Research and development of soybean cultivation in Flanders (Belgium)

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Session B – Practical experiences of developing soya cropping in Europe

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22.06.2016 België importeert 0,35 procent van wereldproductie soja

In 2014 werd er wereldwijd 308 miljoen ton soja geoogst, waarvan amper 0,6 procent in de Europese Unie. De belangrijkste procijn zijn de VS, Brazilië en Argentinië. Be
in 2014 netto 690.000 ton sojaschroop sojaolie en 193.000 ton sojabonen in
sojabonnequivalenten gaat het in t
1,064 miljoen ton sojabonen of 0,35 procent
van de wereldproductie. België is voor 50
afhankelijk van de import van eiwitbronnen
voornamelijk soja, van buiten de EU. Vooral de inmenging van koolzaadschroot, een rest

Vlaamse overheid
BEMEFA
APFACA

0.1 Engagementsverklaring
Dit actieplan kaderd in een overkoepelend initiatief, namelijk de engagementsverklaring van minister-president Kris Peeters en BEMEFA, de Belgische beroepsvvereniging van mang
op 25 februari 2010 ondertekenden met betrekking tot maatschappelijke

Vilt

3.06.2016 Nieuw actieplan zet verder in op
eigen eiwitbronnen

Na een positieve evaluatie van het eerste Actieplan Alternatieve Eiwitbronnen hebben de Vlaamse overheid en de Beroepsvvereniging van de Mengvoederfabrikanten (BEMEFA) beslist om een vervolgtraject uit te tekenen. Het streven
van dit tweede actieplan blijft om te komen tot

Vilt

13.10.2016 Soja-import groeit ondanks steun voor vlinderbloemigen

Uit gegevens van de Europese Commissie blijkt dat de Europese Unie in het seizoen 2015/2016 in totaal 14,6 miljoen ton sojabonen importeerde. Dat is 13,2 procent meer dan het vijfjarig gemiddelde. Daarnaast werd ook 19,9 miljoen ton sojaas geimporteerd, of 2,6 procent meer dan gemiddeld. De stijging is toe te schrijven aan de
extra vraag vanuit de diervoedersector en de relatief lage prijs van soja. Tegelijkertijd is de

0. Inleiding
Physiology of the soybean plant and impact on cultivation conditions in Belgium

- **Important for climatological conditions in NW Europe**
  - Low soil temperatures during germination process
  - Sensibility for frost in spring (emergence not before 10-15th of May in light soils)
  - Temperature during flowering period (end of June – beginning of July)
  - Symbiosis with N-fixating soil bacteria
Soybean cultivation in Belgium ?- SWOT

**Strengths**
- Low input of fertilization
- Low input of chemicals
- High protein content
- Optimal protein quality (favourable amino acid composition + high digestibility)
- Valorization of all seed components
- Closing local nutrient cycle

**Weaknesses**
- Early maturing varieties required
- Necessary inoculation with rhizobia
- Susceptible for Sclerotinia
- Sensibility for frost in spring
- Susceptible for lodging
- Unknown crop for Belgian farmers
- Few chemicals registered in Belgium
- Profitability unknown

**Opportunities**
- Strong demand for non-GMO protein
  - For feed: intensive livestock production
  - For food: presence of human food manufacturers
- CAP => 3rd crop in rotation
  - Many specialised dairy farms/pig farms with less than 3 crops in rotation

**External**

**Threats**
- Land use change: soya replacing maize and cereals
- Volatility of prices
- Negative connotation with GMO
Soybean research in Belgium

Strategy at ILVO

Breeding

Optimizing cultivation

Yield

Quality (f.e. protein and oil content)

Sensibility for diseases

Early ripening

Sensibility for lodging

Profitable culture?
Soybean research in Belgium

Flemish research project (2013-2017) (together with KU Leuven and Inagro)

- Focus:
  - Screening early maturing varieties of European catalogue
  - Optimal inoculation with N-fixating bacteria
  - Efficiënt N-fertilization
  - Crop Protection (f.e. homologation of crop protection products, development of bio-assays for screening towards disease susceptibility)
Soybean research in Belgium

Strategy at ILVO

Breeding

Optimizing cultivation

Flemish research project \textbf{(2013-2017)} (together with KU Leuven and Inagro)

- Focus:
  - Optimal row distance and plant density
  - Study of the cost-effectiveness
  - Supporting early adopters
  - Informing farmers
- Co-operation with the Netherlands (WUR, PPO, Agrifirm)
What about germination capacity of seed lots?

• Field conditions after sowing: low soil temperature
• Need of a germination test to predict field emergence
• Comparison of 2 tests: ISTA (1 week 25 °C) and cold test (2 weeks at 7°C followed by 1 week at 25°C) (cold test = comparable with those for maize)
• Comparison of 2 sowing data (early and normal)
• 33 seed samples tested (from 28 varieties)
What about germination capacity of seed lots? - Results

• ISTA:
  • Average germination is 87 %
  • Only 45 % of the seed lots germinate > 90 % (in comparison with other crops like flax is this very low = 100 % > 90% germination)
  • The % of seed lots with low germination (< 70%) is restricted

• Cold test:
  • Average germination is 81 % (6 % lower than ISTA)
  • Only 39 % of the seed lots germinate > 90 % (in comparison with other crops like maize is this very low = 97 % > 90 % germination)
  • The % of seed lots with low germination (< 70 %) is 20 % (1/5 !!)
What about germination capacity of seed lots? - Results

Comparison early and late sowing

• Only seed lots with > 90 % of germination in the cold test germinate well in the field, both after early (13th of April) or normal sowing (7th of May)

Conclusion:

• Verification of germination capacity of soybeans: cold test better than ISTA for prediction field emergence
• High seed quality (> 90 % germination in cold test) = best guarantee for good field emergence even under difficult conditions
• Up to 20 % of seed lots with low germination (< 70 %): attention point for seed companies
Yield trial results

• All graphs presented are based on mean values over years and over locations
• Inoculation trials and seeding density represent mean values of 2 varieties
• Further analysis of data is currently under process
### Variety trials (2012-2016)

- 32 varieties from EU-catalogue screened

<table>
<thead>
<tr>
<th>Moisture content at harvest (%)</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>32,7</td>
<td>27,0</td>
<td>24,5</td>
<td>13,7</td>
<td>17,3</td>
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<tr>
<td>Minimum</td>
<td>13,5</td>
<td>16,4</td>
<td>17,6</td>
<td>9,6</td>
<td>13,5</td>
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<td>Maximum</td>
<td>65,7</td>
<td>47,4</td>
<td>44,1</td>
<td>20,8</td>
<td>33,3</td>
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</table>

<table>
<thead>
<tr>
<th>Seed yield (kg/ha; 85% DM)</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
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<tbody>
<tr>
<td>Mean</td>
<td>2814</td>
<td>3148</td>
<td>2966</td>
<td>2979</td>
<td>4983</td>
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<tr>
<td>Minimum</td>
<td>1220</td>
<td>1481</td>
<td>1491</td>
<td>2032</td>
<td>3200</td>
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<tr>
<td>Maximum</td>
<td>4185</td>
<td>4242</td>
<td>4910</td>
<td>3928</td>
<td>6472</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Protein content (%)</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td></td>
<td>40,5</td>
<td>36,3</td>
<td></td>
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</tr>
<tr>
<td>Minimum</td>
<td></td>
<td>35,2</td>
<td>30,8</td>
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<td></td>
</tr>
<tr>
<td>Maximum</td>
<td></td>
<td>48,0</td>
<td>42,1</td>
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</tbody>
</table>
Inoculation trials (2014-2015)
N-fertilization trials (2015-2016)

Seed yield (kg/ha; 85% DM)

Moisture content at harvest (%)
Row distance and seeding density (2016)

Seed yield (kg/ha; at 85% DM)

Seed density 50 k/m²
Seed density 65 k/m²

Moisture content at harvest (%)
Bioassay for Sclerotinia

• Development and optimization of Sclerotinia bioassay
• 15 varieties evaluated ranging from highly susceptible to moderately tolerant
What is the situation at farm level?

• Farmers
  • Early adopter farmers involved in research project + experience - feedback important for further development of project and introduction in practice
  • 20 ha in 2016 (cfr. 140 ha in the Netherlands in 2016)

• Setting up of demonstration platforms in 2017 – co-ordination ILVO
  • 3 locations (in different agricultural regions)
  • Guidance for the culture + information on website
  • Co-operation with agricultural centers and farmers
How introduce soybeans in different types of farm exploitations?

- Soybeans in function of the type of exploitation:
  - *Arable farming*: culture for “dry beans”
  - * Farms with cattle*:
    - Culture for “dry beans” (necessity of heating)
    - Culture for “silaging of whole plant” (alone or together with maize – grass))
  - *Legumes in the field*: culture for “fresh green beans”

- More diversity of crops in framework of GAP

- Climate change: more possibilities for “subtropical” crops in NW Europe
Conclusion

• Prospects are positive
• Still to work on some remaining bottlenecks
  • Culture for dry soybeans:
    • Stability of yield over the years: to improve
    • For cost-effectiveness need of higher yield (4,5 – 5,0 tonnes/ha): to realise by breeding and optimization of cultivation parameters
    • Need for logistic support for buying seeds for the farmers, harvest, cleaning and conservation
    • Processing for feed and food: capacity is available in private companies
  • Culture for ensiling: still need of more knowledge of process of ensiling and combination with maize / grass – research at ILVO + other institutes
  • Culture for fresh green soybeans: necessity of knowledge of the most adapted varieties: research at ILVO
• **Finishing:** 2016 was a bad year for the farmers in Flanders (Belgium) but not for soybeans
  - A lot of water problems end of May – beginning of June: *no negative influence on early growth of soybeans*
  - Drought + high temperature from Augustus till September: *positive effect on ripening + very low disease pressure*
  - Result: *very good yields – much better than expectations* in 2016 – to be confirmed next years

• **Break through must be possible within 2 years**