Vegetables under shelters and green-houses

May 28 th to June 2nd, 2007

Mission by Paula FERNANDES
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Martinique, F.W.I.

- Schedule of the mission :

28th may 2007
- Arrival at Grenada Airport - 12h00am flight LIAT
- Taxi to Hotel GEM
- Telephone contact with Mr Daniel Lewis at the MOA
- Picking up Fred Salmon at Grenada Airport at 9 p.m.

29th may 2007
- 8h00am Courtesy visit to Mr Randolph Shiers and meeting with Mr Daniel Lewis at the MOA with Yvan Mathieu and Fred Salmon
- 11h00 am Visit at Maran nursery
- 14h00 am Visit at Mr Goodwin's farm (Grandville area)

30th may 2007
- 9h00 am Meeting at Grandville extension services with extensionists and farmers : talks and discussions
- 13h00 am Meeting with Mr Malachy Dottin
- 15h00 pm Visit at Mr Marlon Peters 's farm (Beausejour area)
- 16h00 pm Visit at Mr Malachy Dottin's nursery

31th may 2007
- 9h00 am Visit at Maran nursery
- 10h00 am Visit at Mr Lloyd's farm (Paradise/Grandville area)
- 14h00 pm Work at Maran nursery

1st june 2007
- 8h00 am Technical purchases for Maran nursery in St Georges
- 9h00 am Work at Maran nursery
- 14h00 pm Meeting with Daniel Lewis, Yvan Mathieu and the Cirad team.

2nd june
- 6:00h am Departure to Martinique Arrival 10:00h am Flight LIAT

- Objective of the mission

Technical information and advices given to technicians and producers.
Brief survey of the evolution of vegetables under shelters or greenhouses since 2005.

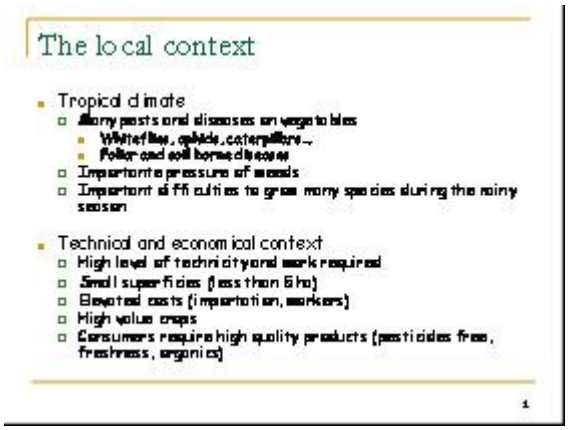
The meeting with Mr Daniel Lewis gave us more details about what was expected from the mission. The major themes of local interest for the training were defined :

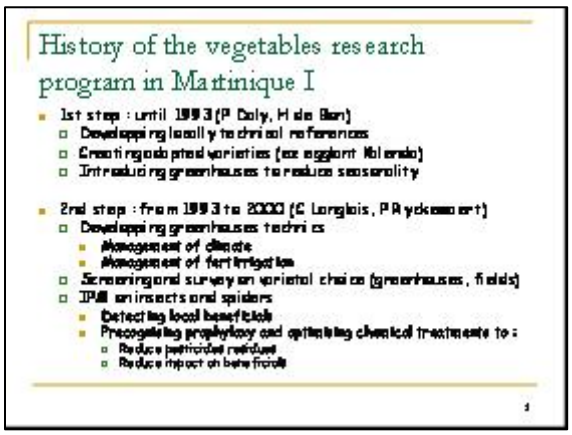
- management of climate under shelters or greenhouses
- integrated pest management including soil borne diseases
- experience and results on organic agriculture
- perspectives and new research program for the next years

Unfortunately, an organizational problem mobilizing all the technicians during 2 days the same week conduced us to have only one morning available to talk with them about all these points.

Meeting with the technicians and producers at the Grandville extension services

The first speech presented the history of the research on vegetables in Martinique to give an overview of the available results.





Actual and future project (E Wicker, P Fernandes, B Rhino)

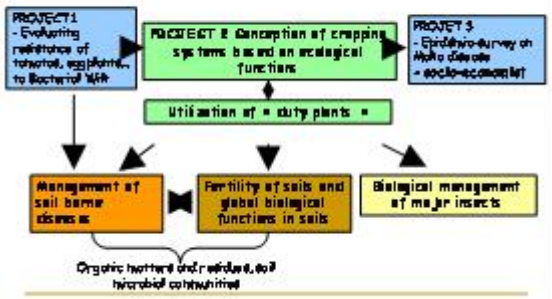
- Developping organic/agroecological alternatives to manage
  - Soil borne diseases
  - Soil fertility
  - Insects
- To be able to purpose new and adoptable cropping systems without chemicals
  - No pesticides
  - No fertilizers

Cropping systems based on local ressources (plants, beneficial insects, organic matter)

Management of soil borne diseases

- Improve epidemiological knowlegde on bacterial wilt of vegetables
  - Means to follow bacterial populations in water and in soils
  - Studying the impact of banana-vegetables rotations on the development of bacterial wilt
- Interactions between « duty plants », crops and BW
  - AIM : cleaning the soil by using suppressive plants in association and/or rotation

Perspectives 2007-2013



Soil fertility and biological functions

- Impact of « duty plants » in cropping systems
  - Impact biological functions of soil (N offer to crops, microbial biomass...)
  - Impact on microbial communities related to soil borne diseases
    - Functional microbial groups
    - Indicators of soil suppression
  - Adaptation to local conditions
    - Agronomical adaptation
    - Acceptability to new cropping systems
- Re-use of local organic matters and residues in the cropping systems
  - Biochemical characterization
  - Mineralization kinetics (N offer)

What kind of « duty plants » ?

Agroecological management of insects

- Promoting biological control by local populations of insects by managing the plant populations
  - Studying the whole interactions in the ecosystem
    - Knowledge on local entomofauna
    - Identifying local hosts for beneficials
  - Managing the populations of « duty plants »
    - Cultural technics
    - Management of « habitats »
      - Selection of plants
      - Spacial and time management of these plants

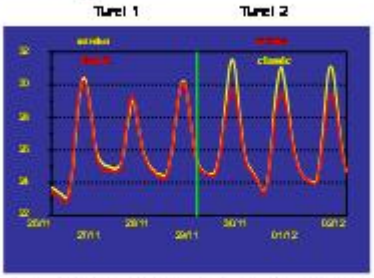
After this statement, the discussion was open concerning :

- the results obtained in Martinique,
- the main difficulties of vegetable crops in Grenada concerning climate (rainy season), main pests and diseases,
- the points of experience of most interest for the audience leading to a second statement (see above, text in Spanish but speech in English) dealing about the management of climate under greenhouses, the presentation of different kind of equipments and infrastructures available.

Resultados de investigaciones sobre el manejo del clima bajo invernaderos en Martinique

Christian Langlois
Paula Fernandes
CIRAD-FLHOR
Horticulture

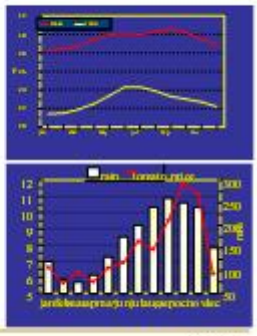
Plasticos mejorados



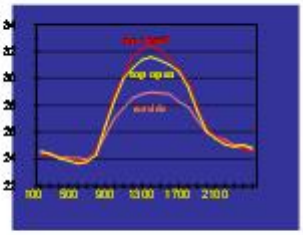
- Beneficio medio 1°C (entre 0 et 2°C) : reflejo parte de los IP y ondas verdes (quema participan la photosynthesis)

Contexto climatico de Martinique

- Temperaturas elevados (medio annual 26 °C)
- Humedad importante todo el ano (medio annual 80 %)
- Riesgos de huracan : cada 9 anos ; annualmente vientos fuertes de mas de 100 km/h
  - Tuneles metalicos
  - Cobertores plasticos



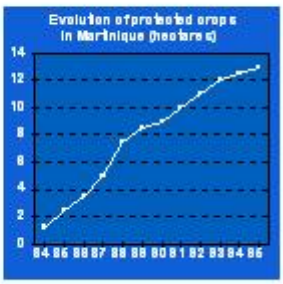
Aeracion en la cumbre



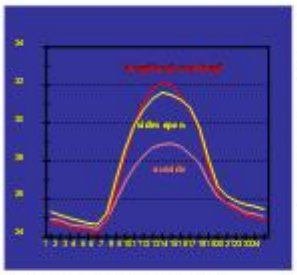
- Reduccion de temperatura entre 1y 2°C

Evolucion de la superficies bajo techos

- Rapido crecimiento entre 1984 y 1995
- Disminucion por causa de
  - Problemas de manejo de insectos y acaros
  - Parasitismo telurico
    - Ausencia de rotaciones
    - Ausencia de desinfection del agua de riego
  - Emergencia de
    - Virosis (TYLCV,PVMV)
    - Aphelenchoides besseyi
  - Falta de capacitacion

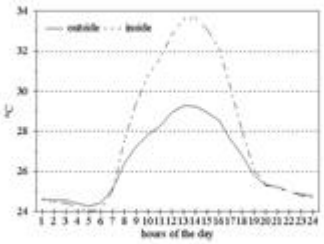


Aeracion lateral y ventilacion forzada



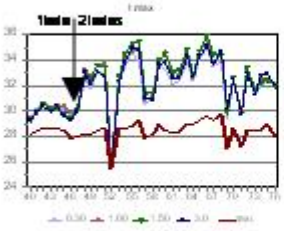
Ventilacion natural mas eficiente

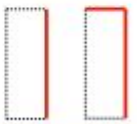
Diferencia de temperatura entre el exterior y bajo el techo



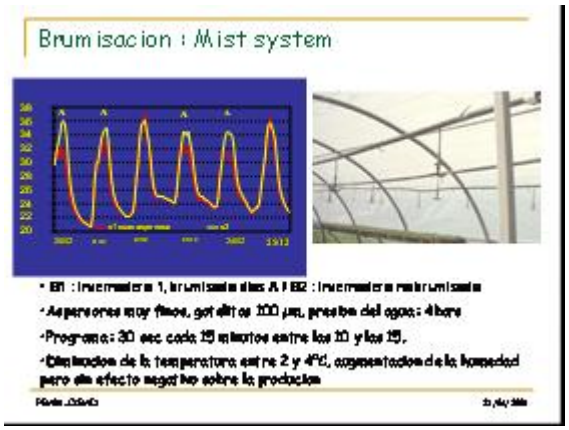
- Aumento entre 4 et 5°C bajo techo bien ventilado (2 lados abiertos)

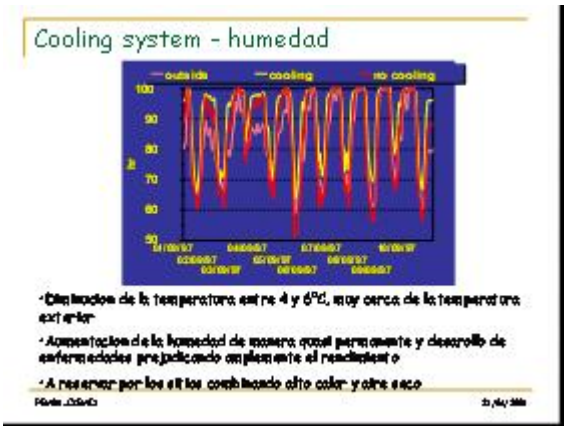
Aeracion lateral

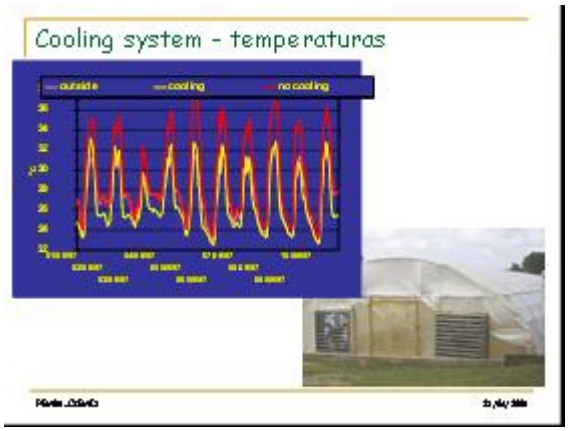


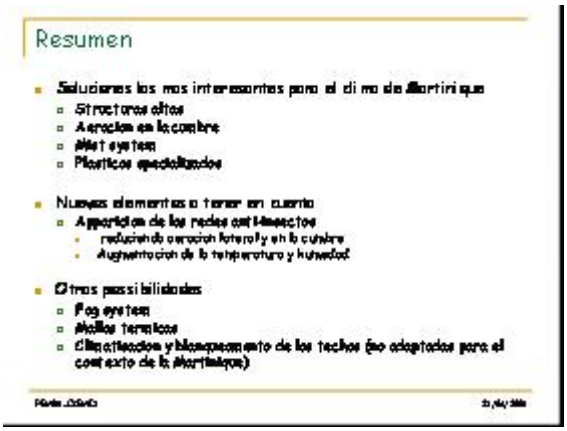


1 lado : temperaturas mas altas de 2°C
2 lados : temperaturas aumentan de 4 a 6°C









Other points of exchange dealed about :

- the comparison of several types of opening and consequences on the climate. Conclusion in the frame of Martinique.
- What is the experience in greenhouses in Grenada ? It seems that there's an important lack of experience about this concern in Grenada. Producers and extensionists are in demand on knowledge about many points concerning the choice of the material, the structures and the management of the crops.
- quality of water and management (diseases and bacterial wilt)
- varietal choice. For example, the tomato variety Caraibo is in decline in Martinique because it's too sensitive to the new bacterial strains of bacterial wilt
- what breeding program is performed in F.W.I. ?
    - seeking combined resistance to bacterial wilt and viruses. INRA is involved in Guadeloupe in this frame and there are collaborations with Cuban teams too.
- Grenada is developing grafted plants (tomatoes and eggplants) for interests in vigour and resistances
- the experience in Martinique shows that nutritional aspects and fertilisation plans need to be revised and controlled for better adequation between the offer and the demand from the plant. Simple tools like field kits of foliar analysis, pH meters and diseases diagnosis kits can be developed for extension officers. Some material is presented.
- A guide of foliar interpretation has to be implemented in Grenada

At the end of the meeting, books and leaflets presented during the introductory statement are given to the four extension centers and to the audience.

Activities, observations and work done at Maran nursery will be described in the report of Yvan Mathieu and Fred Salmon.

Details on the different sites visited

William Goodwin's farm (East Coast) include a consequent coconut plantation that could produce substrat for the Maran nursery and large fields of vegetables : tomato, okra and watermelon.

General observations : Soil well worked before plantation. Low presence of weeds (only in the plantation line) due to a localized irrigation (T-tape) combined with dry climatic conditions. Many insects (pests and beneficial) observed in the three fields, included in the younger one (young tomatoes) : whiteflies, aphids, bugs, ants, ladybeetle. Tomato plants (Heat Master variety) very small, probably the nursery sells plants after 10 or 15 days that is too young. Tomato plants need to be get more vigour before plantation, an age between 3 or 4 weeks in individual pots is recommended.

White flies, aphids and labybeetle eggs on a weed near the tomatoes

Ladybeetle on a weed near the watermelon

A quick test on nutritional status of the tomatoes shoes that nitrates (2400 ppm in fresh sap) are covered at about 75% of the needs while potassium (8400 ppm in fresh sap) is twice the recommended concentration in the plant. These elements, in combination with the presence of many whiteflies (that could contaminate these very young plants with a major virus like TYLCV) and the fact that calcium was never expanded in this field could explain the fact that those plants show difficulty in growing after plantation. A pulverisation of soluble calcium could be done as an emergency treatment to get a quick response from the plant. In a second time, a liming of the soil will be the only way to get a better result.
The same test done on the watermelons shows an equivalent deficiency in nitrogen (nitrates 2500 ppm in fresh sap) and a slightly excedentary level in potassium (5500 ppm for a recommended maximum of 5000 ppm).

The unique fertilizer used is 14-9-21, available because recommended in the banana production. The producer never had soil analysis on this farm and would like to get like tools to manage its crops.
Plants are produced by a nursery but probably sold too young concerning the tomato plants.

Mr Marlon Peters' farm (near Beauséjour)

The producer was absent during the visit and there were very few present crops (lettuce under the shelter). This producer received a shelter from USAID at the end of 2005 but we observed many associated problems :

- concerning the shelter :
  - the chosen model could be improved : the way rainy water is collected can lead to excess of water on the crops under the shelter. This gutter system is not
  - that happened already and the gutter has been replaced but the initial problem seems to be an irregular slope in the shelter leading to this accumulation of rainy water in the middle of the gutter
- concerning the preparation of plantation bed : the work, done manually on this heavy soil leads to a very coarse structure, inadequate from plantation of vegetables
- lack of irrigation material under the shelter conducing the producer to irrigate the lettuces with home water with a garden hose, not adequate for that kind of crop and cultivation under shelter
- the lettuce plants present under the shelter were transplanted too deeply
- the fertilizer is applied before the plantation of the lettuce but the dosis is difficult to estimate

Shelter presenting a deficiency in collecting rain

Soil worked manually showing a very coarse plantation bed

Mr Malachy Dottin's nursery

The structures are well done and optimized in superficie. Many type of plants are produced : tomatoes, lettuce, sweet pepper, cabbage, parsley, orchids….

Substrate is recycled after being heated (see picture), procedure that can provide a partial disinfection. Then organic matter from plant residues is added and Pro-Mix is used with the substrate.

Plants look healthy, the irrigation system is in progress (a part is still irrigated with a garden hose but the aspersion system is taking more place in the system).
A quick estimation let think that about 800 000 plants can be produced every year.
A possible improvement could be to use bigger supports (bigger volume like 7*7cm) to produce older tomato plants (3-4 weeks old instead of 10-15 days).

Mr Lloyd's farm (Paradise, near Grandville)

This is a 2.5 ha farm where we have seen tomatoes, sweet potatoes, okra, pepper, squash, eggplants and, in the borders, some bananas, papayas and other fruits. This producer received from USAID two shelters from the same type than Mr Marlon Peters but the gutter wasn't furnished so Mr Lloyd covered himself one of the two shelters with a plastic.
As the others producers, he uses banana fertlizer 14-9-21. A quick test done on its tomatoes shows a sufficient level of nitrates in the plants (2600 ppm at this stage) and an excessive level of potassium (5 000 ppm instead of 3500-4000 ppm at this stage). Tomatoes show symptoms of virus like TYLCV.

Some plants show wilting symptoms but it seems that it doesn't come from a bacterial origine after a simple test in water. The management of irrigation could explain that symptoms during this dry period. Aspersion tubes were painted in white to reduce heatness in irrigation water and irrigation under shelters, realized with adapted T-tape required from the producer some arrangements because of water pressure.
Mr Lloyd complains about the difficulties to get soil analysis in Grenada and to get some support from agricultural services that don't have any tool for quick diagnosis on the farm. When he needs soil analysis he sends samples by himself in Trinidad or in Miami. The way he manages technical difficulties with personal solutions shows his dynamism and willingness to progress.

Conclusions

Some points of conclusion are similar with the survey done in ananas survey : the growers operate as individuals with limited collaboration with the extension services. A technical staff operates in MOA and in districts extension services in order to provide technical assistance.
In term of equipment, no organization nor central packing house has been implemented.

As far as vegetables are concerned, farmers have received very few technical training for correct management standards. No on going training and research activities contributed a lot to the problems.

Technicians of extension services are very interested in tools for on farm diagnosis that is a big expectation from producers too. Simple kits like the wallets used during this mission (Spectrum Technologies on www.specmeters.com) could be used to assess the nutritional status of the crops (at least nitrates for all crops and potassium for fruit vegetables) and adjust the fertilization quickly. Elisa kits for quick diagnosis could be used too to help identifying the main diseases. Technicians and producers would like to have, at least, some leaflets or booklets to help them recognize, on the farm, pests, beneficials and diseases that then could lead to a better utilization of pesticides. A training opened to technicians and producers, combining some therotical aspects and visits on farms about integrated pest management could be of great impact. Another suggestion would be to organize a soil analysis survey in the farms (centralizing the sampling and analysis procedure) to provide some recommendations for, for example, liming or organic fertilization.