 7 June
- Plant densities from 29000 to 33000 pls/ha
- No N fertilization limits, only one farm in NVZ
- Plastic mulching in two farms
- Soil moisture sensors in two farms
- Soil phys&chem. analyses provided by farmers
- Ks (saturated hydraulic conductivity) evaluated in each field (method of cylinder)
GesCoN: the pieces of the puzzle

- Rainfall
- Atmosphere: temperature
- Plant growth (DW, yield...)
- transpiration
- Evaporation
- N uptake
- Soil N, OM dynamics
- Water uptake
- Soil volume interested by root
- Root growth
- Water movement
- Infiltration
- Runoff
- Fertigation management
- Capillary fringe
- Drainage
- Leaching
- N mineralization
- Soil volume interested by root
- Soil N, OM dynamics
- Water uptake
Two papers have been recently published. The first describe the methodological approach and the second is the calibration on processing tomato.

http://journal.frontiersin.org/article/10.3389/fpls.2015.00319/full

http://journal.frontiersin.org/article/10.3389/fpls.2015.00495/full
GesCoN: fertigation management scheme

Cloud service

Climatic data
- Temperature
- Humidity
- Sunlight

Plant & soil monitoring
- Sensors

DSS
- Model
- Decision supports
- Site & crop specific data

Daily

Hand held devices
- Crop manager

Decision making
GesCoN - ECOFERT: 2018 demonstration trials preparation

Initial software setup

Collection of soil analysis, field and crop information
GesCoN DSS: communication scheme

- 5 meteo sts
- Automatic acquisition of meteo data
- DSS Model
- Daily message to the farmer
  - Pop-up Flock notification
  - App message
  - No daily meteo data inputs required by the farmer

The only input requested
- Confirmation of fertigation
- Data of comparison sector
- Additional feedbacks (if any)
GesCoN DSS: the communication with the farmers

Ecofert News
Del 2018-09-09 18:31:26
Azienda: Esempio

Per la data del 05/06/2018 fertirrigare con 117 m$^3$/ha di acqua (4 h 13 min) e 20 kg/ha di N

Esegui

Rilascia Feedback ★

Aggiorna settore di confronto

Dati coltura:

Stress termico 0%

Durata irrigazione

<table>
<thead>
<tr>
<th>ore</th>
<th>min</th>
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<tbody>
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<td>4</td>
<td>13</td>
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</table>

Azoto applicato per ettaro (kg/ha):

Salva

| 20 |

Cancel
GesCoN DSS: the communication with the farmers

FARMER’S FEEDBACK

1. Feedback:
   - Sei soddisfatto dell’acqua fornita finora?
   - Seguente

2. Feedback:
   - Sei soddisfatto del fertilizzante azotato fornito finora?
   - Seguente

3. Feedback:
   - Come valuti lo stato attuale della coltura?
   - Precedente
   - Seguente

4. Feedback:
   - Raggio [cm] della superficie circolare bagnata, dopo 2 ore dall’intervento
   - Data dell’intervento a cui si riferisce la misura:
   - 12/09/2018
   - Precedente
GesCoN DSS: the communication with the farmers

Other information provided by the DSS in the daily communication

Information on the crop status

<table>
<thead>
<tr>
<th>Dati coltura:</th>
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<tbody>
<tr>
<td>Stress termico 0%</td>
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<tr>
<td>Stress idrico 0%</td>
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- Ciclo: 17%
- Acqua: 50%
- Azoto: 81%

The list of all irrigations and N applications

<table>
<thead>
<tr>
<th>Storico interventi:</th>
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<tr>
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<tr>
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<td>4</td>
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<td>5</td>
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<td>6</td>
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<td>Tot</td>
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</tbody>
</table>
Severe thunderstorms
hail
strong winds
GesCoN DSS: 2018 demonstration trials - preliminar results
<table>
<thead>
<tr>
<th>Farm</th>
<th>Total (Mg ha⁻¹)</th>
<th>Refuse</th>
<th>Marketable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farm A</td>
<td>84 84</td>
<td>53 51</td>
<td>31 33</td>
</tr>
<tr>
<td>Farm B</td>
<td>170 174</td>
<td>125 119</td>
<td>45 55</td>
</tr>
<tr>
<td>Farm C</td>
<td>219 214</td>
<td>189 182</td>
<td>30 32</td>
</tr>
<tr>
<td>Farm D</td>
<td>211 209</td>
<td>180 172</td>
<td>31 32</td>
</tr>
<tr>
<td>Farm E</td>
<td>180 188</td>
<td>149 139</td>
<td>31 32</td>
</tr>
<tr>
<td>Farm F</td>
<td>165 163</td>
<td>136 136</td>
<td>29 30</td>
</tr>
<tr>
<td>Average</td>
<td></td>
<td></td>
<td>31 32</td>
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</table>

* No information provided
Conclusions of the demonstration activity

- A real comparison is difficult because farmers were affected by the DSS suggestions even in the comparison plot;
- The use of the DSS GesCoN has allowed 24% of water saving;
- No substantial differences observed in the amount of N fertilizer, but no limitations were set in this experience;
- Farmers don’t want to manage much daily input data;
- They require only clear and simple information;
- Age, education and a minimum of training of farmers are key factors in following a DSS;
- In a DSS management, mobile phones are excellent tools for a two-way communication;
- Further results on fruit quality are in progress.
Thank you for your attention

gescon.altervista.org