



Smart Irrigation for Smart Agriculture

Catalog 2022



Weather stations



On field sensors



Greenhouse sensors



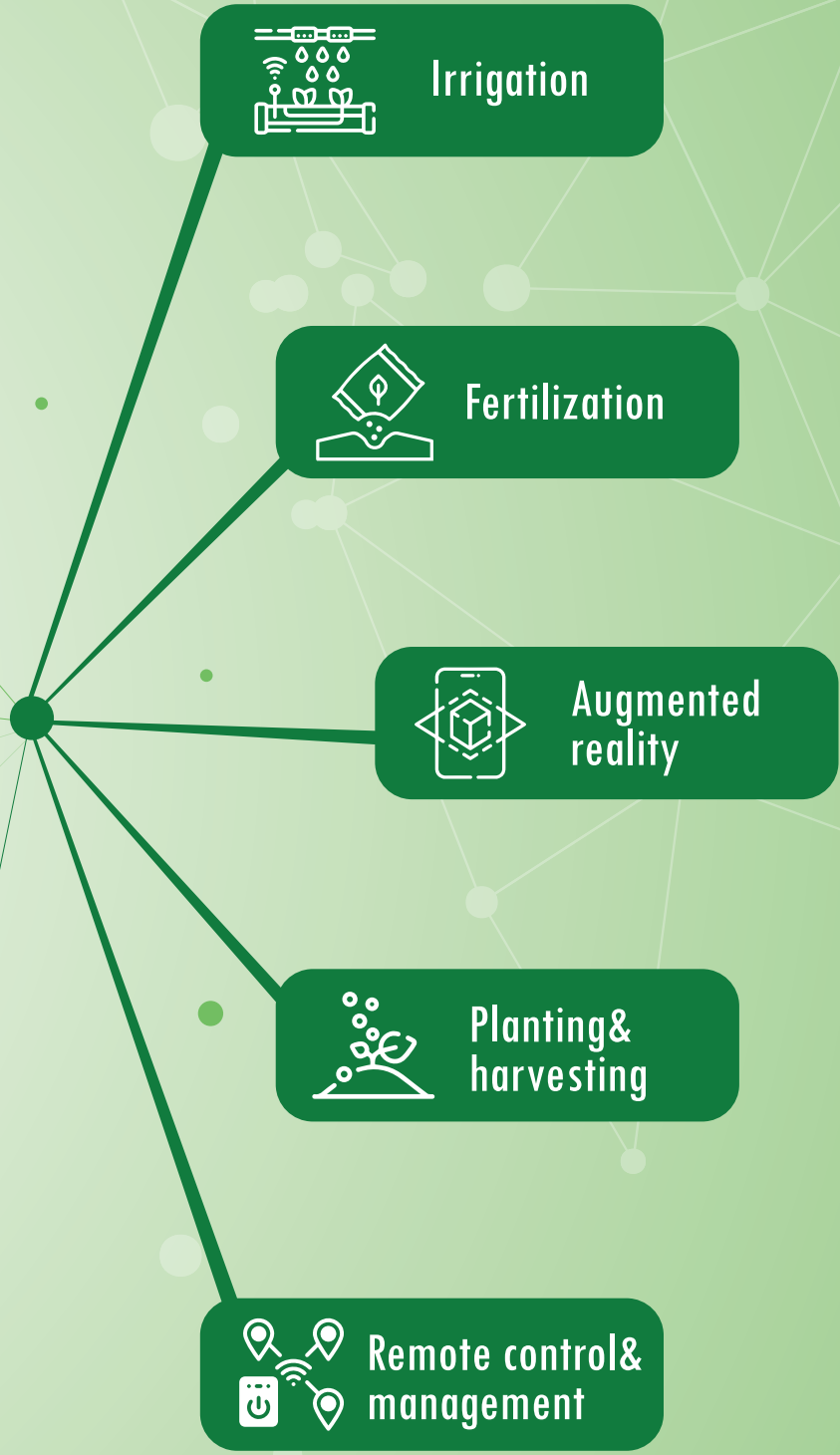
Satellite imaging



Crop models

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Who

Nabu was born on field, from the will of two companies after fifty-year experience in the agriculture sector, with the aim to be a simple and comprehensive platform to manage crops and their irrigation systems, enabling remote control functions.

Nabu's artificial intelligence allows you to connect crop models by relating probes in the field, satellite images and future weather forecasts. The innovative machine learning system continuously improves Nabu's decision-making process.

We, in Nabu, are close to all farmers in the digitalization process by providing an immediate and easy system to manage the irrigation system, study the vegetation index and plan irrigation operations thanks to the calculation of the evapotranspiration and geo-localized weather forecasts.

Our team of technicians helps farmers during the season directly in field.



Top quality



Sustainability

Working in agriculture, discovering nature and witnessing its magic all over the world has taught us to respect it even more. Nabu was created to help farmers, optimizing the necessary resources: water, energy, fertilizers, labor.



Yield increase

Nabu's task is to maximize production per unit, developing different agronomic advice for each pixel of land!



Data protection

We respect the value and potential of the data we collect every day, in the fields, greenhouses and companies of our customers. For this reason, we undertake to treat them with respect and not to sell them to anyone for market research, promotions etc.



Remote control

Through the Nabu Total remote control system, it is possible to intervene remotely (smartphone, tablet or PC) on the operation of the irrigation system exactly as if we were in the field!

Agriculture & Artificial intelligence

Agriculture plays a key role for both economic development and security for our civilization and many times is linked to new technologies, mainly related to the use of artificial intelligence.

How can we actually deal with it?

If our horizon was short-term, we would have to admit that collecting from crops daily data, later analysed and processed by a machine, which will independently take operative decisions on growing procedures, would look like a bright (even if quite obvious now) idea of tomorrow.

But what if our horizon was on the day after tomorrow?

Many people argue that our civilization's depressed chances of survival only lie

in the colonization of other planets (or, at least, we should say this looks like the less violent and bloody among the possibilities). So why still thinking of earth and harvesting crops in the era of space colonization? We could boldly affirm that there's no need to cultivate the earth for a humankind that has no earth. First things first, we should talk more about food production and less about agriculture: traditional livestock, crops and fish farming will become obsolete and disappear due to the lack of resources and land. If world's population is assumed to be nearly 10 billion by 2050, with far more demanding requests, can food satisfy everybody without having a destructive impact on climate and planet? Widening our horizon on artificial

intelligence, we could easily create a link between all stages of food production/consumption: input – output – transformation – transport – sale – final consumer. All the production chain could adapt and relocate its best resources to match consumers' requests regarding volumes and attributes, instantly reducing food waste and loss as well (which still count as 30% of global production). Metropolis age, tens of millions of inhabitants each, will require food production on site, almost impossible to manage effectively without the help of dedicated automated workflows. In the end, if food is energy, why can't we transform in the easiest and cheapest form for us to absorb and reuse? The future of agriculture may not involve agriculture at all.

Nabu Smart

Nabu Smart is the complete solution that allows you to keep your crops under control, check weather forecasts, optimize the application of inputs and increase productivity, without the aid of physical devices installed in the field.

Thanks to the satellite images updated almost everyday you can check the vegetative state of the crops in your fields, examine the water content and prepare an irrigation plan adapted to each of your plots!



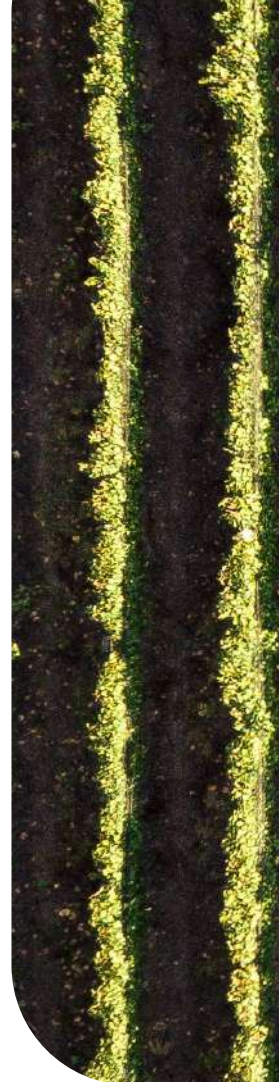
Nabu Total

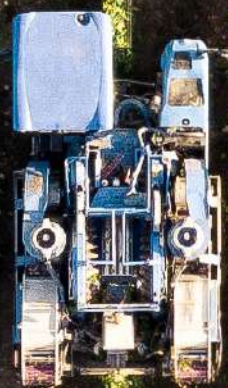
Designed for the most advanced companies, Nabu Total combines the data processed by the artificial intelligence of Nabu Smart with the weather stations and probes installed in the field. Thanks to the exclusive algorithms, it is possible to obtain a specific irrigation plan for each crop and each irrigation sector (variable rate irrigation technology).



Nabu Total is the only solution on the market that combines satellite data, field data (collected by probes), geo-localized weather forecasts and artificial intelligence tools.

Thanks to LoRa technology, it is possible to install up to 100 nodes in the field, within a radius of several kilometers from the main weather station (Nabu Station).





Nabu Station

The complete weather station, to be installed in the field, equipped with a solar panel and cloud storage.

- > Anemometer
- > Thermometer
- > Rain gauge
- > Leaf moisture sensor
- > Soil moisture sensors



Nabu Smart Box

The unit in the field, with a wide range, which accepts inputs (from probes) and outputs (for remote control).

- > Control all components of your irrigation system (drip, center pivot or sprinkler)
- > Soil moisture and EC
- > Water flow and pressure
- > Water quality (pH and EC)

Nabu Smart



Web/mobile App

Based on our satellite models and sensorless intervention, we provide growers with an integrated, high-resolution perspective of the entire land, rather than surveys of several isolated locations. Thanks to the convenient and easy-to-use Nabu software, the grower obtains dynamic and specific irrigation indications for the location and type of crop, which can be used in any place and at any time.

The main advantage of Nabu is the exact knowledge of what is happening, in real time, in your field!

Our vision

By combining remote sensing, data science and agronomy, we offer growers the ability to supply the right amount of water, at the right time, on all cultivated land.

Farmers around the world can improve crop yields and reduce water consumption for sustainable agriculture.

- Crop analysis
- Soil analysis
- Tree analysis
- Geo-localized weather forecasts
- Real-time, personalized notifications

How does satellite imagery work?

Satellites are one of the most used means in agriculture to perform remote sensing or remote sensing. In fact, satellite images make it possible to monitor crops remotely in a precise and efficient way. Main features are spatial and time resolution.

Spatial resolution is the definition, which may vary from 0,50m to 10m.



Satellite imagery

1. Crop analysis

Depending on various crops and the season, Nabu offers you the best solution for satellite indices. With the right tool it is very easy to get an effective, immediate and real-time insight of what is going on in the field.

Nabu knows your crop in the field and can easily choose the most effective satellite index, depending on the parameters you want to monitor (crop status, crop moisture, weeds and microelements). If you don't want to monitor a single parameter but have a complete view of your field, you can run the Nabu index which shows you all insights on a single map!

Standard resolution: spatial resolution 10 m, time resolution: 3/5 days. Data provided by ESA.

High resolution: spatial resolution 3,5 m, time resolution 1/2 days. Data provided by commercial companies.

As a Nabu user, you won't need to spend time looking at satellite photos everyday, you will be automatically notified when Nabu spots any problem with your crops.

Technology for Agriculture

2. Soil analysis

In the soil menu, you can find useful maps displaying:

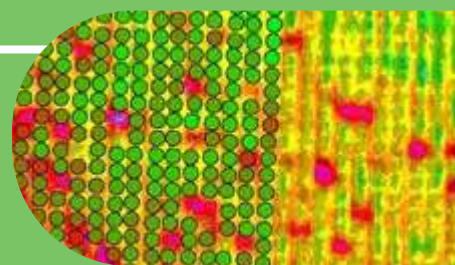
- field capacity;
- surface soil salinity;
- surface soil permeability.

These parameters are obtained from machine learning algorithms that analyze the historical satellite images of the selected areas, obtaining easy-to-read maps.

In Nabu Total function, the platform will use these parameters to define the correct irrigation schedule for your system.

3. Tree analysis

Thanks to ultra-high definition satellite or UAV data, Nabu can analyze individually each tree in an orchard, forest or park, recognizing and identifying tree data from soil data.



4. Geo-localized weather forecast

Nabu provides you with geolocated weather forecasts, dedicated for farmers and growers.

In Nabu Total function, the platform will use these parameters to define the correct irrigation schedule for your system.

5. Real-time, personalized notifications

Nabu users can select the preferred notifications, from weather forecast events to real-time update on field, for example when maps show signs of weeds, drought or a decline in green indices.

Thanks to Nabu intelligence, you can monitor problems before they happen in the field.



Present and future in Precision Agriculture

A new era of high-frequency satellite imagery

The combination of broad-area coverage, field-level detail, frequent in-season revisit rates, and rapid availability has not always been possible.

With today's advances in computing and satellite technology, it is now becoming a reality. The result is a continual stream of satellite data that can provide valuable input at each stage of the farm management workflow.

The result is more sustainable, efficient, and productive agriculture at every step of the crop cycle.

Turning imagery into insights

Satellite imagery captures light reflected from farmers' fields. Crops reflect specific spectral signatures at different stages of the season which serve as a baseline for crop health and can indicate anomalies in the growing cycle.

If vegetation is damaged or loses vitality, the amount of reflected light changes. Those changes can be detected and mapped, helping farmers to target scouting, localize treatment, and optimize inputs for those areas.

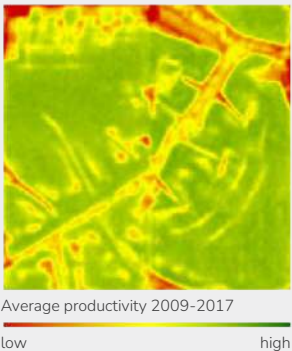
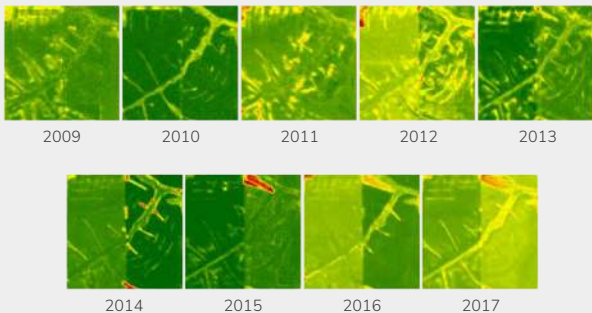
Satellite imagery for every step...

1. Planning

At the planning stage, access to crop productivity maps derived from satellite imagery collections over a multi-year period can be helpful. When minded for predictive insights, these annual maps can help growers optimize field productivity by identifying in-field patterns and localized trends.

2. Productivity analysis

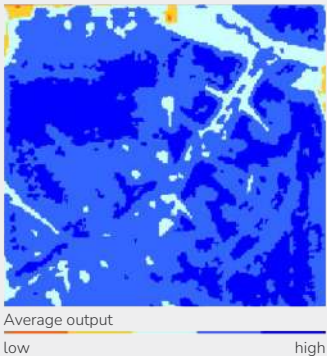
Delineating management zones in fields is an essential first step in planning the application of inputs. Vegetation indices calculated from historical imagery can be used to create baselines for in-field variation of crop productivity. Site characteristics such as topography or soil properties affect productivity and can be identified to improve planning and practices.



3. Management zone delineation

With this information, agronomists can set site-specific crop production goals and recommended addressing different parts of the field in appropriate ways. If crop performance is historically lower in one management zone due to nutrient deficiency or water scarcity, planning for fertilization or watering can take that information into account.

This practice not only improves yield and output prediction, but also helps farmers avoid over-application and save costs.

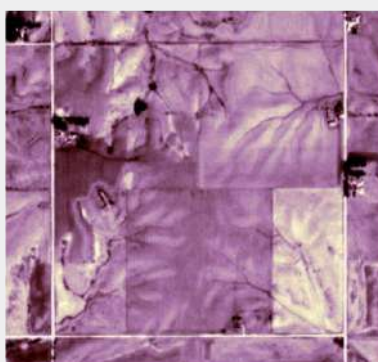


4. Soil preparation

Access to recent archives of satellite imagery helps agronomists and their customers design seeding irrigation and fertilization strategies according to historical productivity and stable soil zones.

Spectral indices derived from imagery of bare soil fields describe the combined effects of soil type, organic matter content and soil moisture to provide a relative measure of average water holding capacity.

Darker soil readings may indicate greater nutrient and moisture retention where light regions may suggest areas in need of targeted fertilization for nascent crops.



Soil brightness derived from bare ground imagery indicates moisture, texture and organic content.

Soil brightness
dark bright

5. Crop management

Management of crops during the growing season is a crucial activity for every farming operation and is also where satellite imagery can provide the greatest value. Imagery enables agronomists and growers to:

- › Detect crop health issues
- › Map and direct scouting
- › Localize prescription treatments
- › Monitor crops development

5.1 Enabling precision agriculture

Nabu machine learning functions enable real-time multiple prescriptions maps, ready to be exported and used for other functions:

- › Variable Rate evapotranspiration maps
- › Variable Rate water balance maps
- › Weed management

5.2 Health monitoring

Growers need to make critical decisions throughout the growing season, and these decisions need to be made in real time, as conditions change. For instance, unanticipated weather variations such as a wet or dry spring can affect crop development and alter the periods during which pest infestations or disease outbreaks are likely to occur.

Monitoring can improve health analysis by crop or fields of interest. Consistent and complete imagery coverage of vital areas enables timely and informed decision making.



5.3 Issue detection and alerting



Frequent data means farmers can address problems early, before large-scale damage is done. A steady supply of satellite imagery can help detect vegetation issues as soon as they occur, letting farmers know precisely when and where to act.

With imagery updates and vitality alerts, growers can quickly identify affected areas, assess field issues, and respond.

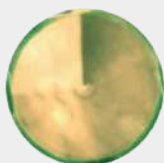
Moreover, thanks to the integration with irrigation system and field sensors, Nabu allows farmers to immediately identify the problem and fix it. Under you can find an example of Nabu with center pivots.



Over-watered areas



Clogged sprinklers



Running sprinklers



Under-watered areas

Nabu Total



Nabu technology

1. Holistic approach

Nabu's unique combination of satellite and field data allows the creation of geolocated models and prescription maps for any irrigation systems, anywhere.

2. Remote control

Sensors and actuators are connected to the same platform, only one login is required to see your crops in your fields and to monitor, from your smartphone or computer, how your irrigation system is working.

Use cases: drip and spray irrigation systems.

Some Nabu Total climate sensors...



Anemometer

Compact anemometer, made of robust and corrosion resistant thermoplastic materials. Reduced consumption.



Solar radiation

Solar radiation sensor with reduced consumption, compact and weatherproof.



Temperature and humidity

Sensor for measuring various environmental parameters, including temperature and humidity. IP68 and anti UV materials.



Leaf humidity

Designed to achieve perfect spray irrigation, the leaf moisture sensor is designed for installation directly in the field.

Nabu Smart Box



Nabu SmartBox is designed to collect and send data to cloud from the sensors and to control all actuators of irrigation system (valves, pumps, filters, fertigation pumps), operating in the toughest environments with low power consumption.



Features

- › Ultra-low power
- › Can be powered by batteries, solar panel, grid
- › 100+ sensors integrated on 1 board
- › 50+ actuators on 1 board
- › 4 radio technologies: 4G/LoRa/LoRaWAN/WiFi
- › Industrial protocols: 0-5V, 4-20mA, RS485, Modbus, CAN Bus
- › Up to 10 outputs

Use cases

- › Weather station
- › Field sensors (moisture, temperature, leaf wetness, stem, truck and fruit diameter)
- › Water sensors (pressure, flow, pH, EC)
- › Irrigation valves controller
- › Self cleaning filters controller
- › Fertigation pumps controller
- › Electric pump controller (also with inverter)

Some Nabu Total field sensors...



Nabu multilevel probe

Permanent sensor for soil moisture and EC, collects data each 15cm from 15cm to 60cm of depth.

- > No maintenance and no calibration required;
- > Fully solid state;
- > Internal compensation for common soil salinity.



Environment

Maintenance free sensors.

- > Rain;
- > Temperature and humidity;
- > Wind speed and direction;
- > Leaf wetness.



Water pressure and flow

Water meter and pressure transducers.

- > Range 0-10 bar, 0-16 bar e 0-25 bar;
- > 4...20 mA and 0-5V
- > Modbus RS485

Nabu Smart Pivot

Your Pivot, Your Field, all in one single platform

1. Monitor your crop

Real-time information from your fields and the weather, with evapotranspiration, water balance and irrigation needs calculation. All data is provided by Nabu Smart functions.

2. Remote control

Manage every aspects of your operation and make adjustments anytime from anywhere, all with one easy-to-use platform. You can access and implement daily automated irrigation recommendations with Nabu Advisor for VRI and Pivots irrigation.

Nabu Smart Pivot functions...

Control

- › Start/Stop
- › Forward/Reverse
- › End guns on/off/control panel
- › Speed % or controlled by control panel

Program

- › Start/Stop programs on calendar
- › End guns control by sector (max 3 end guns)
- › Speed % and water application depth (mm) by sector, by running direction and defined by Nabu Smart technology (combining sensor and satellite data)
- › Auto Reverse or Auto Stop controlled by 2 angles with delay if with water
- › Stop in Slot by Angle

Monitor

- › Span position on Google Maps
- › Status of Pivot (on/off)
- › Running direction
- › End guns status
- › Real speed of the machine
- › Depth application (mm)
- › Pressure in the system: last tower, main tower and intermediate towers (requires pressure transducers)
- › Position by angle relative to North
- › GPS/Galileo signal
- › 4G signal
- › Total hour counter
- › Water hour counter
- › Water volume, m³ (requires water meter)

Alarms

- › Power lost
- › Low pressure
- › High pressure with main valve close
- › No water
- › Direction change
- › GPS connection



Nabu Smart Pump



Your Pump, Your Field, all in one single platform

Use cases: electrical pumps, solar pumps, motorpumps.

1. Monitor your pump, lake, river, borehole

Real-time information from your pump and water quality, flow, volume, levels in your river, lake, basin or borehole.

2. Remote control

Manage every aspects of your operation and make adjustments anytime from anywhere, all with one easy-to-use platform. You can access and implement daily automated irrigation recommendations with Nabu Advisor for VRI and Pivots irrigation.

Nabu Smart Pump functions...

Control

- › Start/Stop/Auto (by pressure or external command)
- › Pressure and flow
- › Inverter parameters
- › Direction of rotation

Program

- › Start/Stop programs on calendar
- › Start/Stop by external functions (open/close contact or sensors)
- › Pressure multisetpoint by external contact, sensors, valves
- › 10 programmable outputs (for example for electric valves)
- › Quick unclog: in case of clogging, the system tries to change direction of rotation and sends an alarm

Monitor

- › Electrical pump: voltage, current, frequency, rpm, power
- › Motorpump: rpm, power, fuel consumption
- › Flow (requires water meter) with self-learning functions.: high/low flow alarms
- › Motor/engine status
- › GPS/Galileo signal
- › 4G signal
- › Total hour counter
- › Water hour counter
- › Water volume, m³ (requires water meter)
- › Power meter

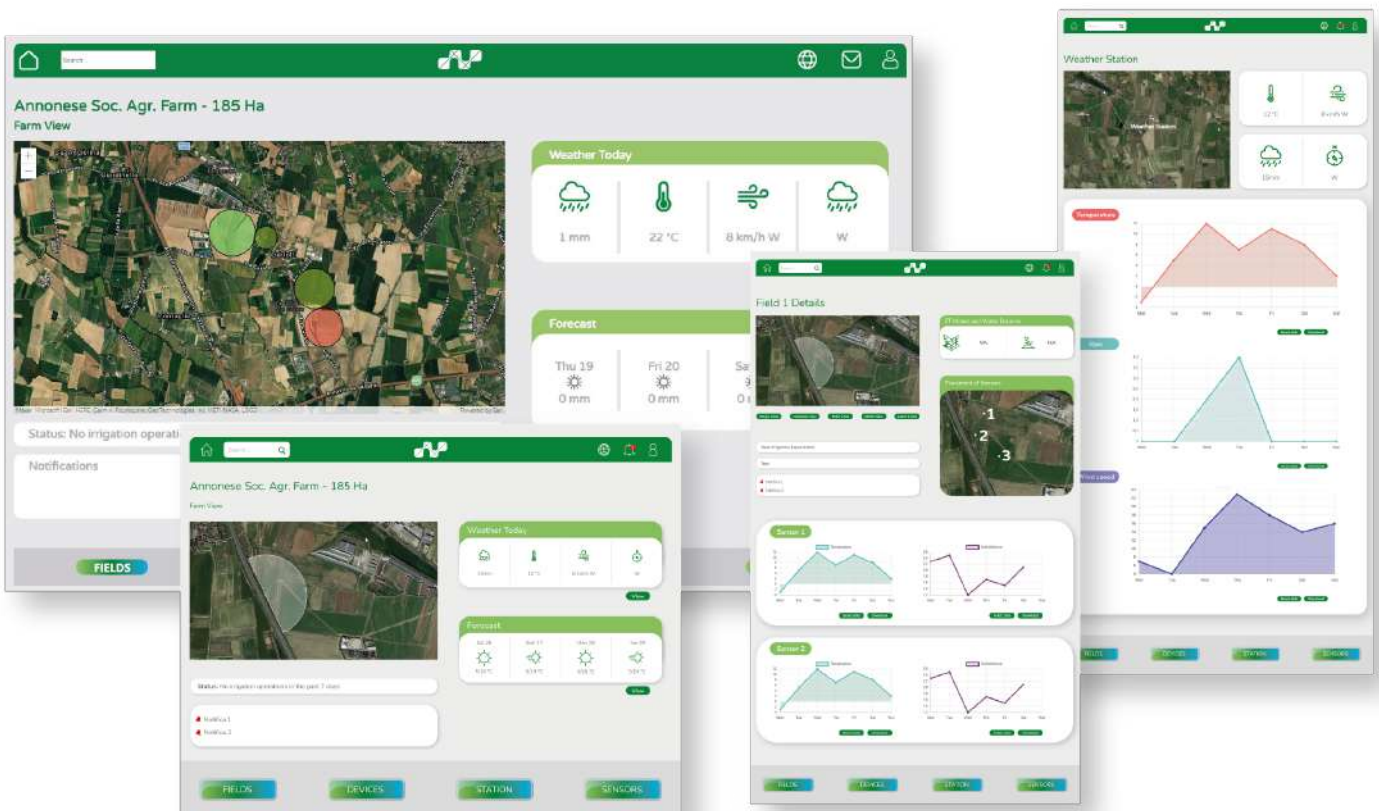
Alarms

- › Power lost
- › Low pressure
- › High pressure with main valve close
- › No water
- › 4G signal
- › GPS connection
- › Pump failure
- › Flow: high/low with self-learning functions
- › Water levels (requires external sensors)



Nabu AG platform

Nabu AG platform combines all important functions for irrigation management on a single platform, on a field-scale architecture.



Functions

- › Irrigation system (drip, spray, pivot) management
- › Weather forecast
- › Satellite imagery
- › Field sensors and weather station management
- › Prescription maps

- Satellite & Sensors Data
- Data Analysis
- Decision Support System
- Remote control

The Nabu difference...

Guided installation of field sensors

Thanks to powerful machine learning tools and its complete satellite historical archive, Nabu can suggest you the best position for the sensors in the field. For any field, our software will tell you the best positions to monitor in order to obtain meaningful data.

An aerial photograph of a landscape, likely agricultural, with a green and yellow color scheme. A prominent red line, possibly a river or canal, winds through the scene. A large, irregular red area is visible in the lower center, suggesting a specific region of interest or a different land use type. The text 'Nabu for land reclamation' is overlaid in white on the left side of the image.

Nabu for land reclamation

Estimation of the potential water requirement

In addition to soil fertility analysis, Nabu offers a complete tool for designing the right irrigation system, estimating the right maximum evapotranspiration per crop in each plot. This tool helps the client in the correct setting of a variable irrigation rate per system.

Soil potential fertility analysis

Before new investments and reclamation actions for agricultural purposes, it is essential to fully understand the potential of the land examined, planning the necessary interventions in advance and examining the potential criticalities. Nabu offers a cost-effective, radical and innovative solution that allows its customers, potential farmers and professionals, to save time and money.

Using the internal satellite image database, Nabu analyzes soil fertility by comparing different photos taken at different times of the season. For tropical areas, an algorithm similar to the vegetation index is used, while for desert areas Nabu comes with a combination of soil texture and water content.



Nabu for greenhouse and vertical farming



01. Environment and irrigation control

We try to make the greenhouse smart in a way that it can think and make decisions according to the situation.

Thanks to its full line of sensors, not only can Nabu control environment and inputs (water, light, fertilizers) to save them and increase productivity but, thanks to its proprietary architecture, Nabu AI analyzes the relationship between inputs and outputs, providing the best solution for both small and commercial hydroponic and vertical farming projects.

02. Augmented reality for augmented agriculture

In a closed environment, pushing the union between nature and technology to the limit, farmers must be capable of getting all the information they need instantly and easily, directly on field or in the greenhouse.

Thanks to NABU augmented reality, while farmers walk on field and in greenhouse they can get notifications, read data and interact with their automated farm processes, instantly and directly on their smart glasses.





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