Creating tomorrow's technology together

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Challenges

addresses **5 specific issues** identified by **small farmers** dealing with an increasing **lack of water:**

- **Water resource management** – Reduction of water consummation

- **Crop yield and quality** – No more over- or under-watering

- **Crop durability and longevity** – Storage times and freshness

- **Trace the evolution of seasonal cycles** – refine annual predictions

- **Budget constraints** – Existing systems are too expensive!

Value Proposition

Action	Benefits
Optimization of water resources	Sustainable Development Financial
Quality and productivity optimization : Longer shelf-life for vegetable production. Better management of ground cover between vine rows. Amelioration of fruit production	Financial Work Organization Sustainable Development
Remote monitoring of needs in real time	Financial Work Organization
A flexible economic model adapted to different farmers	Financial
A reduction of treatments (phytosanitary, pesticides, etc.)	Sustainable Development Financial
Anticipation of the life-cycle of insects. Prediction of diseases and risks on vines, orchards, and aromatic plants	Financial

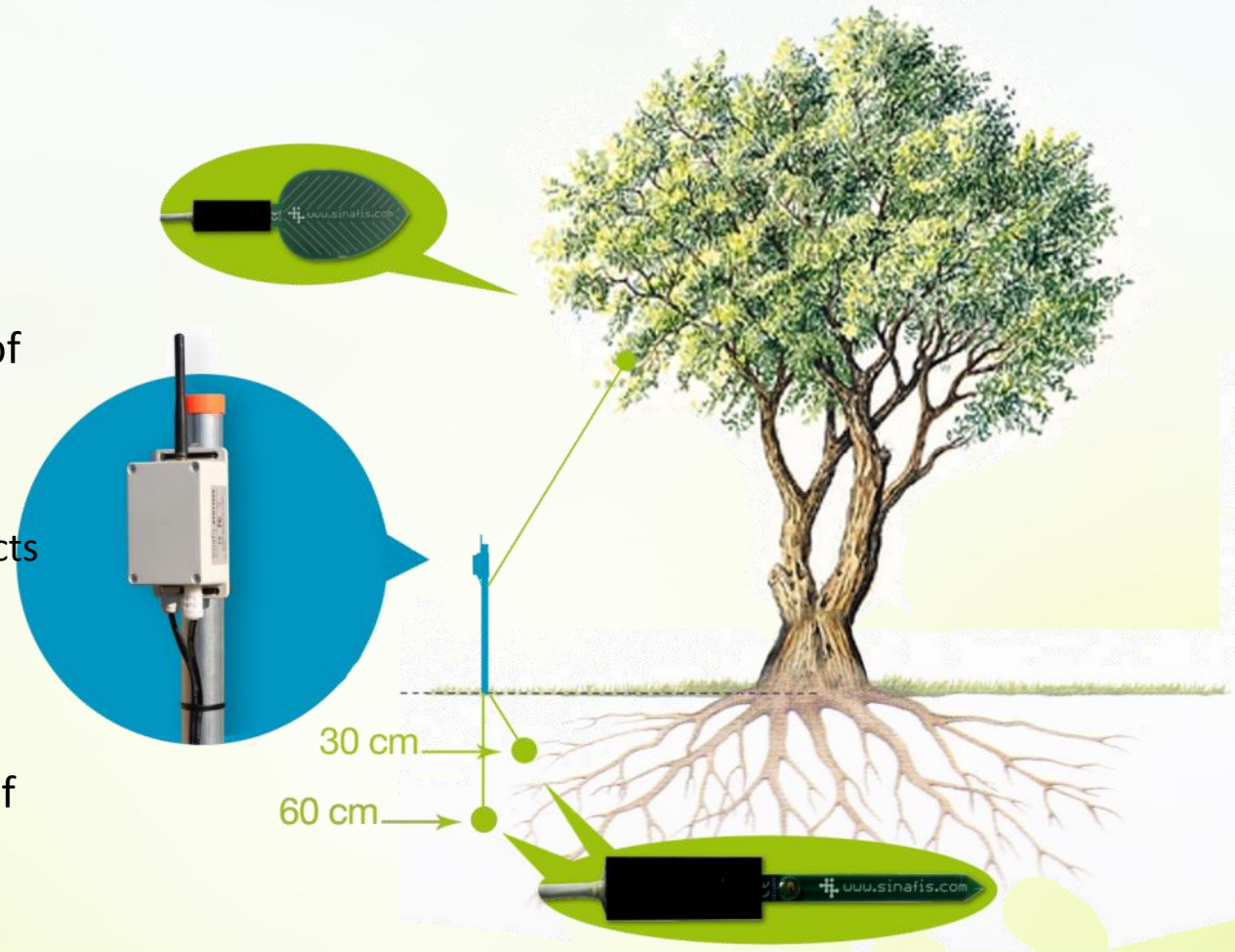
Cultures: Field crops (wheat, corn, soy, sorghum, etc.), vegetables, fruit trees, olives, vineyards, medicinal and aromatic plants, green spaces…

Use Cases

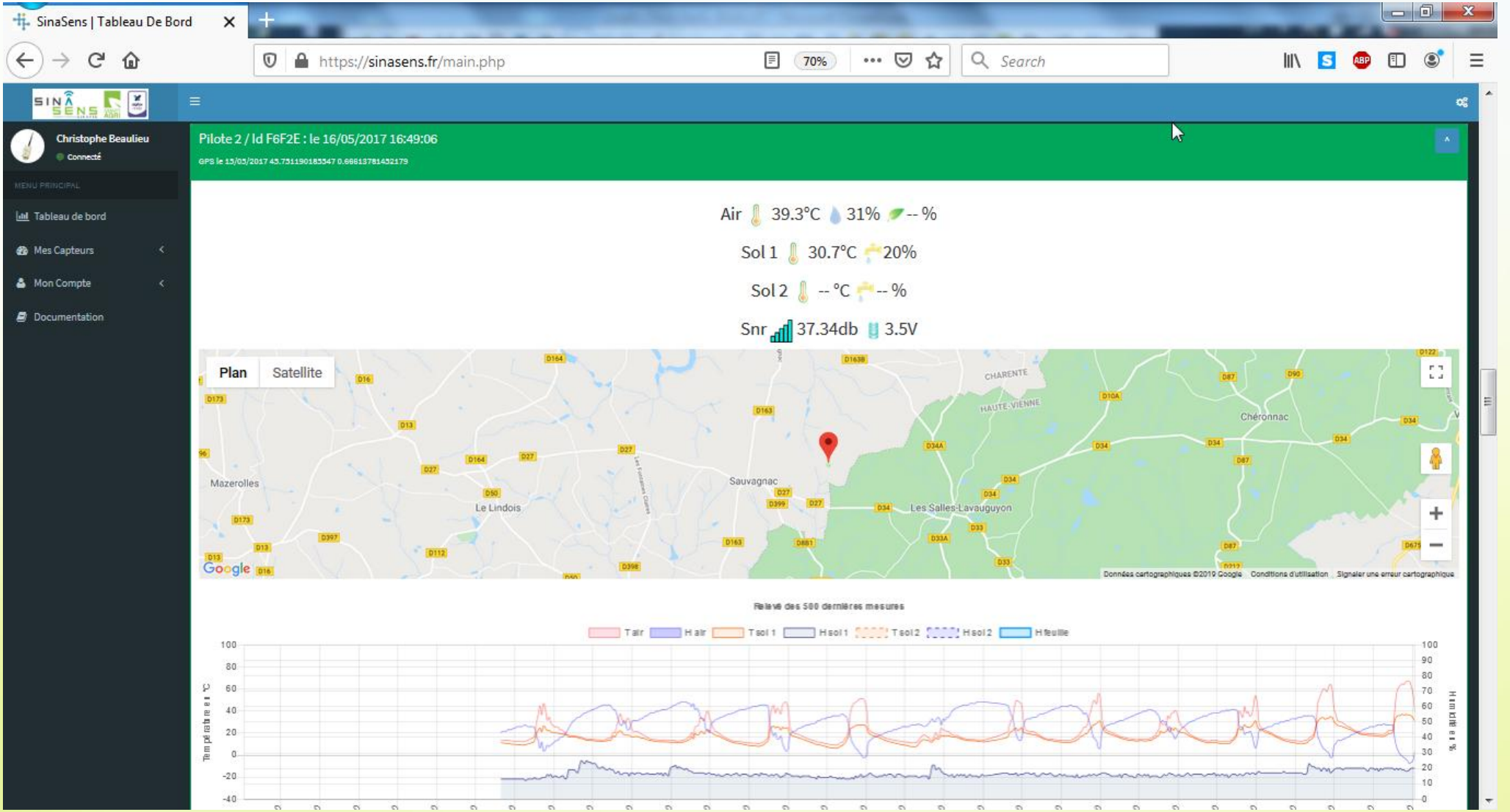
- Level of **humectation** on the **leaves**
  - Anticipate leaf moisture-related diseases
  - Optimizing treatments

- Relative **humidity** and **temperature** of the **air**
  - Detect frost
  - Anticipating the life cycle of insects
  - Anticipating diseases and risks

- Relative **humidity** and temperature of the **soil at two different depths**
  - Control root irrigation
  - Manage ground cover(mowing or crushing)



Client Dashboard



Proof of Concept

Olivier Plessis

Vegetable producer in the Tarn & Garonne, France

Results:

- **Reduced water consumption**
- **Improved product conservation (shelf-life)**
- **Optimization of work organization**

6000 m2 in 12 greenhouses
+ **1.5 ha** open fields

	2017	With SinaSens Smart Agri 2018	Δ
m3	7200	5700	-20%
€ (Avg. cost)	11 160	8 835	-20%
€ (Avg. Cost/year)	300	250	-16%

Benefits for other cultures

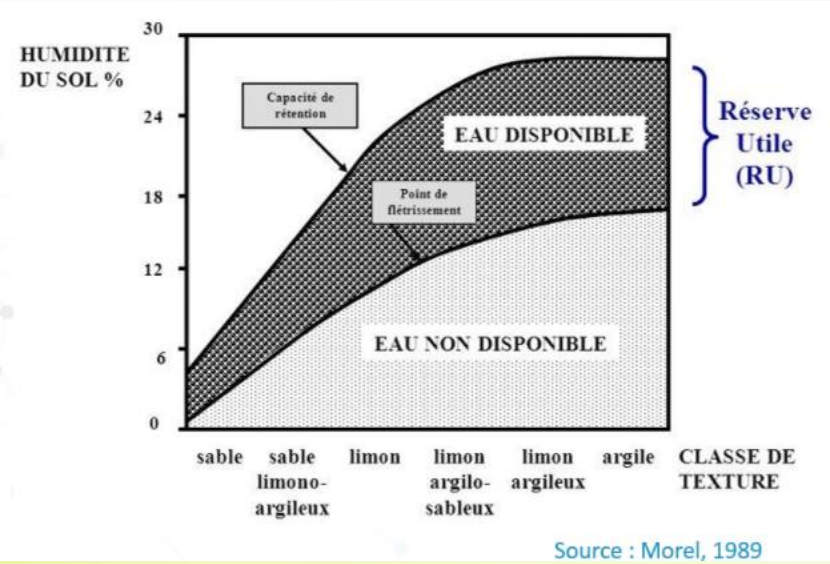
Culture	Benefits
Olive Trees	• Irrigation control according to the needs of the root system • Anticipation of waterborne diseases and bacteria that impact the buds and leaves • Detecting insect pest larvae as soon as possible as they emerge and migrate towards their proliferation zones in order to limit pesticides • Reinforcement of the number of perfect flowers to improve pollination
Viticulture	• Control of the irrigation of young plants and the vines • Anticipation of waterborne diseases on the leaves (mildew, etc.) • Humidity control under the ground cover between vine rows to decide when to mow • Frost anticipation and alerts
Field Crops (wheat, corn, soy, sorghum, etc.) Fruit Trees	• Irrigation management (optimization of water resources by reducing watering)
Aromatic and Medicinal Plants	• Irrigation management (reduced watering) • Anticipation of waterborne diseases on the leaves
Green Spaces/Municipalities	• Irrigation management (reduced watering) • Reorganization and reduction of work time
Potatoes / Beets / Carrots / …	• Irrigation management (reduced watering) • Anticipation of waterborne diseases on the leaves

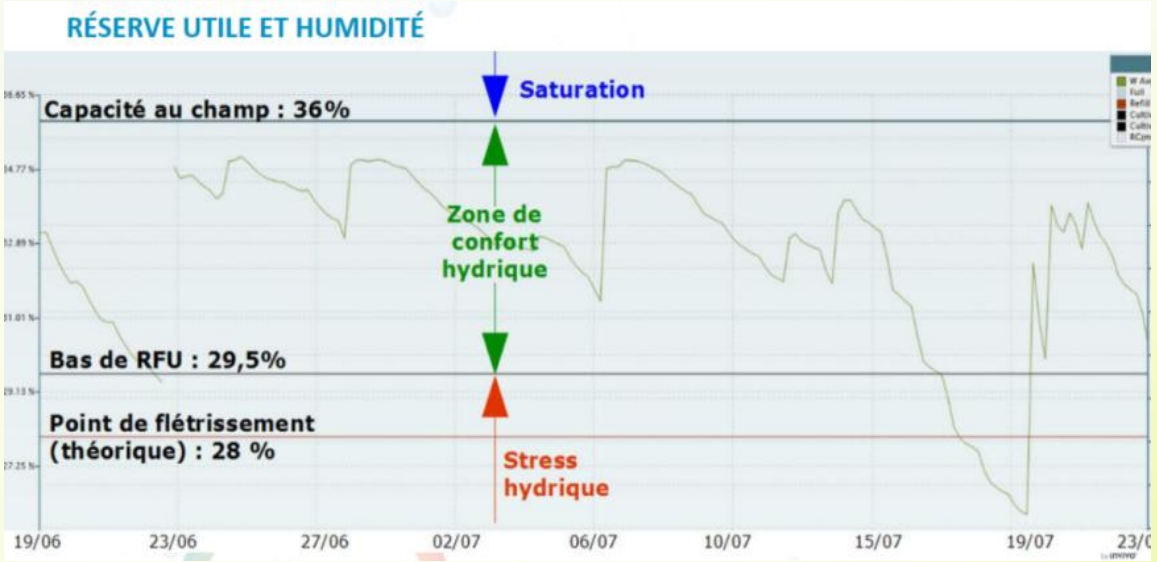
References

Why: To obtain rapid germination and better yield

How: By sowing when the soil temperature reaches 10 ° and by controlling the Available Water Content by monitoring the soil humidity

Results: **An increase in yield +10 to 15%**





References

Why: To prevent diseases, optimize treatments, anticipate freezing

How: By monitoring the conditions relating to temperature, air humidity and leaf humidity

Results: **1 or 2 more seasons of data acquisition required**

Mildiou de la vigne – *Plasmopara viticola*

FACTEURS	FAVORABLES AU DÉVELOPPEMENT DE LA MALADIE
CONDITIONS FAVORABLES AUX CONTAMINATIONS PRIMAIRES	Oeufs d'hiver mûrs + Vigne réceptive (dès la première feuille étalée) + **Eau libre** (pluviométrie > 5 à 10 mm) + **Température > 11°C.**
CONDITIONS FAVORABLES AUX CONTAMINATIONS SECONDAIRES OU REPIQUAGES	**Humidité** (pluie et rosée, même faible) et températures douces (11°C < T < 28°C).

Oïdium de la vigne – *Uncinula necator*

FACTEURS	FAVORABLES AU DÉVELOPPEMENT DE LA MALADIE
CONDITIONS CLIMATIQUES	Humidité relative élevée et températures **aux environ de 25°C** et éventuellement petites **pluies fines**. Les zones ombragées (car sensible aux UV).
CARACTÉRISTIQUES ET ENVIRONNEMENT DE LA PARCELLE	Terrains **humides, sols froids et mal drainés** ; **historique** de la parcelle ; côté des rangs situé à **l'ombre aux heures les plus chaudes ; parcelles ombragées** (proches d'une haie par exemple).

Tordeuses ou vers de la grappe

Temps sec et températures élevées (mais inférieures à 30°C).

Conditions pour que le soufre passe du solide au gazeux :

- Chaleur
- Luminosité

T° minimale	8°C
T° optimale	25°C
T° minimale pour un effet anti-fongique	15°C
T° de phytotoxicité *(tenir compte de la T° de l'air et du feuillage = traiter le matin ou le soir)*	>28°C

Sur feuillage trop humide, les risques de pertes au sol sont plus importants.

Source : http://www.biopaysdelaloire.fr/wp-content/uploads/2017/06/Cahier-technique-Mildiou_web.pdf

If the leaves are too humid, the risk of losses of sulfur into the soil are much greater.

References

Clément TOUZOULI

Noyers et grandes cultures
Gers (32)

RETOUR D'EXPÉRIENCE

→ Utilisation des sondes pour **gestion des maladies** et **pilotage de l'irrigation**

Utiliser les données (export csv) sur une saison pour les croiser avec des observations de maladie

Alerte en cas de seuil dépassé

- *Ex : en cas de gel (T° air) sur les périodes sensibles*

→ Comment choisir le seuil ? Comment le fixer sur Sinasens ?

Principales maladies du noyer

ANTHRACNOSE

- Température optimale : 21°C, commence à 15°C
- Humidité relative élevée (96-100%)
- Augmentation de la germination des spores avec la durée d'humectation

(source : Chambre d'agriculture Nouvelle-Aquitaine (2018). Bulletin de Santé du Végétal Grand Sud-Ouest Noix / Noisette)

BACTÉRIOSE

Multiplication active de la bactérie quand :

- Humidité de l'air et humectation élevées
- 16°C – 29°C

(source : Giraud & al. (2011). Le Point sur.... la bactériose du noyer)

The soil and leaf sensors were used to anticipate two leaf-borne diseases, Anthracnose and Bacteriosis, and to manage irrigation.

References

CODC Olive Groves

9 experimental plots
Aude, Hérault, Pyrénées Orientales

Why:	Control irrigation according to the needs of the root system and prevent disease
How:	By monitoring soil moisture conditions
Why:	Anticipate water-borne diseases and monitor the development of bacteria impacting buds, leaves and young shoots (Peacock spots, canker, die-back, Bacteriosis, etc.)
How:	By monitoring the conditions relating to the moisture on the leaves
Why:	To detect as soon as possible the larvae of insect pests which emerge from the ground and migrate towards their areas of proliferation, in order to limit the pesticides and react as soon as possible
How:	By monitoring conditions related to soil humidity and temperature. Bactroceras Oleae emerge en masse from the ground at 12 ° C and persist 8 to 15 days
Why:	Increase the number of perfect flowers while promoting the elongation of the one-year shoots for perfect reiterations and thus improve pollination
How:	By monitoring the conditions relating to humidity and air temperature as well as leaf humidity
Results:	**30-40% increase in the yield over a 2 year cycle**

References Vineyards

Château Fabre Cordon

Why: Management of ground cover between rows to optimize Available Water Content of the soil

How: By measuring the moisture content of the soil

Results: **Optimization of mowing or shredding to save soil water**

Why: To prevent diseases, optimize treatments, anticipate frost

How: By monitoring the conditions relating to temperature, air humidity and leaf humidity

Results: **A reduction in phytosanitary treatments of around 10%**

References Aromatic and Medicinal Plants/Vegetable Growers

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Why: Optimize the management of water resources and improve the quality of aromatic and medicinal plants

How: By controlling humidity and air temperature as well as soil humidity in greenhouses

Results: **The optimum choice of watering method (drip, sprinkler or mist) for better quality of production**

Why: Optimize the management of water resources, control the planting of seedlings and improve the quality of production

How: By controlling the humidity and temperature of the air as well as the humidity and temperature of the soil in greenhouses

Results: **The optimum choice of watering method and a reduction of 20 to 25% in water consumption. Controlling the soil temperature for seedlings allows for faster growth. Better product quality and optimization of work organization.**

References Distributers

Why: Optimize the deployment of auxiliaries, prevent diseases and optimize treatments

How: By controlling the temperature and humidity of the soil and air, as well as leaf humectation

Results: **Increased efficiency in the application of auxiliaries (larvae, mini wasps, bumblebees, etc.) by correlating the plant's life-cycle and the various measured values of the environment.**
Better disease prevention and optimization of bio-control treatments.