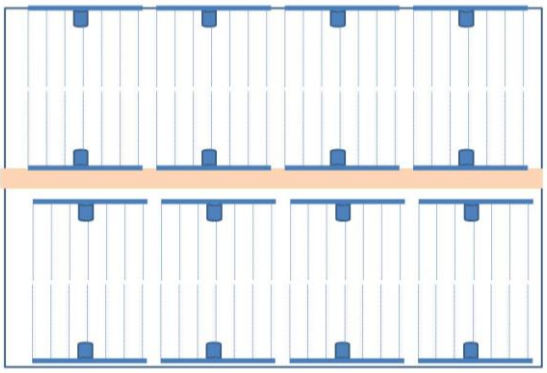
Greenhouse AllGreen

Greenhouse. Owner Husain Hassan (husseinzidane@hotmail.com), extension advisor Dr. Hosni Mohamed, (TATconsultation@yahoo.com), grower Mohammed Desoky (Mohammed.desoky@yahoo.com).14000 m^2; 9750 m^2 sweet pepper red Strike (Enza), 5100 m^2 sweet pepper yellow Deniro (Enza). Screen deck with a plastic deck below. The plastic deck is removable in summer to reduce heat. Hot air is created by diesel heaters and distributed by plastic foil tubes.


Heating. The heating capacity per heater is … (check). Heating usage was said to be 11 l diesel per m^2 which is probably the total usage and relatively low because of a 7 week period in which the heaters could not be used due to electricity that was unavailable. Diesel tank contains 60.000 litre. Usage is about 400 litres per day for 14000 m^2, which is 0.3 l/m^2/day for a period of 35-40 days. Diesel burns at 36 MJ/l and gas at 32 MJ/m^3. Supposing Egyptian diesel is not the best we are talking about 0.3 m^3 gas equivalents/d and 11 m+ gas per m^2 in total. Heating was started at 18 degrees (start value, set point value, realised value; check). Heating started at the beginning of December and stopped mid-March. From mid-January on the heating system was down for 7 weeks.
Actions:

- Check heating capacity per heater
- Check realized heating set point
- Check diesel usage per m^2
- Recommend to have a generator for back up, or choose variety that does not suffer cold periods.

Cultivation system. 3.1 plant per m^2 with 2 stems per plant i.e. 6.2 heads per m^2. Labour planning was to treat all plants every 10 days by hanging them in the wire and taking side shoots. Up to 25 cm (or was it 10 cm?) below the top no young fruits are allowed by the grower. The grower's strategy was to leave three leaves on pinched lateral shoots with pruning. to increase leaf area but at the moment many more leaves were there (labour is quite far behind schedule). Many plants were slumping out of the wire support. The wires may lose some tension as the iron support wires are bending with the weight of the plants (are problems position related? Check). They use a system with wooden sticks to increase wire tension when necessary. Milk is used to prevent the spreading of virus. Presently 60% is harvested in colour to have harvested as much as possible before the prices tart to decline as a result of the production from unheated screen houses. The shape of the fruits is very variable; flat, pointy and round. Pointy is related to too low night and diurnal temperatures..

Actions:

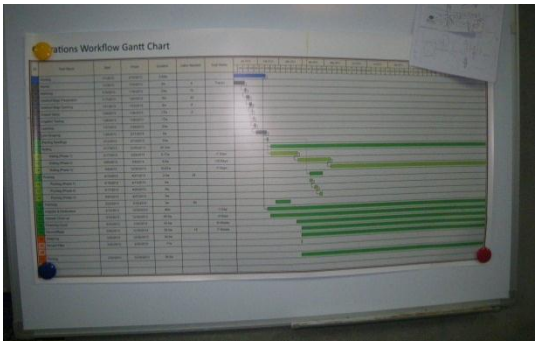
- Strengthen wiring
- Recommend pruning strategy and checks if prunig is done accordingly
- Recommend temperature settings based on realisation of climate.

Climate computer. The climate computer was not set to store data so historic analysis is not possible. Hortimax will be asked to use team viewer to start data collection and allow us to share data (check). Besides that the crop responsible, Mohammed, will have to export data regularly and sent them to WUR (check).

Actions:

- Ask HortiMax to enable data storage
- Export stored climate data to WUR
- Make a team viewer connection

- Send crop and production datas to Wageningen UR (Wageningen UR makes a list)



Substrate and water. BvB (Bas van Buuren) coir slabs of 1 meter in length are used. Plants are planted directly in the slabs without using a propagation block. Water supply is 600 cc/m^2/cycle. Red receives slightly less than yellow though yellow received longer cycles. With 7-8 cycles a day this is 4200 cc per m^2/d.. Drain in red is 20-30% and for yellow 5-10%. 1 drain measurement for 6 plants per colour. Supply was checked with a dripper. Cycles start on radiation every 300 J. Irrigation is allowed to start 1 hour after sun up and stops 3 hours before sun down. No clear signs of nutrient disorders. Incidentally a head shows Mn / Mg like deficiency symptoms. Mohammed said the heads were breaking easily. Check for possible causes and include the chances of having a very high turgor in the morning by low EC in the supply compared to EC in the slab. The nutrients were mixed according to recipes by Dr Hosni. Costs water 0.35-0.5 EP (increasing prices).

Actions:

- Check actual water supply in Hortimax computer?
- Is the irrigation adequate, or are improvements needed? Are 7-8 cycles sufficient on hot days?
- More fundamentally, should we somewhere in the future aim for irrigation based on slab water content?
- Check for possible causes of Mn/Mg like deficiency symptoms.
- Advise on re-use of substrate.

Cultivation. Planted 22 September. 5 kg/m^2 harvested and 12 fruits/m^2 on the plant. Expected end yield just below 10 kg/m^2. Propagation is in styropor trays with large square cells. In January heating was stopped for about 7 weeks which caused internodes

to grow really close together and disrupted fruit set and possibly shape. There is no check yet on the exact dates the heating failed. The crop will stop half June and replanting is scheduled for half July to be able to reach the market even earlier this year (half august would be the normal period).
Actions:

- What are the risks of early planting?
- What is the aimed production next season?

Pests and Diseases. We observed aphids and spider mite and presumably fusarium / pythium as roots around the lower stem were brownish. Dr. Hosni said there had been Tarsonemidae mites which caused deformations (weekhuidmijten?). White fly and aphids are problems before fruit set and mildew after fruit set. Spider mites are a spot related problems. Measures are spraying chemicals. Spider mite control may be improved by spraying better under leaves.
Actions:

- Recommend improved spraying techniques

Climate analysis. Heating is necessary in the winter to keep length growth and development rate. An unheated side row showed severely shorter plants. One heater showed a line of larger plants with poor fruit set. This may well be a problem caused by combustion fumes. Fruit abortion would be consistent with ethylene traces but Husain feared SO2 as Egyptian diesel is known to be very high in sulphur. We think a set temperature for heating is unnecessary and think the night temperature should be lowered in relation to day time temperature. This would save on heating and improve the crop.
The second deck (plastic) takes away quite some light. If the screen takes 40% and the plastic 20% the combined effect would be 40 + 0.6*20 is about 50%. This may well be limiting yield. We think the plastic deck may go as soon as heating is no longer necessary. This means the plastic could already have been removed.
Actions

- Recommend temperature management, using two goals: optimum temperature and minimum energy use.
- Measure light interception

Analysis root environment. Slabs are wet but not as wet as to loose water on squeezing. The particle size is too small for this system. A big advantage is the base dressing in fertilisers which comes with the slabs. This means that the start is good but it also means the supply EC must rise a bit later on.
The supply EC is now 2.5 and is sometimes lowered on radiation to 2.0. When we visited clean water was supplied of EC 0.9. The drain percentage is said to be 10-30% but one of the measuring units loses water at the back. Slabs are drained over the whole bottom by about 100 factory made 5 mm holes. All in all the nutrient supply is not too high (2.5 minus the clean water EC is 2.0-2.5 minus 0.9 is 1.1 to 1.6)
The support wires are attached to the slabs, pulling the slabs up and dividing them a little into three compartments per slab. This is not advisable but does not create big problems as the whole bottom is perforated. No slabs were opened to check on the total root system (Check). No dead roots were found from the side and bottom but Franks found dead roots on the stem base. Frank suspects the uneven crop results from root problems; I suspect the uneven harvesting of fruits and removing of side shoots. Probably both.

Actions:

- Check total root system.
- Recommend optimum EC

Crop Analysis. Crop treatments are much too much focussed on preserving fruits. This stops the length growth of internodes and frustrates light interception. We found up to 7 large fruits on one stem which is excessive. It unbalances the crop and creates inhomogeneity.

Actions:

- Manage towards better vegetative / generative balance

Conclusions. Improvements with potential for Egypt would be number 2-4:

1. Crop maintenance and plant balance (to increase yield: sufficient pinching and pruning in time.
2. Heating (costs): put down a table with night T depending on day T.
3. Deck (yield): calculate the right dates to put in and remove the plastic screen.
4. Substrate (costs): advice on disinfection, re use and re planting (in cubes).
5. Substrate (yield): registration drain and drain EC per day and analysing drain.

Company BioEgypt

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Company. 4-5 ha. Mostly flower crops for the Egyptian market. As this market is mostly gone at the moment he is cutting back on costs by leaving greenhouses empty, not spraying and going back to soil growing. Export of flowers only to Arabic countries.

Growing system and greenhouse for the experiment. Plastic greenhouses with screen on the side or with synthetic side panels and a pad and fan cooling system. Several greenhouses are equipped with heating systems (diesel burners with distribution of hot air). A lot of greenhouses had an interesting mist system used for cooling. All greenhouses could recirculate over the Hortimax unit but many were cut off from recirculation as substrate had been changed for soil again. The nutrients were mixed and solutions were checked by a female Dr. who came in every week to do just that. No adjustments were made for recirculation.
The part for a possible recirculation experiment would be two units of 5000 m^2. These include heating and cooling and recirculation. Roses would go out and be replaced by vegetables, possibly sweet pepper on substrate.
Actions:

- Discuss with HortiMax selection of test greenhouse



Flower cultivation. All crops looked basically well and healthy. Said, the main grower is capable and grows in soil and various substrates in systems which look like Dutch for. Anthurium, Calla, Cymbidium, rose son substrate and rose and chrysanthemum in soil. In chrysanthemum miner fly, aphids, thrips and consequent black mould were gaining a foot hold. In roses white fly was problematic. Roses were recovering after the cut back for mother's day. The rose crop was vegetative and very reddish as probably light levels were low and growth was strong. Light levels were said to be 20.000 lux inside in the winter and 60.000 lux inside in the summer (check). Production level was 150 to 200 flowers per m^2, for small to medium sized roses (check Nicky?).
Lily seemed to grow suboptimal but seemed the last lot in an otherwise deserted greenhouse i.e. non representative.
Propagation of rose Calla and chrysanthemum was done on wire tables. The Calla came from tissue culture and looked healthy and well rooted. The roses were inoculated by themselves and also grew well and rooted well. Chrysanthemum cuttings were a bit

uneven and slightly yellow in places. The grower explained this by the momentarily lack of Trianum. It seemed the present system is used well to the limits of the possibilities.

Actions:
- Check light levels
- Production levles

Cultivation vegetables
Tomatoes (last season) and now cucumber and courgette. Some beans for phytoseiulus production and outdoors potatoes and wheat. In the wheat (as in the calla) experiments on bio agents were performed, among which Trianum.
The cucumber was overloaded with fruit and had to many side shoots, even if they would take one side shoot for an extra head as indicated. Fruits were as low as to touch the ground for the first three fruits. As the wire is very low, they do try to harvest as many fruits as possible before going over the wire.
Courgette was grown in soil with furrow irrigation. Courgette suffered from virus which might be prevented by propagating and selecting the material prior to planting. Plants were not bound to the deck which might help to prevent topping over into the ditches. No pollinators or hand pollination were used.
Actions:
- Develop good cultivation practices.

Analysis rooting environment. Coir perlite mixtures are use in ratios from 20% (propagation) to 70% (large containers) of perlite. Grower Said knows the proper drain percentages (basically the amount of perlite is the drain %). Perlite is produced in Egypt out of rock imported from Greece. The quality is seen as second rate as the perlite pulverises very easily. The grade is good.
Actions:
- None

Biological crop agents. We visited the laboratories for bulking the microbial solutions produced in situ. High hopes were expressed for the Egyptian formulated BIOPLUS product which is a mixture of Serratia marcesens en Bacillus subtilis. The production is causing them to work the lab for 10-12 hours a day, mainly autoclaving. Storage is a big problem as the product only keeps working for 1-3 days. Bioplus contains *Serratia marcesens* and *Bacillus subtilis*.
Their top priority is to learn how to concentrate and improve the shelf life of Bioplus. This might be possible by binding the microorganism to a carrier (clay?) and cool the paste or to dry the mix to powder. They also need protocols on the proper revitalising the product with water and nutrients just before applying the material in the field.


In relation to Bioplus they also have a big interest in measuring (methods and protocols) quality and concentration of Bioplus; how much CFU are inside and how effective is it still.

We discussed the solarisation of soils (soil resetting). After the ban on Methyl Bromide they now use Chloropicrin and basamid. Not surprisingly problems with nematodes are quickly increasing, reducing yield with 40% easily. We think soil resetting is a potentially important technique for Egypt as they have the required temperature and organics material at hand and the required 7-10 day period still fits in their basic growing systems. They claim nematode are more of a problem in the desert. Dutch experience however is that nematodes are much more difficult to treat in clay soil (Delta) than in sands. Solarisation could solve problems for annual crops. In the Delta the problem for orchards cannot be solved with solarisation. Mahmoud was not very interested but the idea fits in his philosophy of promoting crop production in the Delta instead of building.

Actions:

- Develop protocols on the evaluation of microbial bioagents.
- Check with Koppert what products will be allowed in the near future on the market; what is the schedule here?
- Check with Dr. Mahmoud when Serratia is allowed on the Egyptian market.
- Explore options for experimentation with predators. In relation to this: is a conference to be timed this year?
- Explore options for soil resetting.

Conclusions: Improvements with potential for Egypt could be:

1. Recirculating water and nutrients (reduced emission, costs).
2. Advice for development of a screening method for Bio Control Agents.

   Other useful technology, that can be developed outside the project, is:

3. Testing soil resetting (yield, emission reduction, water quality)
4. Storage and quality system Bioplus (Egyptian industry, emission reduction).

General

Between now and the end of the season:

- Meeting in NL with HortiMax and Koppert
- Develop communication protocols
- develop a production + economic overview of the company: base line study
- Develop sequence of technology improvements for Egypt