

GSD Agrisensor

Sensing | Control | Gateway

A field-ready agricultural platform built around the Espressif ESP32-C5.



8

soil probes

4

temperature + humidity
sensors

4

relay outputs

IP65

custom housing

One controller. Multiple measurement points. Better decisions.

Automation reduces wasted power and water

Accurate measurement and control turn high-cost irrigation into a managed, accountable input.

Electricity is often one of the largest controllable operating costs in irrigated agriculture.

Automation helps avoid unnecessary pump runtime, dry-run events, overwatering and manual site visits.

1

MEASURE

soil • flow • tank • pressure

2

DECIDE

rules • schedules • thresholds

3

CONTROL

pumps • valves • relays

4

VERIFY

usage • alarms • trends

LESS

wasted runtime

Run pumps and valves only when conditions justify it.

BETTER

irrigation evidence

Track when water moved, which zones ran, and what changed.

FASTER

fault response

Catch dry wells, blocked filters, stuck valves and abnormal usage sooner.

Practical automation examples

- ✓ Pump only inside off-peak windows when possible
- ✓ Stop irrigation when soil target is reached
- ✓ Shut down on low tank level, no-flow or pressure fault
- ✓ Alert staff before water loss becomes crop loss

Compare pump runtime, water volume and energy use by irrigation zone.



GSD AGRISENSOR

Automation across the whole farm

From irrigation to cold rooms, GSD connects sensors, controls and alerts into one practical operating layer.



Water management

Meter abstraction, storage, pressure, flow and irrigation-zone use so water decisions are measured.



Electricity and pumps

Reduce unnecessary pump runtime, schedule around power constraints and identify abnormal load behaviour.



Cold chain and packhouse

Monitor cold-room temperature, humidity, door events, compressor run patterns and alarm conditions.



Crop environment

Control fans, lights, vents, fertigation and irrigation based on real field or greenhouse readings.



Livestock and remote water

Watch trough levels, boreholes, collars, tags and telemetry from remote areas.



Alerts and accountability

Create an audit trail of readings, actions, alarms and operator response for better decisions.

Automation benefit for farmers

Use energy, water and labour only where they create value — then record the result so savings are visible, accountable and defensible.

Capabilities shown combine the Agrisensor with compatible GSD, LoRaWAN, MQTT and third-party devices as required by each deployment.



GSD AGRISENSOR

GSD AGRISENSOR OVERVIEW

Sensing | Control | Gateway

ESP32-C5
platform



One field-ready controller combines multi-point soil and climate sensing, local automation, backup power and modern connectivity for irrigated agriculture.

1

Measure the growing area

8 AC-excited soil probes plus 4 DHT22 climate sensors give representative readings across beds, tunnels, trees, pivots or irrigation zones.

2

Control farm equipment

4 low-voltage relay outputs connect to the supplied relay board for pumps, valves, fans, lights and other controlled loads.

3

Integrate by design

Wi-Fi, MQTT, Home Assistant and Thread/Matter-ready hardware platform allowing the Agrisensor to act as a gateway-enabling platform.

4

Operate your way

Sensor Mode sleeps between scheduled readings. Relay/Gateway Mode remains awake for continuous automation and device collection. Offline Mode continues local control and stores downloadable CSV records.

Built for real farming decisions

Change the sensor.....Keep the Brains.

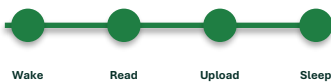
Replace exposed probes, sensor assemblies and field cables as consumables while retaining the controller, housing and power system.

Automation operating profiles

One control engine. Three ways to run: scheduled sensing, continuous control, or offline automation with downloadable CSV.

1 SENSOR MODE

Wake • Read • Upload • Sleep



Low-power scheduled sensing for solar installations and extended backup endurance.

Typical interval: 15–30 min

2 RELAY / GATEWAY

Continuous automation and connectivity



Local rules keep pumps, fans, valves, lights and supported gateway functions active.

GSD AGRISENSOR CONTROL ENGINE

Sense • Decide • Act • Record

3 OFFLINE MODE

No coverage? Keep working.



Readings, alarms and automation actions are timestamped and stored locally for recordkeeping, auditing or post-processing.

CSV DOWNLOAD

1 SENSE

Soil, climate, water and device inputs

2 DECIDE

Rules, thresholds and timing windows

3 ACT

Relay outputs, pumps, fans and valves

4 RECORD

On-device log and downloadable CSV records

Advanced soil monitoring

Eight independent AC-excited channels provide practical multi-point root-zone monitoring.



AC excitation reduces probe wear

- Reduced probe polarization
- Reduced electrolysis
- Reduced long-term corrosion
- More stable and repeatable readings

Dashboard view

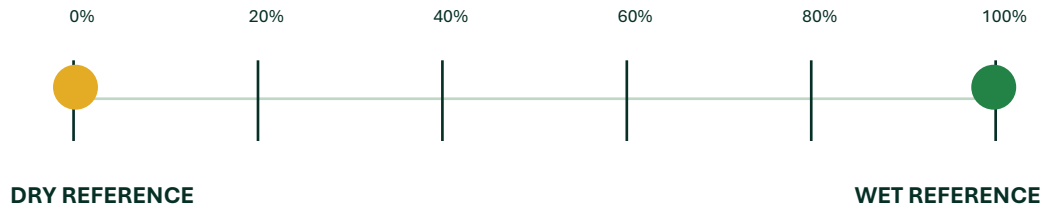
Individual readings + average + wettest/driest outlier detection.

The calibrated percentage is a practical irrigation-management scale and is not presented as laboratory volumetric water-content measurement.

Calibration and lifecycle

On-device calibration turns field variation into useful, repeatable irrigation information.

Two-point soil calibration



Each soil channel can be calibrated independently on the device

CHANGE THE SENSOR. KEEP THE BRAINS.

The intelligent controller, IP65 housing and power system are the long-life platform. Soil probes, DHT22 sensor assemblies and exposed field cables are supplied as replaceable consumables.



Recommended approach: inspect exposed probes, sensor assemblies, cables and connectors at the end of every growing cycle. Replace any worn, damaged, corroded or unreliable components.

Greenhouse vertical climate profile

One Agrisensor monitors a local tunnel section. Typical installations use three to four units distributed along the tunnel to monitor crop sections and the vertical climate profile.



1

Ground / root zone

Cold-air accumulation and humidity near lower leaves.

2

Plant canopy

Conditions experienced by active leaves.

3

Roof level

Heat build-up and ventilation effectiveness.

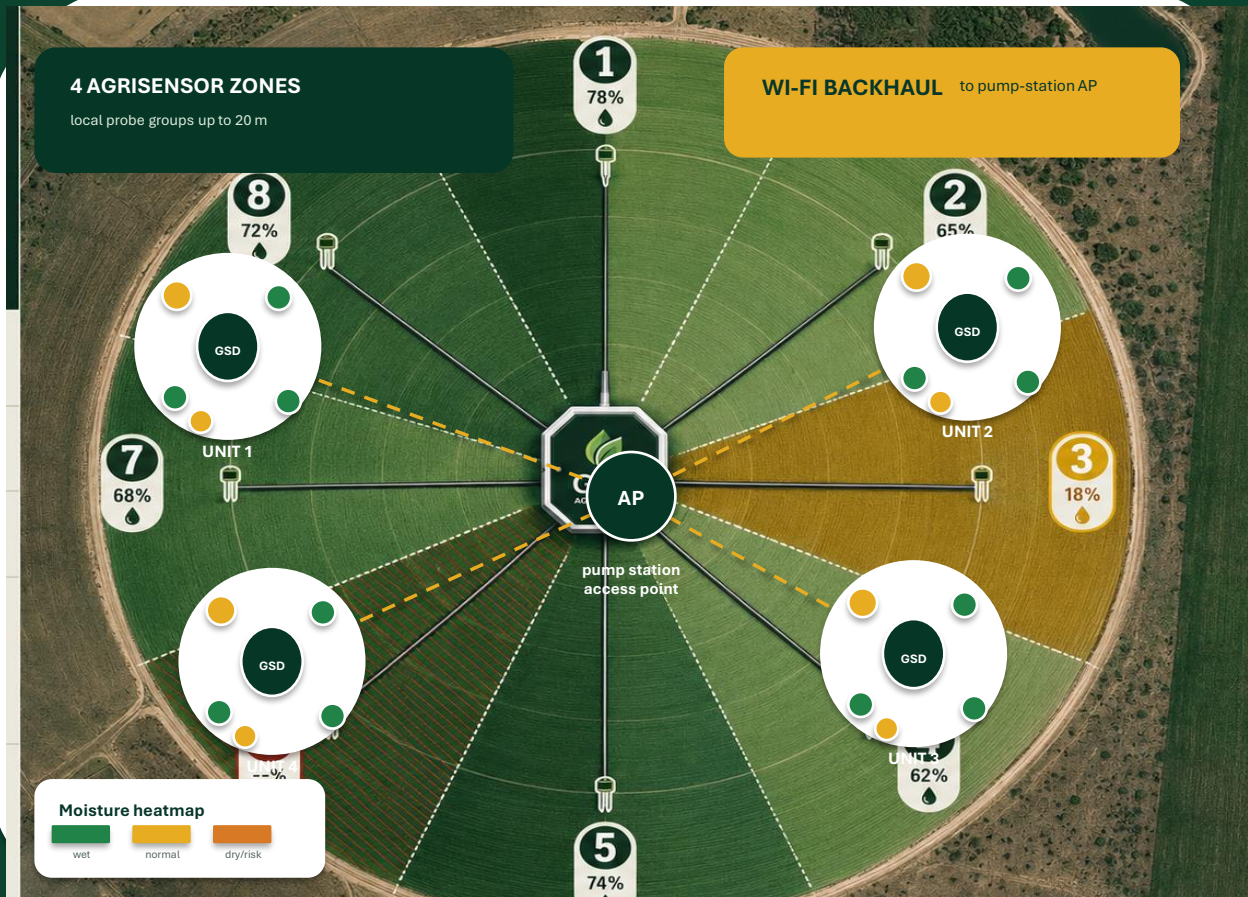
4

Flexible point

Outside reference or known hot/cold spot.

Centre-pivot directional sampling

Four Agrisensor field units use local soil-probe groups on cables up to 20 m and return data over Wi-Fi to an access point at the pump station or other powered location.



Local 20 m probe groups → multiple Agrisensor zones → Wi-Fi backhaul → combined field heatmap

1

Directional visibility

Compare quadrant behaviour instead of relying on one field reading.

2

Problem sectors

Highlight dry areas, soil variation and possible blocked-nozzle zones.

3

Scalable coverage

Add Agrisensors where larger pivots need more measurement density.

Combined field view

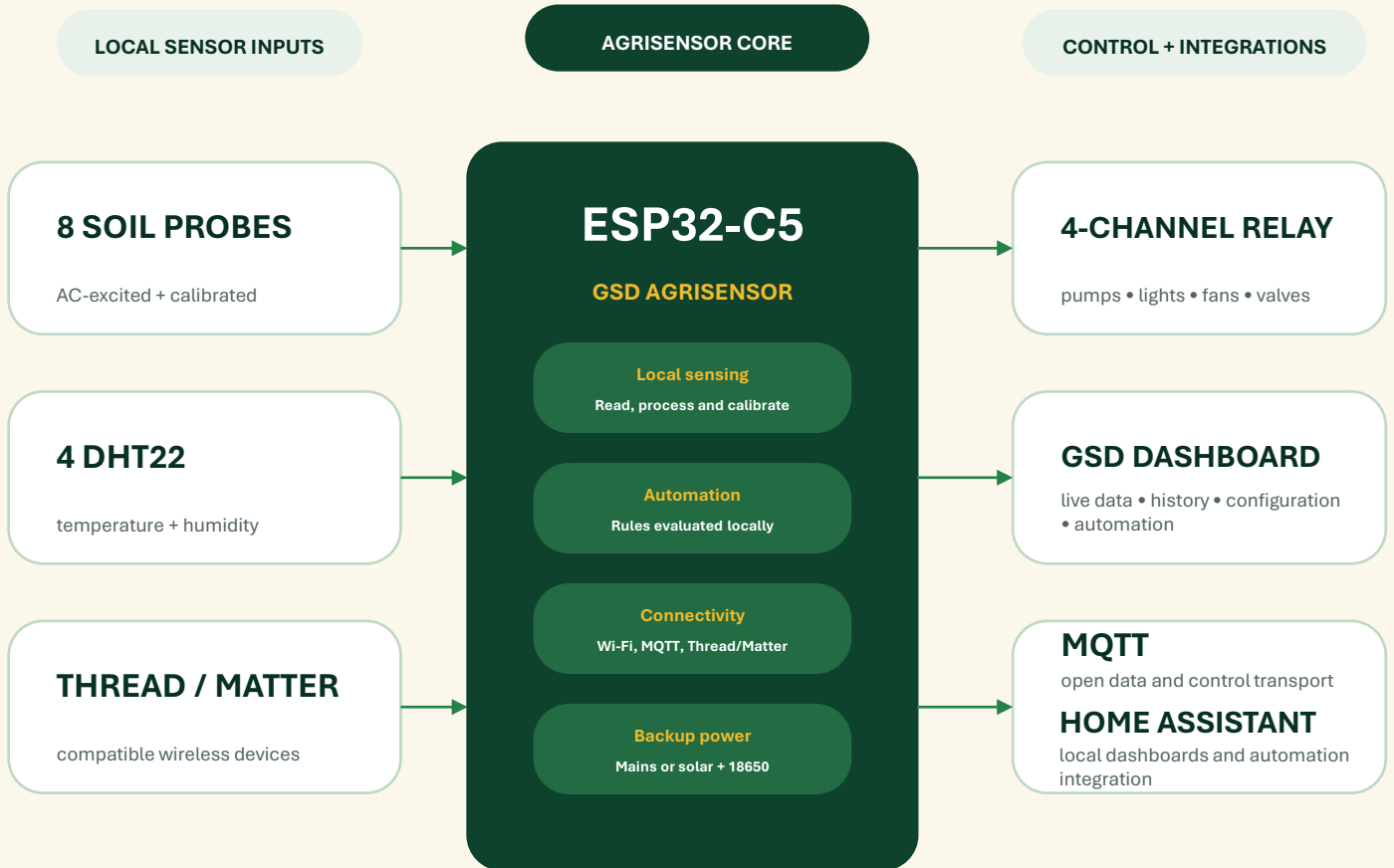
Average moisture • driest quadrant • heatmap trend • nozzle-risk alerts • pump-station AP status



Combined readings reveal dry sectors, irrigation imbalance and soil variation, and may indicate distribution problems such as blocked nozzles.

Connectivity and integration flow

The Agrisensor is designed as both a field controller and a gateway-enabling platform.



THREAD/MATTER-READY HARDWARE PLATFORM

Every Agrisensor includes the ESP32-C5 radio hardware required for supported Thread and Matter firmware packages. Device compatibility and gateway functions are enabled and validated per firmware release.

Battery backup and performance

Battery backup protects monitoring and local control during temporary power interruptions.

3,000 mAh 18650 backup battery

Continuous operation testing shows approximately 30 hours while evaluating automation rules every 10 seconds.

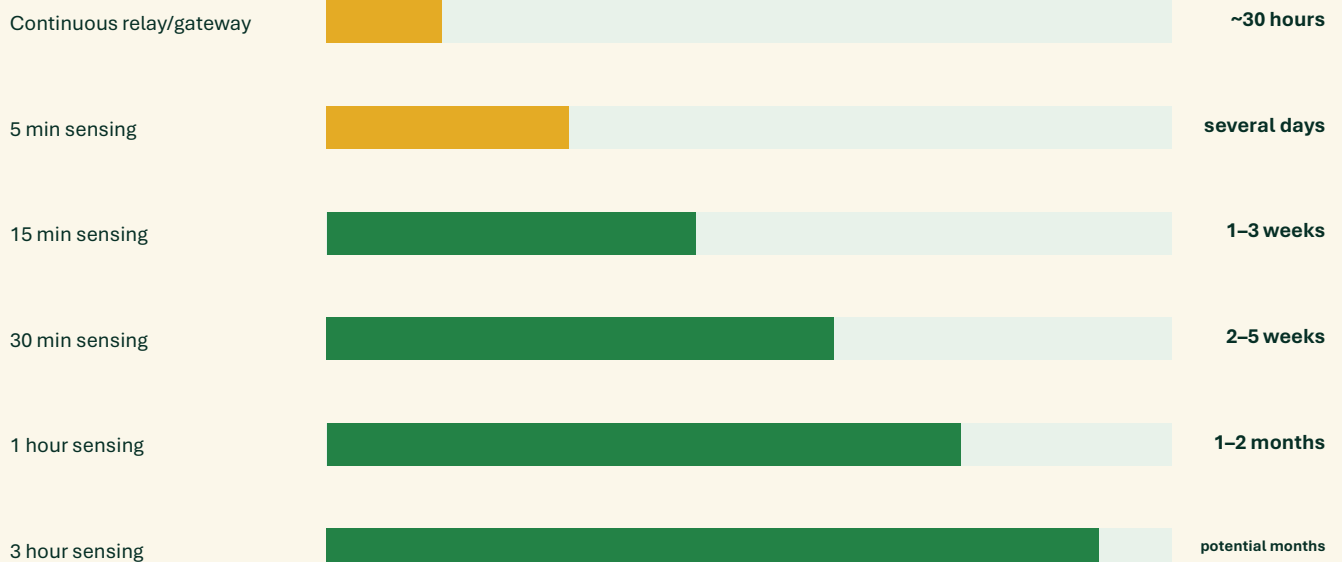


30 h

tested continuous mode

Indicative Sensor Mode

ENGINEERING TARGETS — NOT YET PRODUCTION-VALIDATED



Longer Sensor Mode runtimes are engineering projections and must be confirmed on final production hardware. Runtime depends on reporting interval, Wi-Fi signal, sensor count, battery condition, sleep current and active gateway functions. The battery is intended as backup power, not the primary operating supply.

Built for real agricultural layers

One platform. Four practical deployment environments. Accurate local data, smarter irrigation and better operational decisions.

09

Built for real agricultural layers

One platform. Four application layers.
Accurate local data, smarter decisions, better yields.


Greenhouses + tunnels




Vertical climate profile
Track temperature, humidity and VPD from root to canopy.


Fan, light & irrigation control
Automate environment for optimal growth.


Bed-by-bed soil moisture
AC-excited probes for accurate moisture and EC readings.


Healthier plants, higher yields
Fewer inputs, better outcomes.


Orchards



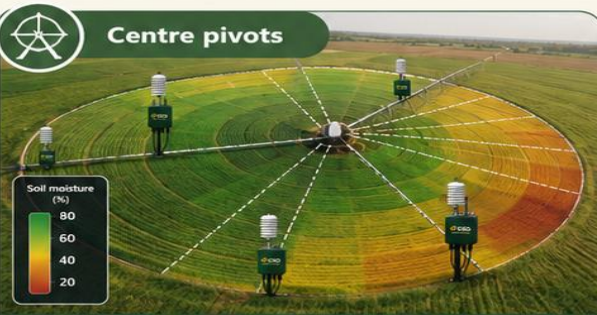

Tree-block insights
Soil moisture trends and root-zone conditions.


Better decisions
Irrigate when needed, not on a schedule.


Emitter performance
Verify irrigation uniformity across multiple points.


More fruit, less waste
Improve quality and water efficiency.


Centre pivots




Directional visibility
See what's happening across every sector.


Multiple units, one network
All units connect to Wi-Fi at the pump station.


Spot problems early
Blocked nozzles, dry zones and soil variation.


Smarter irrigation, better yields
Apply water where it delivers results.


Wi-Fi backhaul to pump station or control room


Open-field vegetables




Root-zone monitoring
Accurate soil moisture where roots grow.


Irrigate with confidence
Only when and where crops need it.


Soil variation aware
Understand differences across the field.


Lower costs, higher returns
Save water, energy and labour.


Modular. Scalable. Proven in the field.

Add more units as you grow.





Product specification summary

A modular controller platform for sensing, automation and gateway expansion.

Feature	Specification
Product	GSD-Agrisensor-4TH-8SH-4R
Main chipset	Espressif ESP32-C5 — dual-band 2.4/5 GHz Wi-Fi 6, Bluetooth LE and IEEE 802.15.4
Inputs	8 soil-probe channels + 4 DHT22 channels
Control	4 low-voltage relay outputs
Connectivity	Wi-Fi, MQTT, GSD Dashboard and Home Assistant
Thread / Matter	hardware-ready; supported functionality enabled by firmware package
Power	permanent mains or solar supply with 18650 backup battery
Enclosure	IP65 custom housing
Calibration	Individual on-device soil-probe calibration
Consumables	replaceable soil probes, DHT22 sensor assemblies, field cables and connectors

One controller. Multiple measurement points. Better decisions.

GSD - Make the complex simple and usable.

NOTE:

Product specifications, runtime estimates, wireless range and supported third-party integrations remain subject to final hardware, firmware, installation conditions and project validation. Images are illustrative and may not represent final production hardware.

Connect more of the field

A GSD-designed Wi-Fi 6E base station extends reliable connectivity from a powered site to Agrisensors and compatible devices across the farm.

GSD WI-FI BASE STATION

Dual-band Wi-Fi 6 | AX3000

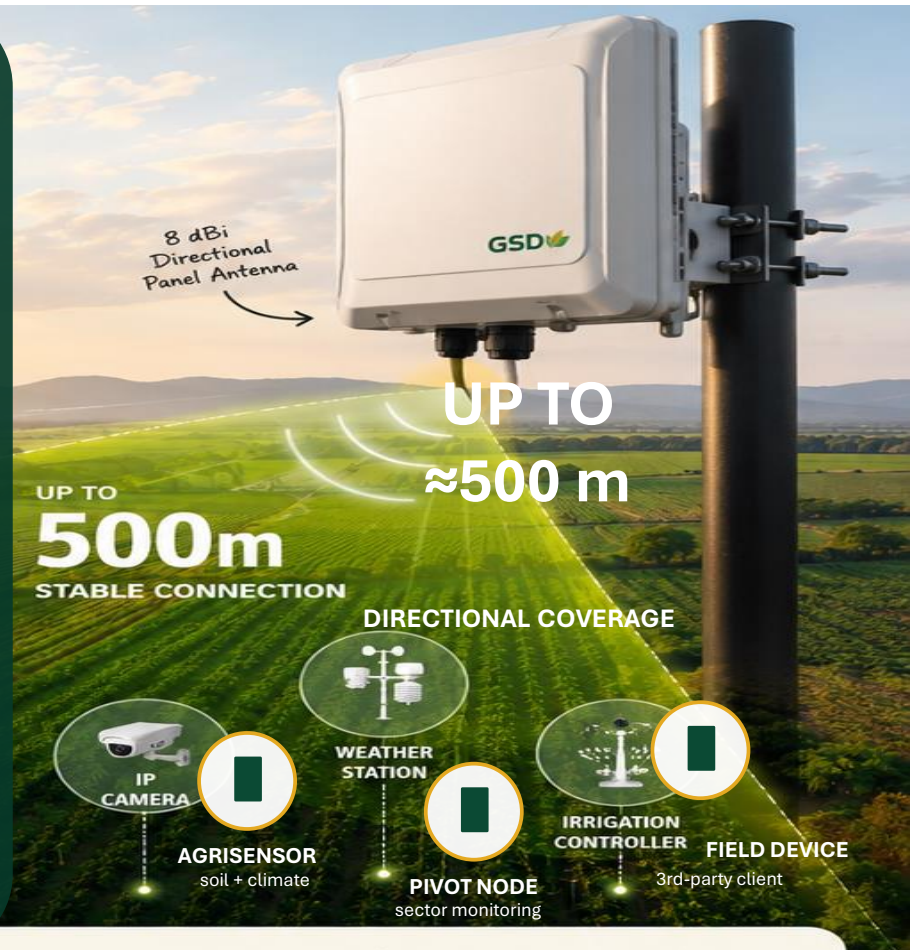
High-throughput Wi-Fi 6 platform

A GSD-designed AX3000 base station extends reliable Wi-Fi connectivity from a powered location to Agrisensors and compatible field devices.

 **8 dBi panel antenna**
Directional coverage

 **Up to 500 m**
To compatible devices with clear line of sight

 **Custom OpenWRT**
Control, security, updates



ONE BASE STATION. WIDE COVERAGE.

Deploy at a pump station, control room, mast or other powered location with clear line of sight to the monitored area.

AX3000

High-throughput Wi-Fi 6 platform

8 dBi

Focused directional panel antenna

OpenWRT

Custom firmware and remote management

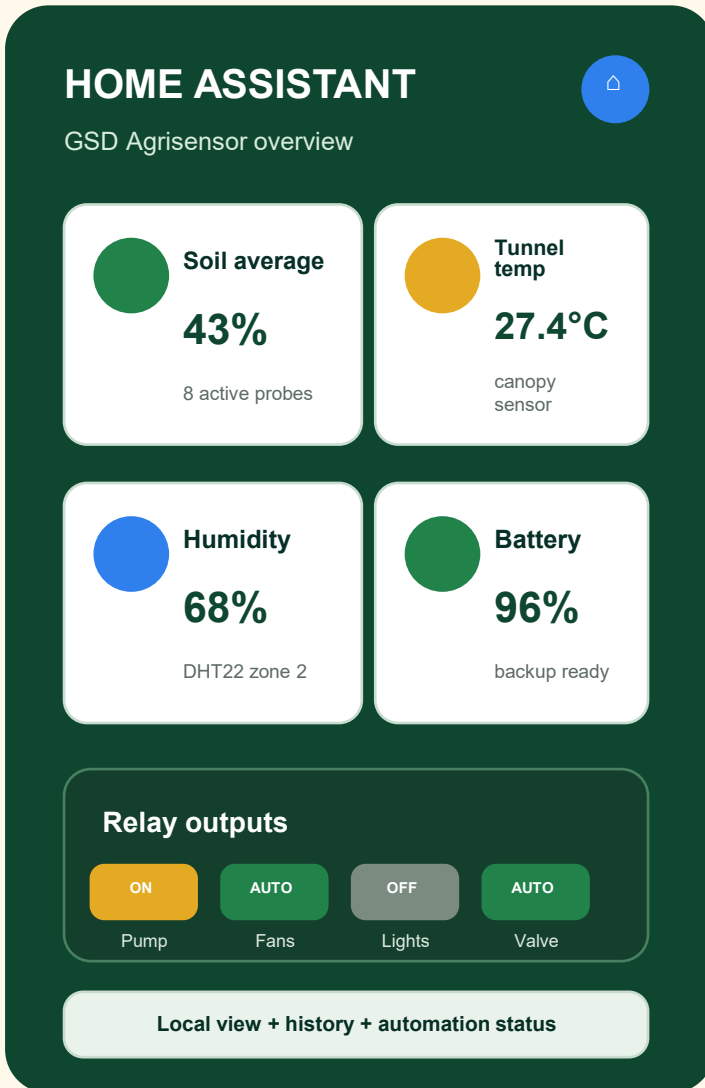
≈500 m

Typical device range with clear line of sight

Actual coverage depends on antenna alignment, installation height, terrain, vegetation, interference and the radio performance of the receiving device.

Home Assistant integration

Bring Agrisensor readings, relay states and farm automations into a familiar local dashboard.



How it connects



The Agrisensor publishes readings, relay states and system information over Wi-Fi and MQTT. Home Assistant turns Agrisensor data into a local dashboard and automation layer for the wider farm.

Home Assistant is a global, open-source home-automation platform supported by a worldwide community of developers and users. It provides local control, broad device compatibility and a flexible foundation for custom monitoring and automation without locking the customer into a single vendor.

What Home Assistant adds

- 1 Live farm dashboard**
Soil, climate, relay and battery entities in one view.
- 2 Local automations**
Use Agrisensor states inside existing HA routines.
- 3 Open integration path**
Combine GSD data with weather, cameras and other devices.
- 4 Installer-friendly**
Keep the GSD Dashboard, MQTT and HA working side-by-side.

Home Assistant turns Agrisensor data into a local farm-control dashboard.

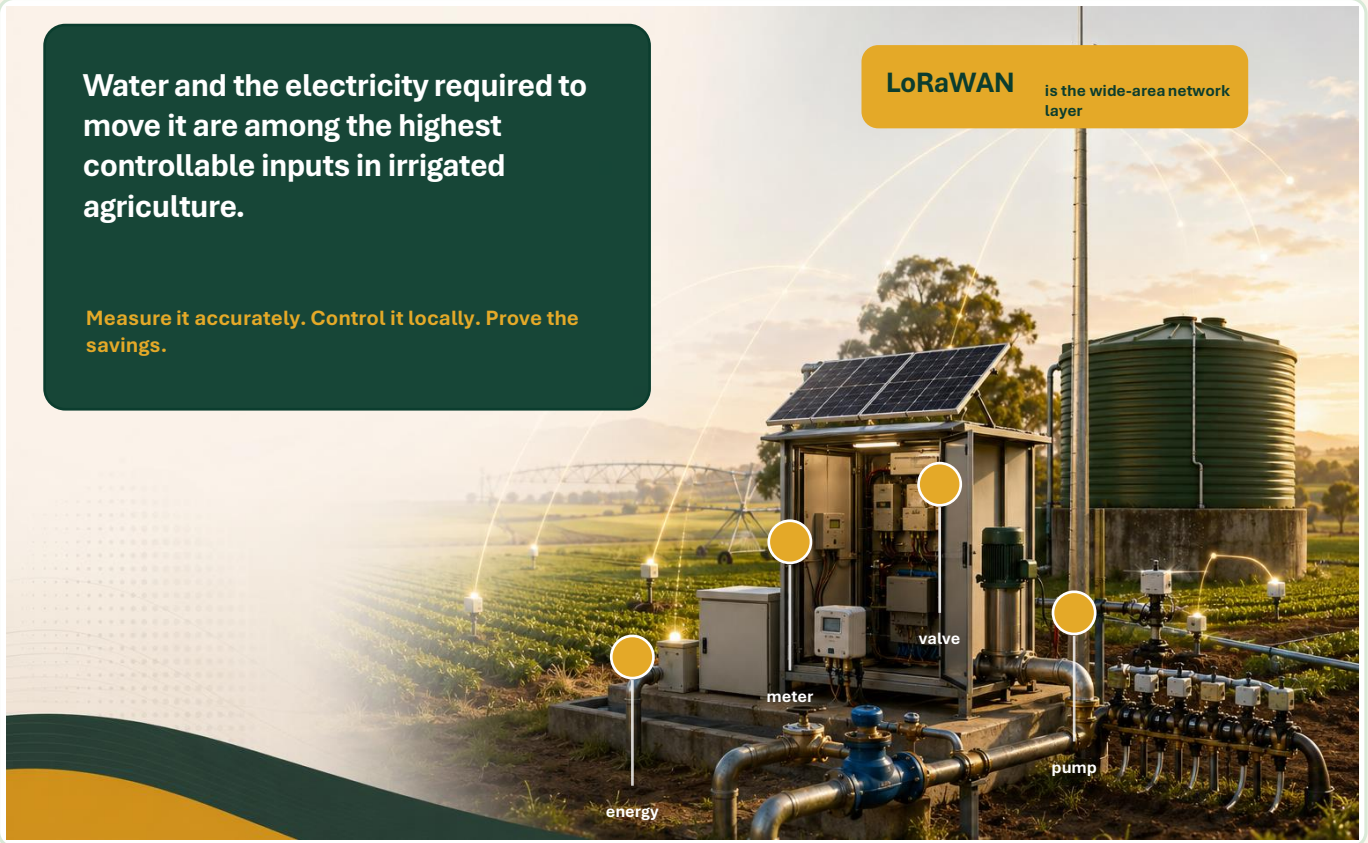
LoRaWAN farm services

Wide-area, device-agnostic infrastructure for water, electricity, pumps and field control.

Water and the electricity required to move it are among the highest controllable inputs in irrigated agriculture.

Measure it accurately. Control it locally. Prove the savings.

LoRaWAN is the wide-area network layer



Water metering

Integration experience with selected LoRaWAN devices from Kamstrup, Bove, Axioma and other compatible suppliers.



Remote pump stations

Boreholes, tanks, pressure, valves, pumps, energy and remote site alarms.



Device agnostic

Device-agnostic LoRaWAN platform. GSD supplies the complete LoRaWAN operating layer: field devices, gateway connectivity, dashboards, alerts and control workflows.

GSD Farm Services Dashboard

Water

124.8 kL

today

Pump

RUNNING

zone 3

Energy

38.2 kWh

24 h

Alerts

2

action

Water + power trend



Valve schedule

Pump protection

Leak / burst alerts

GSD supplies LoRaWAN technology within the Agrisensor range — field sensors, gateway connectivity, dashboards and control workflows.

LoRaWAN livestock + water

Livestock location, telemetry, trough levels and borehole control over a wide-area LoRaWAN network.



GPS LoRaWAN collars

Long-range cattle tracking using periodic GPS positions, activity information and farm telemetry.



LoRaWAN ear tags

Network-assisted location estimation, identification, body-temperature telemetry and activity/step data, depending on the selected device.



Water trough levels

Monitor drinking points and catch low-water events before stock are affected.



Borehole control

Remote borehole and pump management for livestock water security.

GSD Livestock & Water Dashboard

Collars

128

online

Ear tags

442

active

Troughs

83%

avg level

Borehole

AUTO

control

Movement + health trend



Geofence alerts

Body temp / steps

Trough + borehole status

One LoRaWAN network can support livestock telemetry, trough monitoring, borehole automation and wider remote farm services.

Thread + Matter devices

GSD AGRISENSOR RANGE

Thread/Matter-ready hardware

Indoor farm offices, packhouses and cold-chain operations connected through one automation layer.

Compatible Thread and Matter devices can be incorporated into the wider local automation system using supported border-router, controller and firmware configurations.



Farm offices

Doors, motion, lights, plugs and occupancy for secure local automation.



Cold rooms

Temperature, humidity, doors and leak alarms for produce storage.



Packhouses

Environmental monitoring, energy visibility and relay control for operations.

Why it matters

Cold-chain failures, open doors and poor storage conditions become visible fast — before produce quality or compliance is affected.

One local automation layer

Supported Thread and Matter devices can feed local rules, alerts and dashboards alongside Wi-Fi, MQTT and LoRaWAN services.

Popular device types



Temp / humidity



Door contacts



Leak detection



Energy plugs

Home Assistant unifies the farm technology stack

One local platform brings Wi-Fi, MQTT, LoRaWAN and compatible Thread/Matter devices together.

**GSD
Agrisensor**
soil • relays • MQTT

Thread / Matter
sensors • switches

**Home
Assistant**
local automations

**Farm
Dashboard**
alerts • trends

Examples of brands offering potentially compatible models

Aqara • Eve • Philips Hue • Shelly • Tapo • SwitchBot • Meross

Brand examples are indicative only. Availability and compatibility depend on model, region, protocol version and firmware support. Devices are validated per project.

Build the monitoring and automation system around your farm

Start with one Agrisensor and expand using Wi-Fi, LoRaWAN, Thread/Matter, MQTT and Home Assistant as requirements grow.



Measure accurately. Automate locally. Prove the result.

GSD
AGRISENSOR

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Partner preview —
specifications subject to
final engineering
validation.