Plan ECOPHYTO 2018 : reduce 50 % use of pesticides in ten years, if possible

- **Providing the tools to change practices and reduce the use of plant protection products :** a epidemiological surveillance network & a farm network to disseminate techniques;
- **Training for the safe use of plant protection products :** certification provided to distributors, advisers and users.
- **Research :** coordination for speedier innovation – specific Ecophyto funding for projects.
- **Indicators for monitoring progress on Ecophyto 2018 targets :** NODU (number of doses units)

Six years project (2012 – 2018) : the National Apple Network "Ecophyto Experimentation"

"Evaluation of innovative multi-site apple production systems, with the aim to reduce the use of pesticides"

- **Six partners** coordinated by Ctifl

La Morinière Station d'expérimentations — Inveniv — CEFEL — CEHM Centre Expérimental Horticole de Marsillargues — Station d'Expérimentation Arboricole Provence Alpes Côte d'Azur "La Pugère" — Ctifl

- **28 systems studied**

Type of the system	number	Varieties
Base	9	Gala, Fuji, Golden, Granny, Ariane
ECOPHYTO 1	7	Gala, Fuji, Golden, Granny
ECOPHYTO 2	5	Ariane, Crimson Crisp
AB = organic production	7	Ariane, Akane, Crimson Crisp, Opal

Questions at the begining of the project

With the aim to maintain the same yield and quality :

- Is it possible, based on the actual knowledge, to combine different protection techniques and tools to reduce the use of pesticides ?
- Is it possible to elaborate protection strategies by taking more risks, for a sustainable and competitive production ?
- Do we have products & techniques to limit the number of residues and the level of residues detections on fruits regarding the retailer demands ?
- Which are the innovations we can transfer to the commercial orchards ?

Different ways are studied

Plants	• Use of apple scab resistant varieties • What rule could have root-stocks ?
Protection against pests & diseases	• Nets against codling moth & other tortrix • Beneficial insects against aphids and mites • Apple scab management : reduce inoculum, risk model, product choice • Rain protection • Alternatives pre-harvest and post-harvest treatments
Spray techniques	• Fix spraying system on the top of the trees • Vegetation adapted treatments : volume and doses
Production management	• Mechanical thinning
Weeds treatments	• Alternatives to chemical herbicides
Organic production	• Application of the guidelines

Apple scab – risk prediction

- RimPro model "strategies"

Primary contamination	Between primary & secondary	Secondary contamination
At 80-85 % of the scab projections, apply Armicarb or limesulphur (stop). "Stop" treatments at 90 %. Results : contaminations were possible. Maintain a preventive strategy, but when the potential risk (RIM) > 300 treat again.	Follow potential risk on leaves and on fruits. If there is no risk on leaves, the decision should be based on the fruit risk. "Stop" position.	Treatments are repeated when leaves have scab and if there is a risk on fruits. Decision is based on OILB reference : 1%, 3%, 5% shoots end of June, July, August (sample of min. 200 shoots per system). Results : its possible to get up to 5% - 10% - 15% Type of products : Armicarb or lime sulphur.

- From **0 to 41 % reduction** of the frequency treatment indicator (IFT) depending of the year, the apple scab pressure and the sensibility of the apple variety.

Apple scab resistance varieties

- Strategy : treat only on main projections
- **Up to 70 % reduction** of the IFT fungicides compared to a "non resistance" variety

BUT :

- Powdery mildew protection (ex. Sulphur = "green" list) is needed.
- Situation where resistance is circumvented.

Rain protection against apple scab

- It's still at "experimentation stage"
- **from 85 to 91 % reduction** of IFT fungicides (2010 - 2015)
- For five years, very good results on Braeburn, Gala, but in a new planted orchard (Rosy Glow), apple scab came out from the first year (2015) and damaged 3 % of the fruits. Again in 2016 …
- Protection also again *Gloeosporium ?* Some results.
- Negative points : Powdery mildew and flyspeck & sooty blotch can come out. Specific micro-climat under the plastic cover, incidence on yield and fruit color. Irrigation management has to be adapted.

Codling moth protection

- Use of **granulosis virus** if the pressure is low or in combination with nets (Alt'Carpo)

BUT :

- Resistance situation.

- **Mating disruption : from 37 to 56 %** reduction of the IFT.
- Labor : time to place the dispensers (2-3 h/ha) ; control every 10-15 days (4-6 h/ha per year)
- Initial pest level : low to medium

- **Alt'Carpo** = nets around the orchard combined on the top with hail-nets
- **up to 75 % reduction** of the IFT insecticide.

BUT :

- not adapted to high codling moth pressure
- Incidence on wooly aphids and beneficial insects
- Nets should be closed before the beginning of the fly, but after pollination
- Costs (9000 – 12000 €/ha)

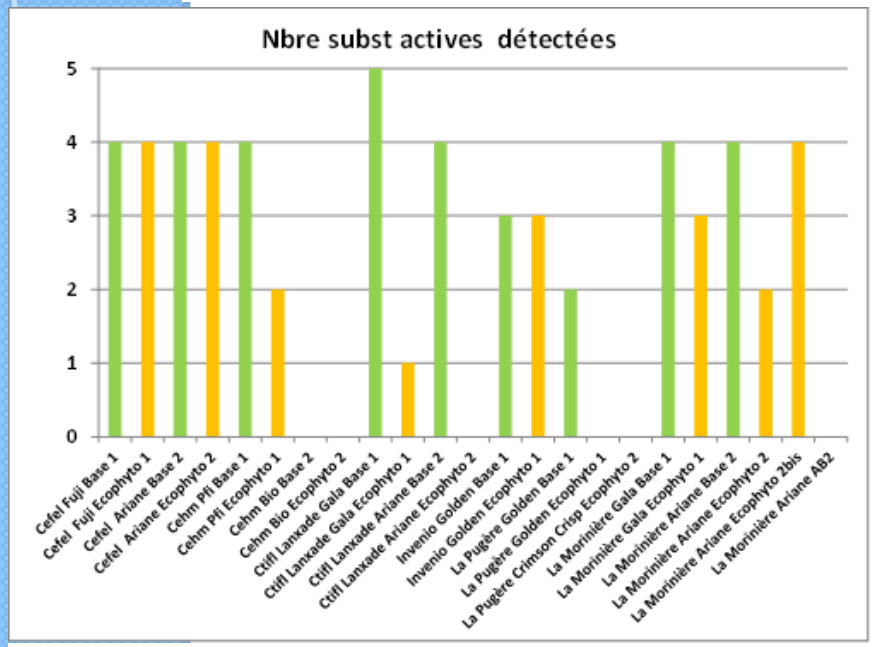
Rosy aphids / introduction of beneficial insects under nets conditions

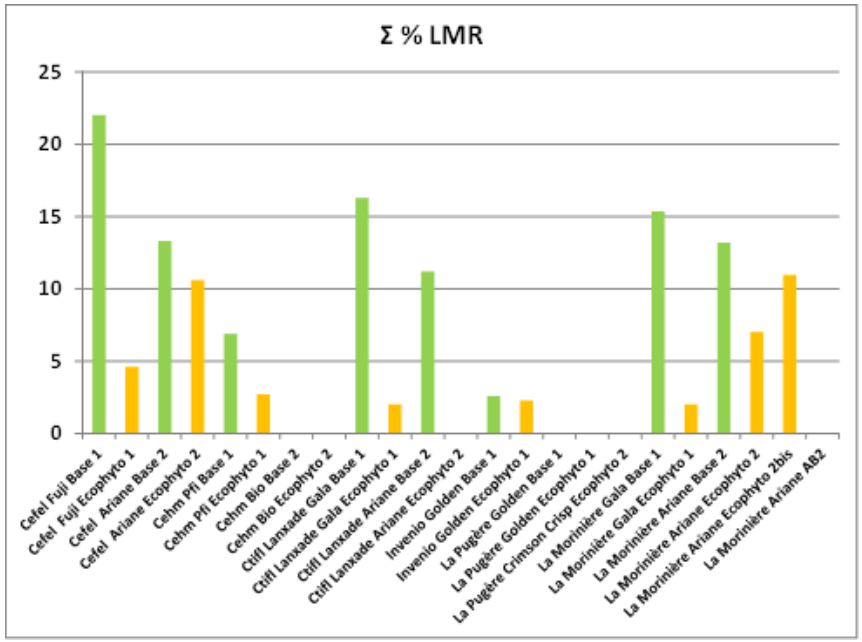
A predatory rule, but not sufficient :

- After 3 seasons, the biological control of rosy aphids with *Chrysoperla carnea* and *Episyrphus balteatus* alone seems not enough and the technic is complex and costs a lot.

- The results depend of various factors :
  - the climate conditions.
  - adequate timing between release and annual dynamic of the rosy aphids populations.
  - the balance between prey/predator.
  - the stage of the culture.
  - the use of some active substances.

Detected residues (2013-2015)





- Majority **between 1 and 4 actives substances** (1 or 2 case up to 5 or 6)
- **Fungicides :** Fludioxonil, boscalid, pyraclostrobine, dithianon, captane, dodine, dithiocarbamates, tébuconazole, cupper
- **Insecticides :** chlorantraniliprole, tebufenozide, thiaclopride, fenoxycarbe, phosmet, flonicamid, chlorpyriphos, acétamipride, spirotetramat, pyridabène
- **Almost all at 10 % of the MLR**, except dithianon at 11 %, cupper at 13 %, flonicamide at 14 %, dithiocarbamates 15 %, captane 20 %, pyraclostrobine up to 36 % of the MRL.

Annual evaluation of different indicators

- IFT (indicator of the treatment frequency) for fungicides, insecticides, herbicides, global. For chemicals and "green products".
- Turnover (yield x price/kg) & quality (sugar, acidity, firmness, juice)
- Number of hours of labour (manual & mechanised)
- Fuel consummation
- Quantity of actives substances
- Operational costs (pesticides, structure, other costs for protection)
- Mechanisation costs.
- Incidence on environment
- Sustainability of the production system.