

USAGE REPORT

Vehicle: Z137

Date: 30/06/2026

Location: SABI AGRI

Missions: 2

Mission 1

Trial date 2026-06-30

Location SABI AGRI, Auvergne, France

Operator Nicolas

Start time 09:30

End time 12:26

Weather

Precipitation type None

Temperature 32 °C

Sun position Zenith

Terrain

Slope 0 %

Cross slope 0 %

Soil

Texture Clay loam

Dominant particle size Stones 20-200 mm

Moisture condition Dry (hard)

Crop

Growth stage Bare soil

Weed pressure 2 %

Planned operation Hoeing

Adjacent environment

Tall vegetation No

Tall buildings No

Metallic structures Yes

Ditch or embankment Yes

High voltage lines No

Roads No

No network zone	No
Robot configuration	
Robot weight	2200 kg
Robot width	1.8 m
<i>Tool</i>	
Tool name	Bineuse
Tool type	Trailed
Tool weight	300 kg
Tool length	1.0 m
Tool width	1.8 m
Tool height	0.6 m
Tool total length	1.7 m
Working depth	0.2 m



Figure 1.1: Mission presentation photo

Mission presentation

Mission parameters

Task to perform	Binage
Trajectory	Rectiligne, square turn
Working speed	3.6 km/h
Mission file	zilus_griffe.json

Organization

<i>Workforce</i>	
Total number of employees	1
<i>Surface</i>	
Theoretical surface of the plot	0.08 ha

Worked plot surface	0.0938 ha
Plot fragmentation	Consolidated (<0.5 km)

Trajectory

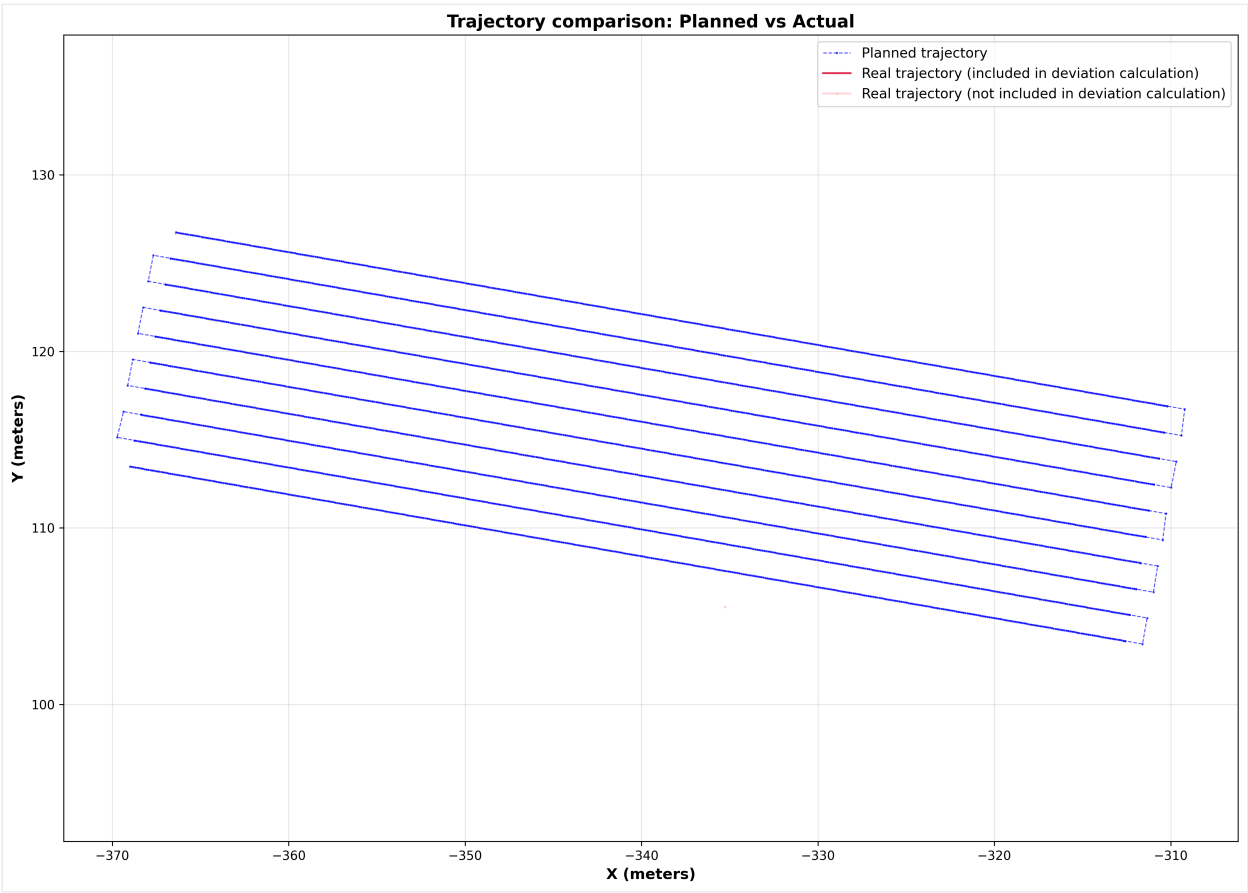


Figure 1.1: Planned vs actual trajectory comparison

Agronomic Summary

Energy per hectare	0.00 kWh/ha
Work rate	0.16 ha/h
Autonomy per battery	N/A

Time tracking

Tool setup	30 min
GPS connection wait	0 min
Wi-Fi connection wait	0 min
Supervision time	150 min
Travel time	10 min
Restart count	0
Stop count	3
Stop causes	ARU distant

Work assessment

Quality assessment	Very satisfied
Crop damage	None

Before work



After work



Performance Indicators

Agronomic ^[1]

Indicator	Value	Unit
Crop species	N/A	
Growth stage	Bare soil	
Soil texture	Clay loam	
Soil moisture	Dry (hard)	
Weed pressure	2	%
Planned operation	Hoeing	
Work quality assessment	Very satisfied	
Crop damage	None	

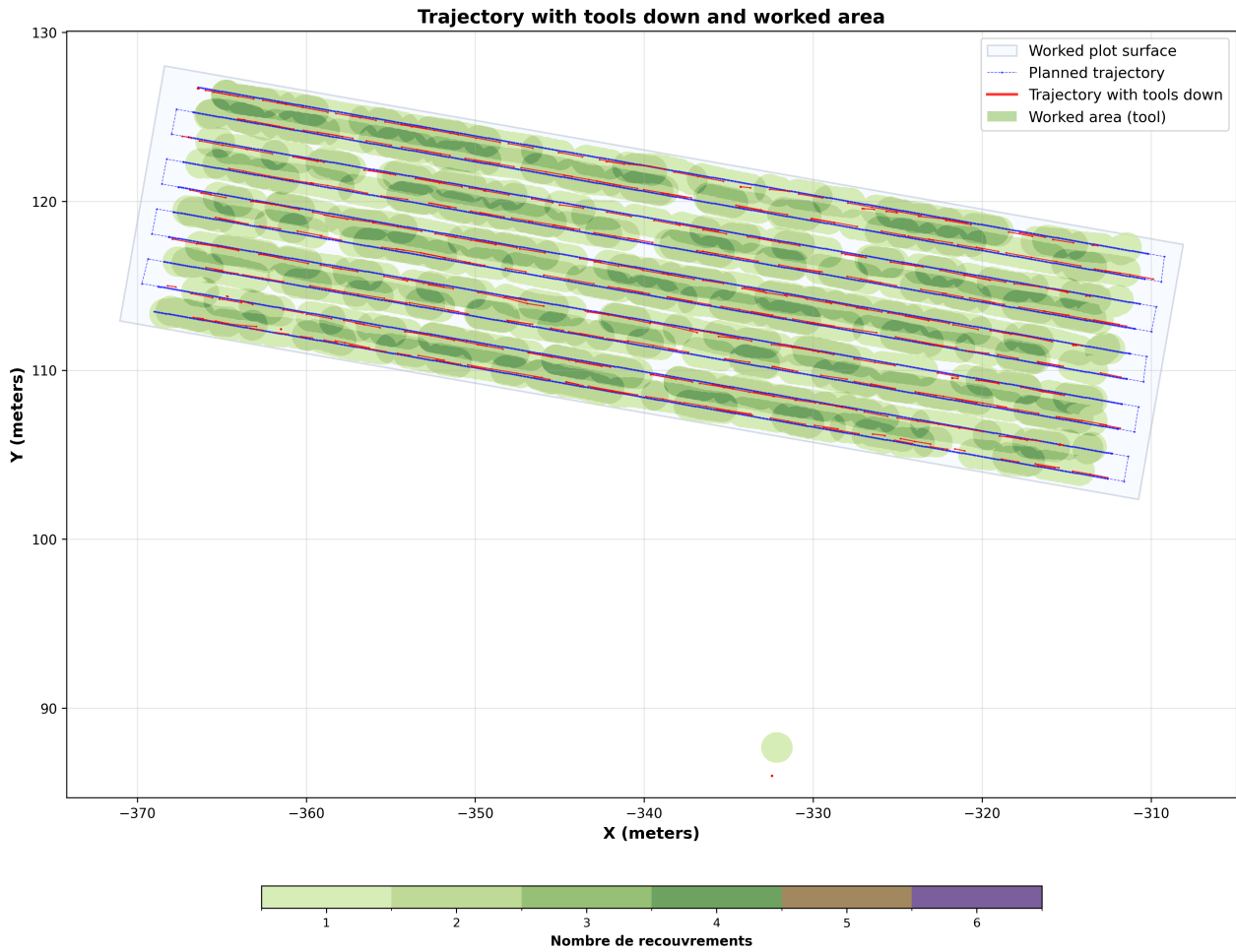
Energy ^[2]

Indicator	Value	Unit
SOC at start	81.00	%
SOC at end	70.00	%
Total discharge ^[3] For a battery pack capacity of: 36.86 kWh	0.00	%
Total energy consumed	0.00	kWh
Average power	0.00	kW
Energy per hectare	0.00	kWh/ha

Indicator	Value	Unit
Autonomy per battery <i>Calculation impossible (energy/ha or reference battery capacity missing)</i>	<i>N/A</i>	ha/batterie

Work Rate ^[4]

Indicator	Value	Unit
Work rate ^[5]	0.16	ha/h
Area covered ^[6]	0.28	ha
Worked plot surface ^[7]	0.09	ha
Worked area ^[8]	0.16	ha
Effective area ^[9]	0.08	ha
Coverage rate ^[10]	98.25	%
Average speed (km/h)	1.63	km/h
Max speed (km/h)	3.60	km/h



Economic ^[11]

Indicator	Value	Unit
Electricity price	0.19	€/kWh
Labor cost per hour	18.00	€/h
Employees assigned	0	
Labor cost per hectare	0.00	€/ha
Energy cost	N/A	€
Energy cost per hectare	N/A	€/ha
Total cost	N/A	€
Total cost per hectare	N/A	€/ha

Environmental ^[12]

Indicator	Value	Unit
Temperature	32	°C
Precipitation type	None	
CO ₂ emissions ^[13] <i>Emission factor applied: 317 g CO₂ per kWh.</i>	0.00	kg
Plot fragmentation	Consolidated (<0.5 km)	

Mission ^[14]

Indicator	Value	Unit
Planned distance ^[15]	603.65	m
Performed distance ^[16]	1530.24	m
Distance deviation	926.59	m
Performed distance (%)	253.50	%
Mean lateral deviation <i>Without half-turn</i>	8.52	cm
Max lateral deviation <i>Without half-turn</i>	19.85	cm
Mean lateral deviation (tool) <i>Without half-turn, tool distance: 170 cm</i>	11.27	cm
Max lateral deviation (tool) <i>Without half-turn, tool distance: 170 cm</i>	19.98	cm
Worked rows ^[17]	10	

Operational ^[18]

Indicator	Value	Unit
Robot weight	2200.00	kg
Tool weight	300.00	kg
Total weight	2500.00	kg
Energy per kg per hectare	0.00	kWh/kg/ha
Mean torque at work (% of nominal) ^[19] <i>Reference nominal torque: 2.39 N·m — Number of motors: —.</i>	N/A	%

Safety ^[20]

Indicator	Value	Unit
Geofencing exits	29	
Time outside geofencing (seconds)	2351.81	s
Time outside geofencing (hours)	0.65	h
Local emergency stops	0	
Remote emergency stops	0	
Bumper activations	0	

Reliability ^[21]

Indicator	Value	Unit
Output errors	0	
Input errors	0	
Battery errors	0	
Motor errors	0	
Cylinder errors	4	
Total errors	4	
Output error time (seconds)	N/A	s
Input error time (seconds)	N/A	s
Battery error time (seconds)	N/A	s
Motor error time (seconds)	N/A	s
Cylinder error time (seconds)	469.91	s
Total error time (seconds)	469.91	s
Error rate per hour	2.35	/h
System availability	92.33	%

Localization ^[22]

Indicator	Value	Unit
Localization errors	15	
Error time (seconds)	41.95	s
Error time (hours)	0.01	h

Time ^[23]

Indicator	Value	Unit
Total duration	6124.53	s
Total duration (hours)	1.70	h
Active time	2588.00	s
Active time (hours)	0.72	h
Inactive time	3536.54	s
Inactive time (hours)	0.98	h
Active time (%)	42.26	%
Inactive time (%)	57.74	%

Mission 2

Trial date	2026-06-30
Location	SABI AGRI, Auvergne, France
Operator	Nicolas
Start time	14:00
End time	07:59
Weather	
Precipitation type	None
Temperature	32 °C
Sun position	Zenith
Terrain	
Slope	0 %
Cross slope	0 %
Soil	
Texture	Clay loam
Dominant particle size	Stones 20-200 mm
Moisture condition	Dry (hard)
Crop	
Growth stage	Bare soil
Weed pressure	0 %
Planned operation	Soil preparation
Adjacent environment	
Tall vegetation	No
Tall buildings	No
Metallic structures	Yes
Ditch or embankment	Yes
High voltage lines	No
Roads	No
No network zone	No
Robot configuration	
Robot weight	2200 kg
Robot width	1.8 m
<i>Tool</i>	

Tool name	Outils rotatif
Tool type	Mounted
Tool weight	300 kg
Tool length	0.6 m
Tool width	1.4 m
Tool height	0.6 m
Tool total length	1.7 m
Working depth	0.1 m



Figure 2.1: Mission presentation photo

Mission presentation

Mission parameters

Task to perform	Passage Rota
Trajectory	Rectiligne, square turn
Working speed	0.5 km/h
Mission file	zilus_griffe.json

Organization

Workforce

Total number of employees	1
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Surface

Theoretical surface of the plot	0.08 ha
Worked plot surface	0.0938 ha
Plot fragmentation	Consolidated (<0.5 km)

Trajectory

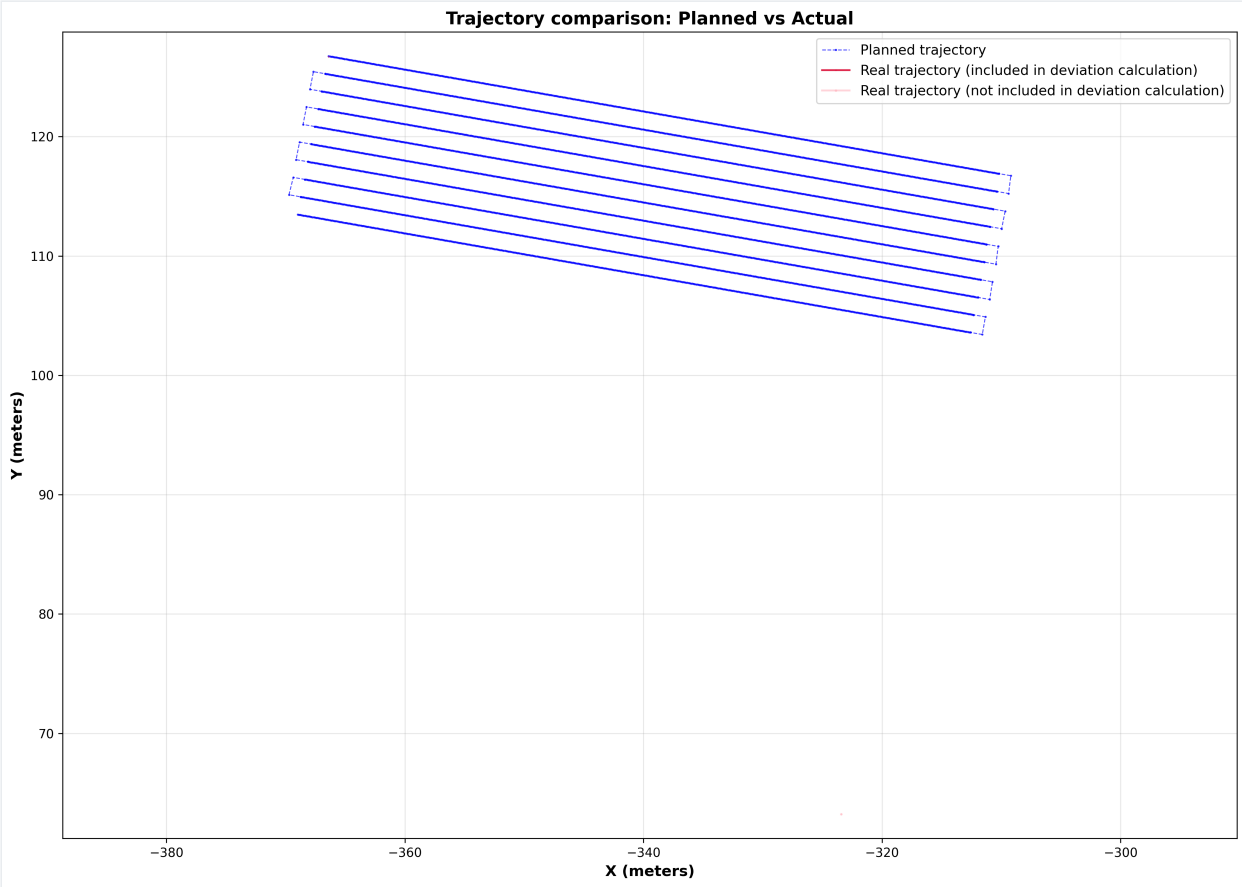


Figure 2.1: Planned vs actual trajectory comparison

Agronomic Summary

Energy per hectare	0.00 kWh/ha
Work rate	0.01 ha/h
Autonomy per battery	N/A
Time tracking	
Tool setup	30 min
GPS connection wait	0 min
Wi-Fi connection wait	0 min
Supervision time	150 min
Travel time	10 min
Restart count	0
Stop count	1
Stop causes	Réglage outils
Work assessment	
Quality assessment	Generally satisfied

Crop damage

None

Before work



After work



Performance Indicators

Agronomic ^[1]

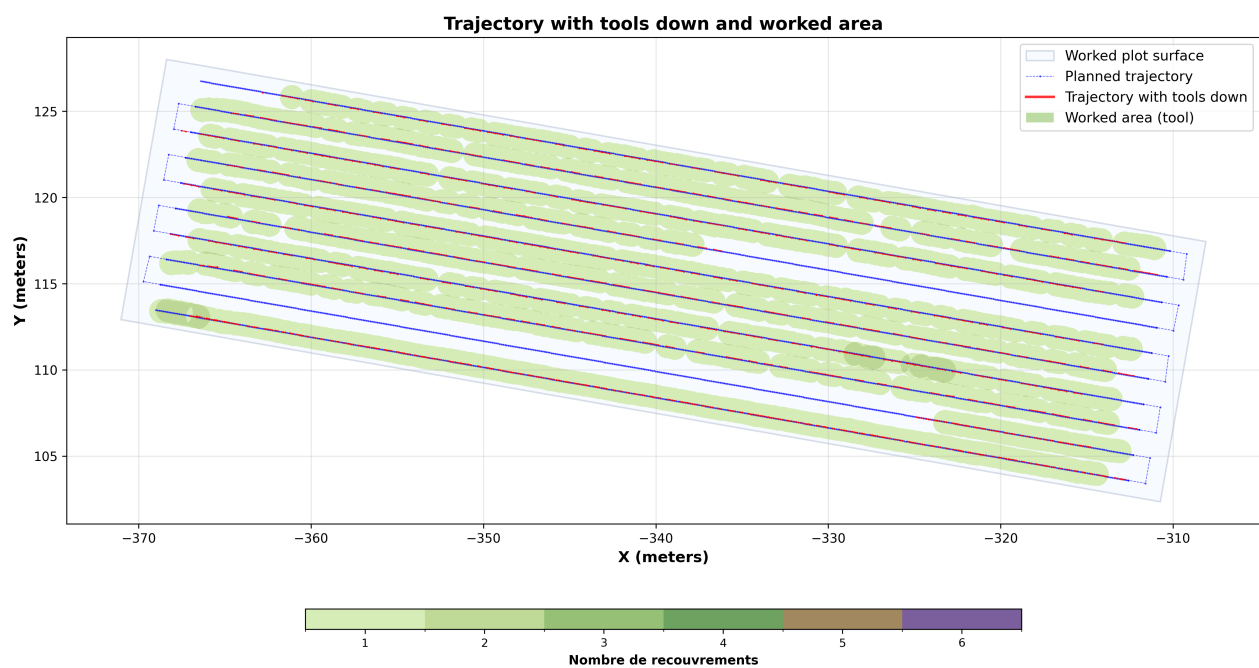
Indicator	Value	Unit
Crop species	N/A	
Growth stage	Bare soil	
Soil texture	Clay loam	
Soil moisture	Dry (hard)	
Weed pressure	0	%
Planned operation	Soil preparation	
Work quality assessment	Generally satisfied	
Crop damage	None	

Energy ^[2]

Indicator	Value	Unit
SOC at start	68.00	%
SOC at end	52.00	%
Total discharge ^[3] For a battery pack capacity of: 36.86 kWh	0.00	%
Total energy consumed	0.00	kWh
Average power	0.00	kW
Energy per hectare	0.00	kWh/ha
Autonomy per battery Calculation impossible (energy/ha or reference battery capacity missing)	N/A	ha/batterie

Work Rate ^[4]

Indicator	Value	Unit
Work rate ^[5]	0.01	ha/h
Area covered ^[6]	0.16	ha
Worked plot surface ^[7]	0.09	ha
Worked area ^[8]	0.07	ha
Effective area ^[9]	0.06	ha
Coverage rate ^[10]	1.86	%
Average speed (km/h)	0.67	km/h
Max speed (km/h)	3.60	km/h



Economic ^[11]

Indicator	Value	Unit
Electricity price	0.19	€/kWh
Labor cost per hour	18.00	€/h
Employees assigned	0	
Labor cost per hectare	0.00	€/ha
Energy cost	N/A	€
Energy cost per hectare	N/A	€/ha
Total cost	N/A	€
Total cost per hectare	N/A	€/ha

Environmental ^[12]

Indicator	Value	Unit
Temperature	32	°C
Precipitation type	None	
CO ₂ emissions ^[13] <i>Emission factor applied: 317 g CO₂ per kWh.</i>	0.00	kg
Plot fragmentation	Consolidated (<0.5 km)	

Mission ^[14]

Indicator	Value	Unit
Planned distance ^[15]	603.65	m
Performed distance ^[16]	891.88	m
Distance deviation	288.22	m
Performed distance (%)	147.75	%
Mean lateral deviation <i>Without half-turn</i>	4.71	cm
Max lateral deviation <i>Without half-turn</i>	19.95	cm
Mean lateral deviation (tool) <i>Without half-turn, tool distance: 170 cm</i>	6.32	cm
Max lateral deviation (tool) <i>Without half-turn, tool distance: 170 cm</i>	19.95	cm
Worked rows ^[17]	10	

Operational ^[18]

Indicator	Value	Unit
Robot weight	2200.00	kg
Tool weight	300.00	kg
Total weight	2500.00	kg
Energy per kg per hectare	0.00	kWh/kg/ha
Mean torque at work (% of nominal) ^[19] <i>Reference nominal torque: 2.39 N·m — Number of motors: —.</i>	N/A	%

Safety ^[20]

Indicator	Value	Unit
Geofencing exits	2	

Indicator	Value	Unit
Time outside geofencing (seconds)	1132.16	s
Time outside geofencing (hours)	0.31	h
Local emergency stops	0	
Remote emergency stops	0	
Bumper activations	0	

Reliability ^[21]

Indicator	Value	Unit
Output errors	0	
Input errors	0	
Battery errors	0	
Motor errors	0	
Cylinder errors	7	
Total errors	7	
Output error time (seconds)	N/A	s
Input error time (seconds)	N/A	s
Battery error time (seconds)	N/A	s
Motor error time (seconds)	N/A	s
Cylinder error time (seconds)	709.67	s
Total error time (seconds)	709.67	s
Error rate per hour	0.41	/h
System availability	98.85	%

Localization ^[22]

Indicator	Value	Unit
Localization errors	5	
Error time (seconds)	53327.76	s
Error time (hours)	14.81	h

Time ^[23]

Indicator	Value	Unit
Total duration	61535.54	s
Total duration (hours)	17.09	h
Active time	2559.97	s

Indicator	Value	Unit
Active time (hours)	0.71	h
Inactive time	58975.57	s
Inactive time (hours)	16.38	h
Active time (%)	4.16	%
Inactive time (%)	95.84	%

Descriptions of indicators

Bracketed numbers refer to definitions, assumptions and sources listed below.

- [1] Agronomic indicator: value from the recorded crop trial context.
- [2] Energy indicator: derived from electrical measurements, consumption and SOC logged during the mission.
- [3] Total discharge (%): energy consumed during the mission (change in cumulative energy, in kWh) divided by nominal battery pack capacity (kWh), multiplied by 100. This indicator does not use start or end SOC; reference pack capacity is stated in the note when known.
- [4] Work-rate indicator: derived from worked areas, speeds and time on field.
- [5] Work rate: amount of work completed per unit of time, in ha/h. Hourly rate = area covered (ha) ÷ total mission duration (h).
- [6] Area covered: this is the area swept by the robot = cumulative odometric distance × robot width.
- [7] Worked plot surface: area of the plot worked by the robot. It is modeled as an oriented bounding box (OBB) with a margin equal to half the robot width around the planned trajectory that was worked.
- [8] Worked area: area processed by the implement (tool width × path length with implement lowered). Each pass counts; overlaps add up.
- [9] Effective area: area worked by the implement excluding overlaps.
- [10] Coverage rate: ratio of worked area to effective area. $(\text{worked area} - \text{effective area}) / \text{effective area} \times 100$. A high value indicates many passes over the same zones.
- [11] Economic indicator: computed from cost settings and mission energy/time aggregates.
- [12] Environmental indicator: derived from weather context or consumption using the documented method.
- [13] CO₂ emissions from grid electricity consumed during the mission (kWh × 0.317 kg/kWh). Source: French Ministry for Ecological Transition — Key Climate Figures (digital edition), chapter on GHG emissions from industry / electricity production (statistiques.developpement-durable.gouv.fr).
- [14] Mission indicator: derived from actual path, plan and computed geometric deviations.
- [15] Theoretical mission distance: cumulative length of the planned trajectory from the mission JSON file. Does not match the robot's actual path.
- [16] Distance actually traveled by the robot. May include movement before the mission effectively starts and after it ends, depending on the recorded data.
- [17] Number of distinct rows worked (tool lowered).
- [18] Operational indicator: derived from kinematics, implement data or documented masses.
- [19] Mean absolute motor torque only when the tool is lowered, as a percentage of the motors' nominal torque.
- [20] Safety indicator: derived from safety-related events and durations.
- [21] Reliability indicator: derived from fault codes and error time per subsystem.
- [22] Localization indicator: derived from localization faults or downtime during the mission.
- [23] Time indicator: derived from timestamps and activity states during the mission.