

Mileos® is a **web-based, on-farm** DSS available to potato growers to control potato late blight (LB), in France. It results from a collaboration between ARVALIS and the Ministry of Agriculture (SRAL Nord-Pas de Calais). The 2 pre-existing DSS's (MILPV and Midi-LIS) have been fused, in 2009, into an optimized tool, entirely reviewed and up-dated in order to better meet national demand and help farmers to comply with EU regulations. With Mileos® (see www.mileos.fr), the fungicide application on potato crops is optimized, triggered according a real-time LB risk assessment taking into account environmental data (climatic and disease pressure), agronomical data such as cultivar's LB resistance and crop health practices for the potato field as chemical input and irrigation.

Mileos® : model description & action thresholds

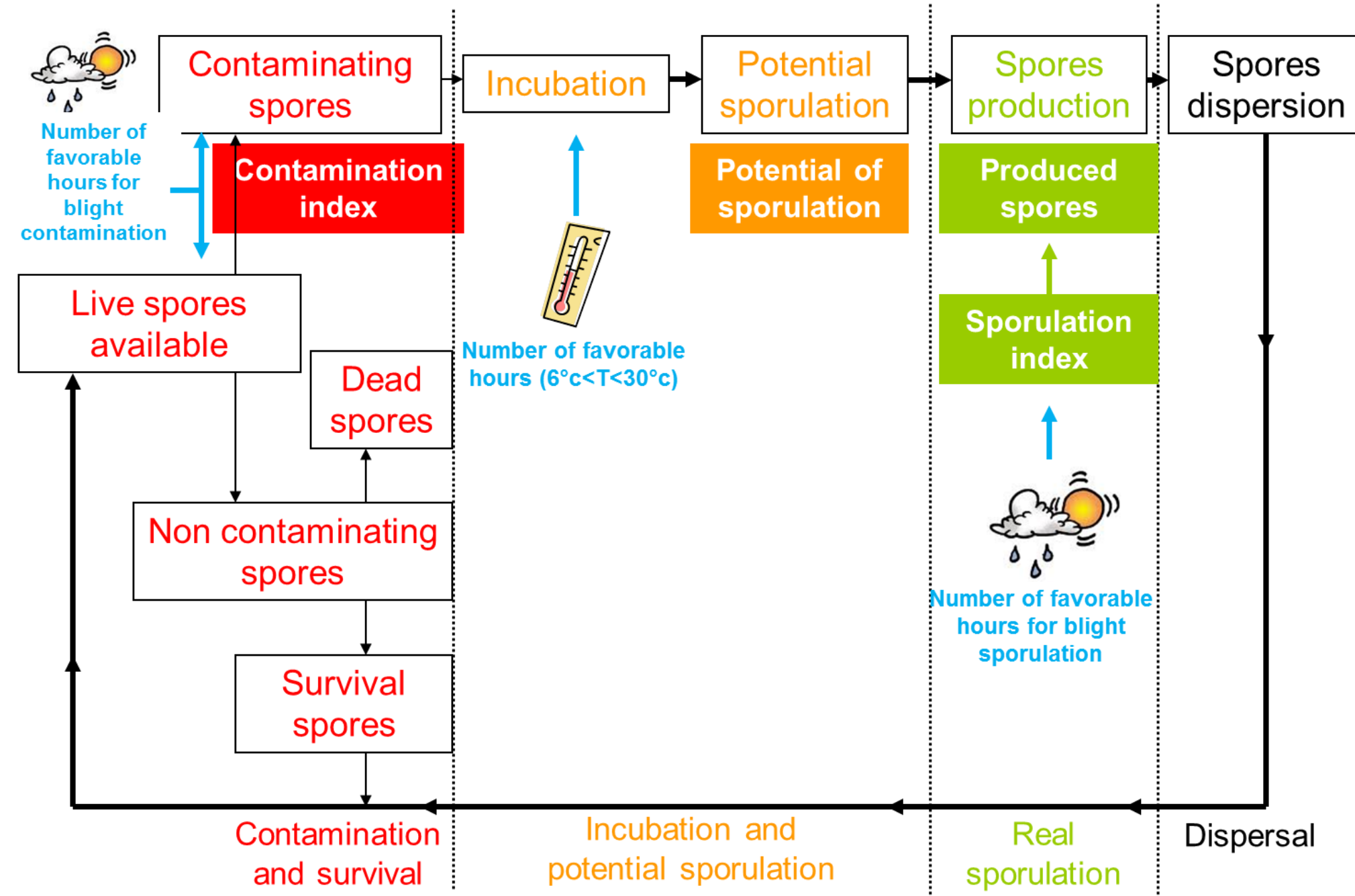


Figure 1: The Mileos® core unit is composed of 4 chronological modules based on the epidemiological cycle of *Phytophthora infestans* (inspired by Muckensturm, 1989)

Mileos® -**new version**- is an amalgamated model initially based on the epidemiological model Guntz-Divoux then implemented for hourly quantitative assessment of contamination index through the model Milsol by calculating the number of live spores available on the crop foliage. More recently, the fused model was revised and set up as **4 different compartments** (Figure 1) strictly simulating the different steps of a LB epidemiological cycle, from contamination to dispersal as well as the overlapping successive cycles. Required input variables are hourly temperature, relative humidity and rainfall. Additional environmental data (crop growth rate, cultivar, disease pressure, irrigation) are daily updated & contribute to the set up of action thresholds: treat or not, and what to treat with (Figure 2).

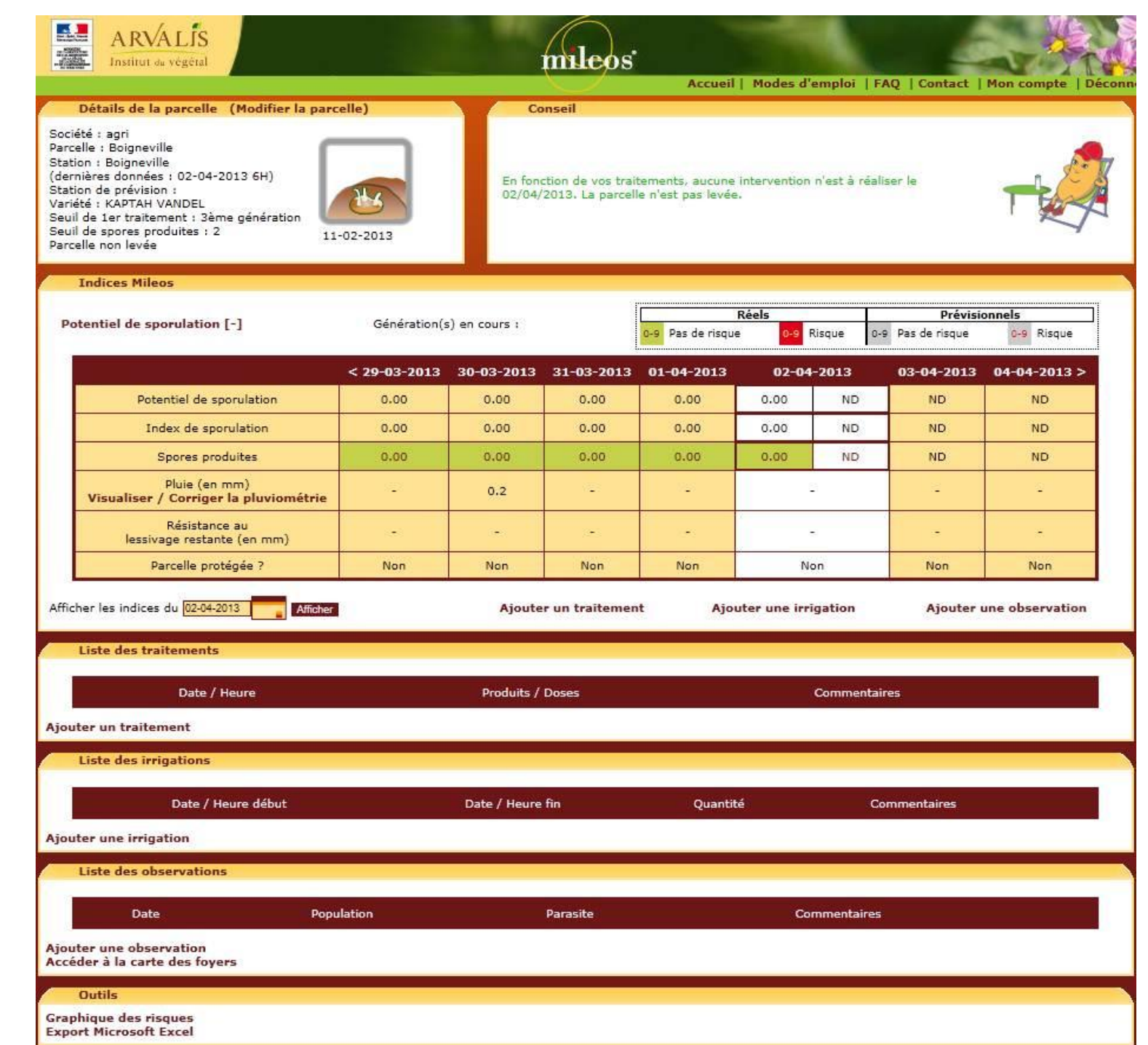


Figure 2: Screen-shot of Mileos® output with the different parameters, sporulation (potential and index), number of available spores

The most significant improvements ...

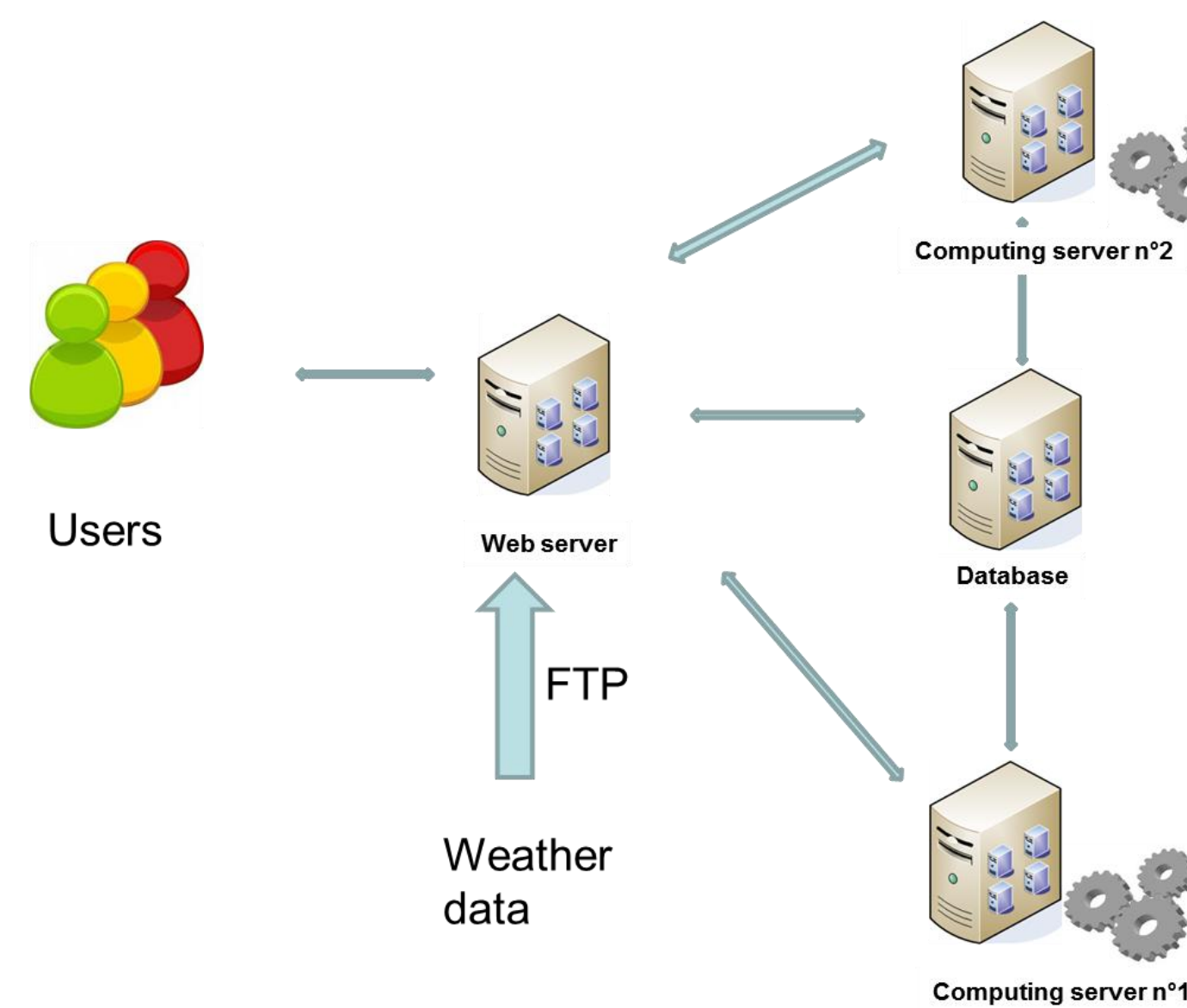
✓ for the core models

Comparative analysis of computed VS observed data for a continuous adjustment that takes into account :

- Genetic evolution (virulence & chem-resistance) of LB populations (Corbière, pers comm)
- Better quantification of primary inoculum sources (in progress ; Toky *et al*, 2012)
- Effect of low temperatures (6-8°C) on the germination of the spores taking into account
- Incubation length better calibrated according to temperature,
- More accurate value for "produced spores" for successive LB cycles
- Integration of cultivar resistance to LB, (updated European Catalog)
- Integration of weather forecast : + 3 days

✓ for the circulation of Information

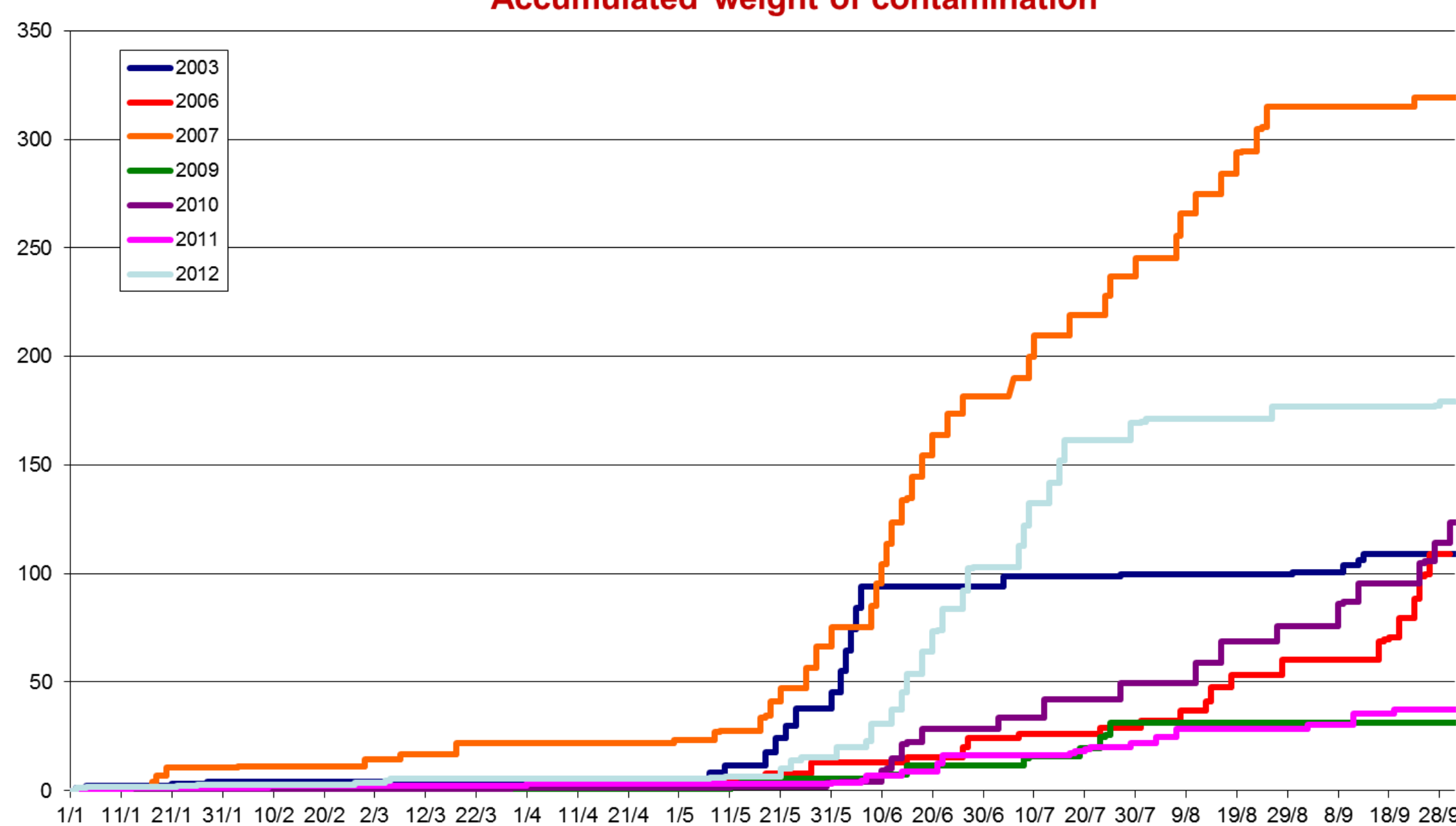
Thorough Redesign of the IT for an optimised transfer of the Information :



- 4 servers: 2 for computing, 1 for the database and 1 as web-server
- Met stations: most potato producing areas have a dense network of met stations, possibility of sharing and exchanging data
- Easy down loading of output data as Excel spread sheet (eg. summary of all treatments, met data)
- LB Risk Alert transmitted on new IT equipments: mobile, smart-phone etc

Mileos® : a tool to follow up LB epidemics

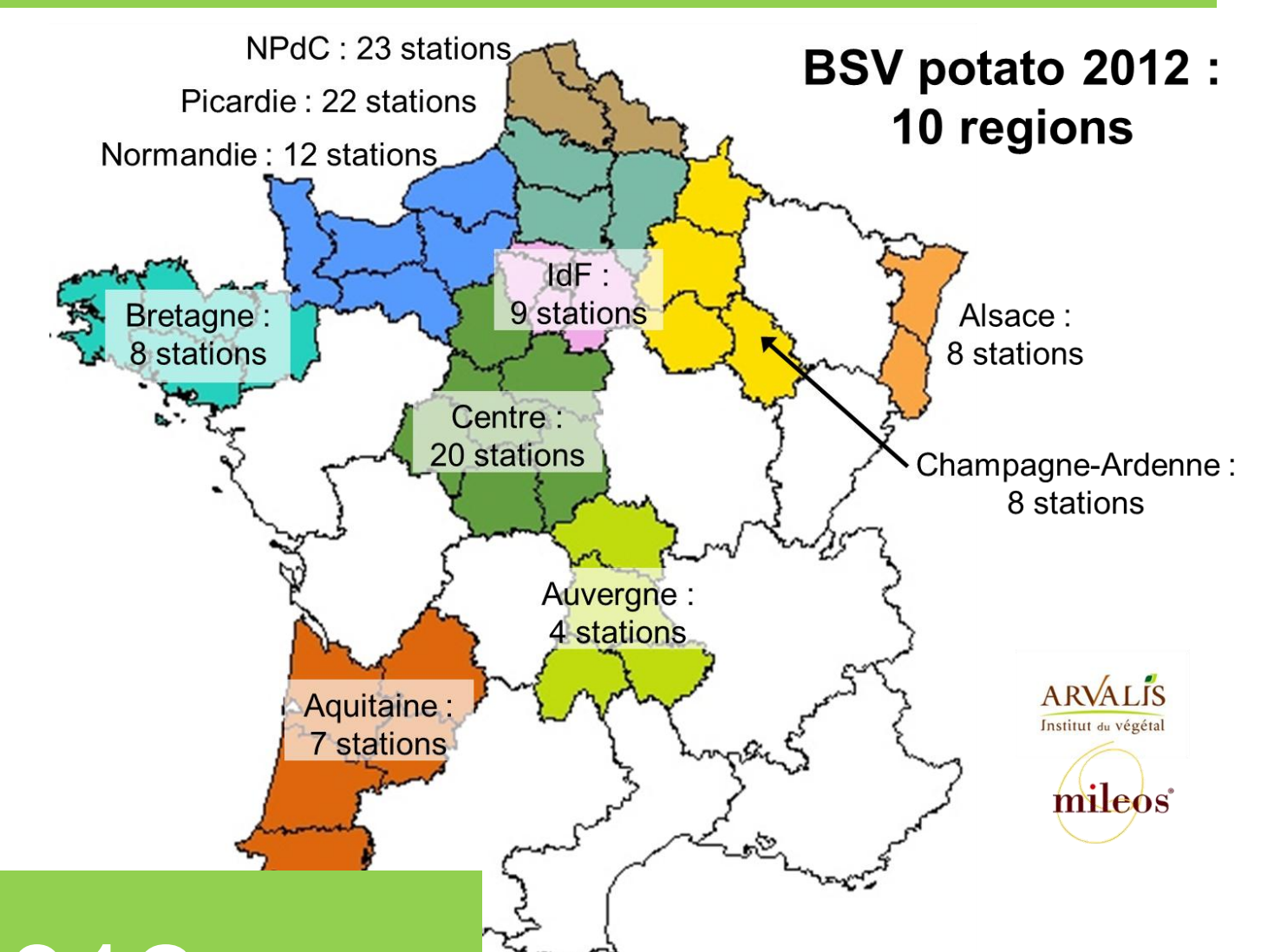
Figure 3 : Blight risk evolution in Boigneville 2003-2012 Accumulated weight of contamination



For a better understanding of environmental impact on LB epidemics, Mileos® is a very useful tool for comparing data (x=cumulated f(Log nb of spores)) over years and per site (Figure 3). The same data analysis can be performed to characterize LB epidemics in different sites in a given year.

Mileos® : a tool for the National Crop Surveillance - BSV

For this purpose, a **simplified version** of Mileos® is used as a weekly LB risk analysis giving LB alerts at the level of a region. No treatment recommendation is given. The criteria of the number of potential LB generations according local met data allows the comparison of disease progression between regions.



Some Figures for 2012

- In 2012, the total amount of connections ...
- for extension and technical teams, was ... **21**
- for individual potato growers, ... **410**
- **1380** different plots (field x cultivar x met station) were supervised, equivalent to ... **20.000 ha**, and representing all types of potato crops: earlies, fresh/ware, processing, starch and seeds; in most of the **potato growing Regions**: Nord-Pas de Calais, Picardy, Brittany, Beauce, Alsace and Champagne.
- The tool has also been recently experimented in Tunisia and Canada.

Mileos® is a sustainable tool for a sustainable control of potato LB. It has demonstrated its robustness and, as a DSS, is constantly tested, updated and adjusted according to the evolution of the biological environment as LB population genetic evolution (sexual reproduction, virulence or resistance to chemicals) or erosion of cultivar behavior to LB as well as according cultural practices or climate change. For these reasons, this device is in full agreement with the EU-Directive 2009/128/EC and fits in the National-French Ecophyto Plan Axe 2.