Self grafted plants (cv. Oriente)  

Ungrafted plants  
(cv. Rajado, standard traditional cv.)
Material and methods

- Plant spacing: 0.3 m between plants; 2.0 m between rows.
- Planting: 11 March 2015; 1st harvest (commercial pods): 56 DAP.
- 2 harvests/week ending at the end of July.
- Grafted plants: 2 stems/plant; self grafted, ungrafted: 1 stems/plant.
- It was recorded:
  - the number of DAP at which the 1st flower and the 1st pod occurred
  - the length, fresh and dry weights of the pods
  - pods diseases and defects and nutrient content (N, P, K, Ca, Mg and Fe).
## Experimental layout (3 repetitions)

<table>
<thead>
<tr>
<th></th>
<th>R1</th>
<th>P101</th>
<th>O3</th>
<th>P2O2</th>
<th>RR1</th>
</tr>
</thead>
<tbody>
<tr>
<td>001</td>
<td>P2R1</td>
<td>P3O2</td>
<td>P3R3</td>
<td>R2</td>
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<tr>
<td>P1R3</td>
<td>P1O2</td>
<td>RR2</td>
<td>O2</td>
<td>P2O1</td>
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</tr>
<tr>
<td>P3O3</td>
<td>P3R1</td>
<td>003</td>
<td>P1R2</td>
<td>P2R3</td>
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<tr>
<td>RR3</td>
<td>P2O3</td>
<td>P3O1</td>
<td>P1O3</td>
<td>P3R2</td>
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<tr>
<td>O1</td>
<td>P1R1</td>
<td>R3</td>
<td>P2R2</td>
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</tbody>
</table>
Preliminary Results

The crop development was similar for the rootstock P3 and for the ungrafted plants, as well as for rootstock P2. The 1st flower and 1st pod appeared at the same time and earlier when compared to P1 and self-grafted crop treatments.
Preliminary Results

The higher pod length was found in the P3 and was similar to the P2, which was not significantly different compared to the other crop treatments. The mean pod length is cultivar dependent: cv. Oriente has longer pods (17.0 cm pod$^{-1}$) than cv. Rajado (14.0 cm pod$^{-1}$) which is a standard traditional cv.
Preliminary Results

- For the cv. Oriente (O) rootstock P3 produced a higher yield when compared to the P1, P2 and ungrafted plants, with no sig. diff. with the self-grafted plants.
- No sig. differences were found between crop treatments for cv. Rajado (R).
Grafting runner bean seems to be an appropriate strategy to increase crop tolerance to soilborne diseases caused by *Fusarium* spp. and nutrient deficiency, mainly for higher yielding cultivars such as cv. Oriente.

The plants grafted onto the “Feijão 7 anos” rootstock (P3) had higher yield, probably due to higher tolerance to these conditions for the scion cv. Oriente.

For the cv. Rajado further investigation is still needed to evaluate the effects of rootstocks P2 and P3.
A similar experiment (with the same crop treatments) was conducted in a commercial greenhouse at the littoral North region. Results analysis are in progress (experiments finished in August) but we expected similar results for both cvs.
Parallel Experiments

Growth chamber pot experiments are being conducted to evaluate the resistance/tolerance to *Meloidogyne javanica* and to *Fusarium oxysporum f. sp. Phaseoli*, with different genotypes.
Resistance/tolerance experiments with different genotypes:

- **Phaseolus vulgaris**
  - standard traditional cvs. (Rajado, Tarrestre, Bencanta, Bragançano);
  - commercial cv. (Oriente).
- **Phaseolus coccineus**
  - Portuguese landrace cv. (Feijão 7 anos);
  - South America landraces selected by the nursery A&F, Pt;
  - commercial TZ cvs. (Aintree, Snowstorm, White Emergo).
Future Prospects

• **We are finding some promising genotypes to use as runner bean rootstocks, based on their resistance/tolerance to soilborne diseases and on the effects on plant growth and development and fruit quality.**

• **Results from growth chamber and greenhouses experiments have to be combined in order to find out the best scion/rootstock combinations.**
Runner beans is a major protected crop in Portugal and in many areas the intensive production systems led to the biotic and abiotic problems that impair crop production.

Recently the crop began to benefit from grafting and we believe that improved rootstocks can overcome the main constraints in different production regions, for both soil production systems and hydroponic systems to increase nutrient uptake.

For organic production grafting is also a very good crop protection and increased nutrient uptake strategies.
Thank you for your attention