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For quality of life

Visit to All Green, 05 November 2014.

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Introduction

The beginning of November is in Egypt the start of the winter period, characterised by night temperatures below 16 degrees Celsius. These low temperatures will halt plant growth up to early February. The visit to All Green was aimed at checking on the plant condition at the onset of the winter period, in an attempt to ensure an optimal condition of the crop.

The visit was arranged by the project leader Anne Elings and visiting specialists were Chris Blok (soil and plant nutrition) and Ruud Maaswinkel (sweet pepper cultivation). Persons met were Hussein Hassan, Mohamed Desokay, Aly and Mohamed (staff) and Dr. Hosni Abdelbaky (TET advisory). The visit took place on November 5 and visits were paid to All Green and the nearby Domcy company.

Situation All Green

At All Green we found a crew busy harvesting yellow and red pepper. Export was already organised with the first shipments under way. A screen installation crew was finishing the plastic screen. Climate was pleasant as the sky was slightly overcast. The crop looks generally well, though short and plants are producing a proper quality of exportable product.

Specific remarks:

1. The irrigation water storage had EC 2.4 and pH 7.2. A sample has been brought for analysis.
   i) This is so saline as to cause Blossom End Rot.
   ii) This has already affected about 15-20% of the fruits with BER, as EC 2.5 was already used since some three weeks ago and as therefore the salt is present in the in the soil.
   iii) This will affect an increasing number of fruits in the next four weeks.
   b) The irrigation storage is covered by algae. Algae cause clogging, diseases and high pH / bicarbonate. A quick test showed pH 8.2 on stirring (outgassing CO_2 is raising pH). Covering the basin reduces algal growth.
   c) The storage is supplied from two alternatingly used wells, one with EC1.1 and one with EC2.4.
   d) 300 users are served, mainly orchards which accept EC 2.4.
   e) The EC is neither checked nor refused by All Green on or prior to delivery.

2. The irrigation supply and nutrient dosing system is down. A technician is expected to visit the farm on 15 November to fix the problem.
   a) In the greenhouse we measured EC/pH of various places along one row of yellow pepper 6 soil samples were brought for analysis of nutrients and possibly nematodes:

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i) EC 2.4 pH 7.8. EC is acceptable, pH is too high. Hosni's advice of 5.4 mmol/l ammonium is right in this light: the high ammonium supply will lower the pH on the root surface allowing for uptake of trace elements Fe, Mn, Zn, Cu, B at a pH otherwise too high.
ii) EC 5.8 in dry spots;
(1) Dry spot = evaporation = accumulation of nutrients and salt.
(2) The dry spots are spread unevenly in the greenhouse.
(3) Dry spots coincide with poorer growth. Spots cover 10-20% in yellow, 5-10% in red.
(4) Dry spots partly coincide with irrigation lines too close together / too far from the plants.

3. Fruit load was excessive for small plants, on big plants the fruit load is better. The heads of small plants typically are dark green in the top leaves (i.e. not brighter in the top than in leaves below).
iii) 25% small plants with >2 fruits are not growing at all (30-40 cm height).
iv) 25% larger plants with >4 fruits are not growing sufficiently fast either.

4. Heating is not considered (for the entire winter season). 6-7 kilogram is not enough to pay for diesel which increased 70% in price compared to last year. The price for pepper within Egypt crashed because the smallholders are over-supplying. Price for export is holding 8-12 Euros per 4 kg box.

5. The plastic screen was still not in. When we were there the screen was being brought in. Night T below 16 °C stops growth effectively. T was below 16 degrees during the last week. The screen is supposed to buy one month of extra growth at both the start and the end of the winter. This means two months extra (although reduced) which is about 1 kg/m^2 on top of 6 kg/m^2 without additional mistakes (and 2 kg on top of a 12 kg/m^2 yield level).

(Please note that the expected effects on yield are estimates only.)


Plastic screen


Light screen


Small plant too much fruit


Bad spot

6. The light screen was closed while it could have been open all day (normally closing at 500 W).
b) 1% light is 1% yield. The screen takes about 50% light so 50% less yield this day.
c) The screen cannot open for the inferior wire system is broken.
d) When closing at >500 W the additional light sum is 200 J/cm^2/d on a 1600 J/cm^2/d day; 12.5% extra yield.
e) 12.5% extra yield on 5 kg/m^2 is 0.6 kg. On 10 kg/m^2 it is 1.2 kg. On 12.5 kg/m^2 it is 1.4 kg.

7. The soil has spots with nematodes. No cure during growing is possible. When changing the crop, Chloropicrin is the only legal chemical. The effect is not 100%. Steam sterilising is slightly better but not permanent and too expensive (5-8 gas-m^3 equivalents to reach 100 degrees 70 cm deep for 1 hour). For the long term (2-6 years) nematodes are the end of greenhouse growing in soil (world wide experience). Either new soil or substrate growing need to be considered.

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Nematodes on roots


Nematode affected plants

8. Ruud and Chris brought slow sulphur burners for 220 Volt to be used in the night for the treatment of mildew. These could not been tested as the power in the greenhouse is off due to a short circuit. Mohamed waits for the technician, which, in our view, takes too long considering the needs of the crop.

Situation at Domcy

1. Visiting a nearby farm showed a pepper crop planted at the same date (July 2014). This provided valuable information on what a realistic expectation for this crop and region is. The main results were:
    a. Seasonal production up to now roughly 2 kg now versus 0.2 for All Green.
    b. Plants 120 cm versus 80 cm for All Green.
    c. Plants homogeneous 1 in 100 versus 1 in10 for All Green.

The main organisational lesson is to use function specialists:

    d. One for measuring, scouting and disease management;
    e. One for nutrients and irrigation;
    f. One for cultivation, harvesting and organising labour.

The main cultivation prerequisites:

    g. Low quality irrigation water EC 1.4. Irrigation EC = 2.5, i.e. nutrient supply is 1.1 EC.
    h. Homogeneously prepared soil.

The grower has 25 year experience. Dr. Hosni claims several other farms produce at this level (7 kg/m^2 no plastic screen, only net screen).

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2. On the nearby farm there was also a cultivation of sweet pepper planting April 2014.
    a. This was also a culture in the soil. Number of plants/m^2: 3.3, two stems/plant.
    b. During the cultivation there were troubles with spider mite. That is why that the lower leaves were removed from the plants. This is not very reasonable (we question this measure).
    c. The production till the beginning of November: 6 kg/m^2. Till the end of December the production will be 8.5 – 9 kg/m^2.
    d. In January the greenhouse will be cleaned. After that disinfection with chloropicrin against nematodes
    e. The new cultivation will be planted at the end of March 2015.

Lessons and approach

The discussion gives rise to quite a lot of measures. To facilitate ranking measures to be taken as discussed above we use an effect estimation system as shown in the Table below. This is a first attempt to quantify and rank measures for the Egyptian circumstances. Although the quantitative effects need to be confirmed (preferably by Egyptian experimentation) it is arguably the best available tool at present to focus actions.

Table 1: Quantification and ranking of measures for sweet pepper at All Green.

Issue	**Growth effect**	**Measure**	**Estimated single total yield effect**	**Total yield from**	**Total cumulative yield**
			% of	**kg/m2**	**kg/ m2**
Situation to avoid	***0***	***No measures***			***3.5***
Poor structure spots	-50% yield on 30% of the area[*1]	Soil tillage and furrows	15%	0.6	4.0
EC/salinity water	-30% by losing fruits with Blossom End Rot [*2]	EC<0.5 not 2.4 dS/m	30%	1.2	5.2
Too high fruit load	No growth during nov-dec-jan = 30% of total growth[*3]	Leave less fruit on the plant	30%	1.6	6.8
Nematodes out	+5% when done -15% when not done[*4]	Chloropicrin	5%	0.3	7.0
Situation to target	***Yield level for fixed screen without light screen and no plastic***				***7.0***
Mobile Light screen	12.5%[*5]	Movable screen	12.5%	0.9	7.9
Plastic screen (high greenhouse)	10%[*6]	In on time, 4 hours a day open	10%	0.8	8.7
Heating	20%[*7]		20%	1.7	10.4

[*1] 50%*30% = 15%
[*2] 15% loss per EC point
[*3] 3 months in a 9 month season taken as 30%
[*4] When not treated nematodes take -15% a year (-30% after two years). At present not all area is affected.
[*5] 1% light = 1% yield. The screens takes 50% light for 4 hours a day. When closing at >500 W the additional light sum is 200 J/cm^2/d on a 1600 J/cm^2/d day; 12.5% extra yield.
[*6] We expect 3 weeks extra growth at the beginning and end of the winter (15-20% yield) but growth is about half so 10% is expected.
[*7] An estimate based on Egyptian experiments.

The sum of the effects is larger than the single effects as the effect rises with increasing yield level. Thus eventually and with highly skilled personnel (no changing crews) 15 kg/m^2 is expected as a very challenging but eventually possible outcome (in a zero mistakes season).

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Some more general remarks

1) The table is a novel tool for Egyptian circumstances. It may be used but needs to be adjusted with new knowledge. The table may be discussed and improved with partners and growers on meetings in February.
2) The supply of water serves 300 growers. Perhaps there are enough greenhouse growers to consider central treating (Reverse Osmosis) and delivery. Companies such as Hoogendoorn (or Witteveen & Bos) might be interested to automate and deliver (and even operate) such a system.
3) General greenhouse cultivation and management skills are not widely available nor shared if they are. There is a lot to be gained by offering short technical courses for greenhouse managers and staff. A local training centre could act as a catalyst for improving knowledge but also encouraging participants to learn from each other and to learn by visiting each other.
4) The gradual introduction of substrate growing to avoid diseases and improve water use efficiency can be facilitated more easily from a local training centre.

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