

# USAGE REPORT

Vehicle: SRBC TEST

Date: 04/03/2026

Location: SABI AGRI

Missions: 2

## Mission 1

**Trial date** 2026-03-04

**Location** SABI AGRI, Auvergne, France

**Operator** Nicolas

**Start time** 11:30

**End time** 12:48

### Weather

**Precipitation type** None

**Temperature** 20 °C

**Sun position** Zenith

### Terrain

**Slope** 0 %

**Cross slope** 0 %

### Soil

**Texture** Clay loam

**Dominant particle size** Gravel 2-20 mm

**Moisture condition** Friable (optimal)

### Crop

**Species** Radis

**Growth stage** Germination

**Weed pressure** 2 %

**Planned operation** Sowing

### Adjacent environment

**Tall vegetation** No

**Tall buildings** No

**Metallic structures** Yes

**Ditch or embankment** Yes

**High voltage lines** No

|                            |         |
|----------------------------|---------|
| <b>Roads</b>               | No      |
| <b>No network zone</b>     | No      |
| <b>Robot configuration</b> |         |
| <b>Robot weight</b>        | 280 kg  |
| <b>Robot width</b>         | 0.64 m  |
| <i>Tool</i>                |         |
| <b>Tool name</b>           | Semoir  |
| <b>Tool type</b>           | Mounted |
| <b>Tool length</b>         | 0.8 m   |
| <b>Tool width</b>          | 0.1 m   |
| <b>Tool height</b>         | 0.3 m   |
| <b>Tool total length</b>   | 1.1 m   |
| <b>Working depth</b>       | 0.18 m  |



Figure 1.1: Mission presentation photo

## Mission presentation

### Mission parameters

|                        |                                             |
|------------------------|---------------------------------------------|
| <b>Task to perform</b> | Semis Radis                                 |
| <b>Trajectory</b>      | rectiligne, square turn                     |
| <b>Working speed</b>   | 0.72 km/h                                   |
| <b>Mission file</b>    | mission_semis_radis_carotte_parcelle_1.json |

### Organization

|                                  |           |
|----------------------------------|-----------|
| <i>Workforce</i>                 |           |
| <b>Total number of employees</b> | 1         |
| <b>Employees on robot task</b>   | 0         |
| <i>Surface</i>                   |           |
|                                  | 0.0202 ha |

**Theoretical surface of the plot**

**Worked plot surface** 0.0276 ha

**Plot fragmentation** Consolidated (<0.5 km)

**Trajectory**

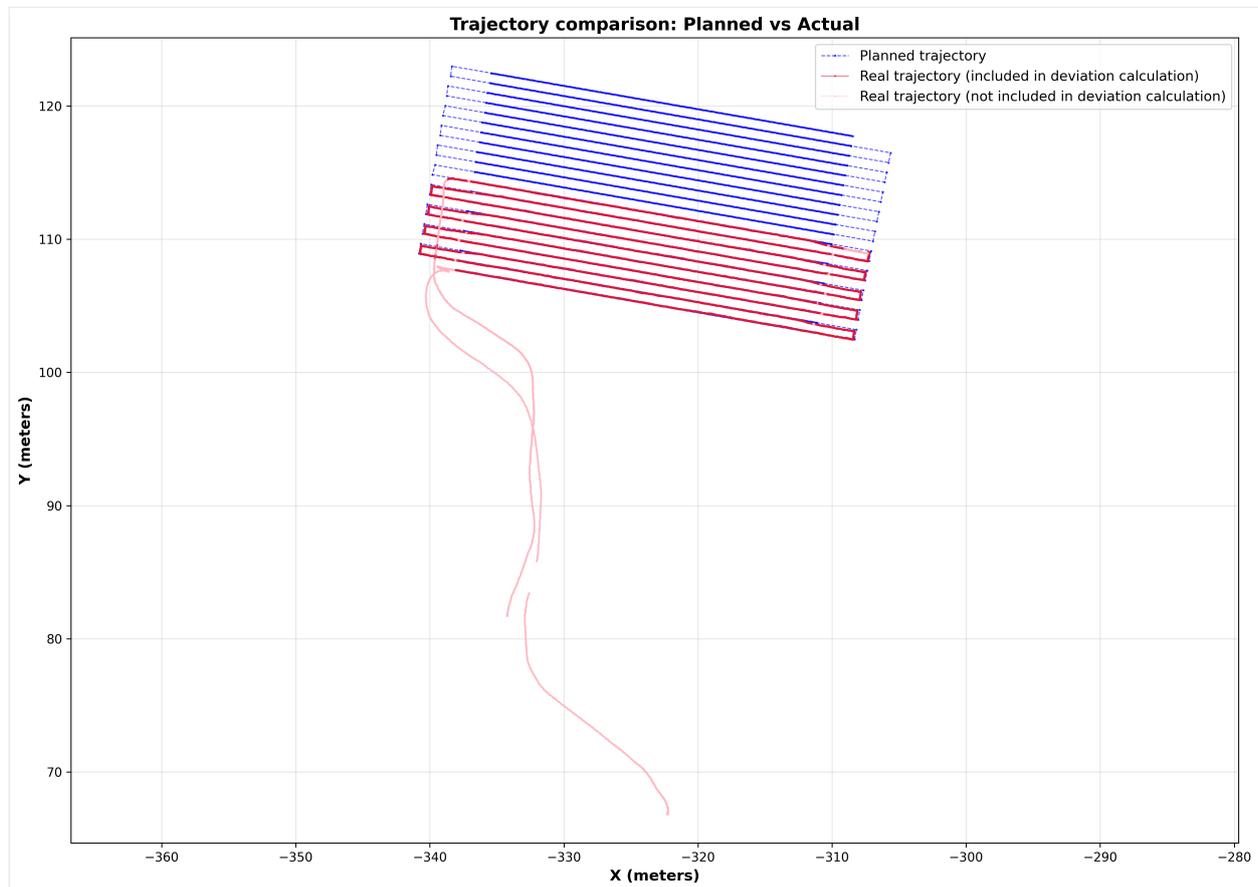


Figure 1.1: Planned vs actual trajectory comparison

**Agronomic Summary**

**Energy per hectare** 3.80 kWh/ha

**Work rate** 0.05 ha/h

**Autonomy per battery** 0.67 ha/batterie

**Time tracking**

**Tool setup** 10 min

**GPS connection wait** 45 min

**Wi-Fi connection wait** 0 min

**Supervision time** 30 min

**Travel time** 5 min

**Restart count** 1

|                           |                          |
|---------------------------|--------------------------|
| <b>Stop count</b>         | 3                        |
| <b>Stop causes</b>        | detection de personnes 3 |
| <b>Work assessment</b>    |                          |
| <b>Quality assessment</b> | Very satisfied           |
| <b>Crop damage</b>        | None                     |

## Performance Indicators

### Agronomic <sup>[1]</sup>

| Indicateur              | Valeur                   | Unité |
|-------------------------|--------------------------|-------|
| Crop species            | <b>Radis</b>             |       |
| Growth stage            | <b>Germination</b>       |       |
| Soil texture            | <b>Clay loam</b>         |       |
| Soil moisture           | <b>Friable (optimal)</b> |       |
| Weed pressure           | <b>2</b>                 | %     |
| Planned operation       | <b>Sowing</b>            |       |
| Work quality assessment | <b>Very satisfied</b>    |       |
| Crop damage             | <b>None</b>              |       |

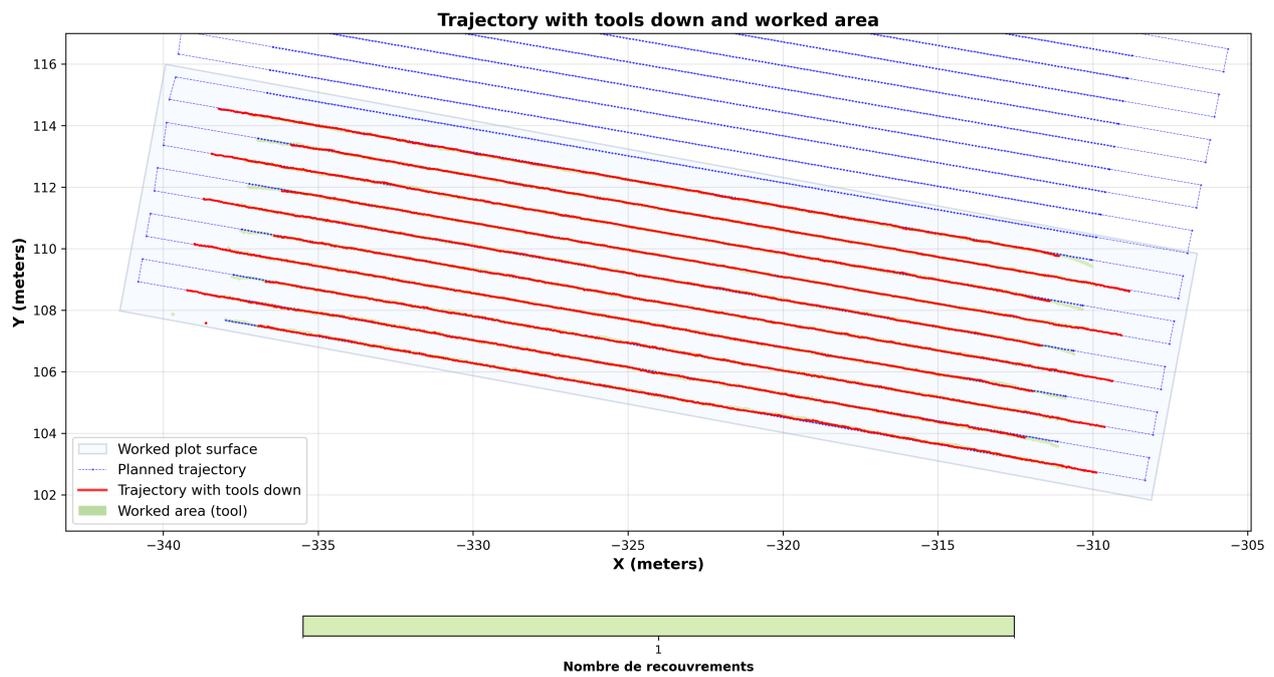
### Energy <sup>[2]</sup>

| Indicateur                                                                        | Valeur       | Unité       |
|-----------------------------------------------------------------------------------|--------------|-------------|
| SOC at start                                                                      | <b>86.20</b> | %           |
| SOC at end                                                                        | <b>80.20</b> | %           |
| Total discharge <sup>[3]</sup><br><i>For a battery pack capacity of: 2.54 kWh</i> | <b>6.51</b>  | %           |
| Total energy consumed                                                             | <b>0.17</b>  | kWh         |
| Average power                                                                     | <b>0.17</b>  | kW          |
| Energy per hectare                                                                | <b>3.80</b>  | kWh/ha      |
| Autonomy per battery<br><i>Reference battery: 2.54 kWh</i>                        | <b>0.67</b>  | ha/batterie |

### Work Rate <sup>[4]</sup>

| Indicateur                  | Valeur      | Unité |
|-----------------------------|-------------|-------|
| Work rate <sup>[5]</sup>    | <b>0.05</b> | ha/h  |
| Area covered <sup>[6]</sup> | <b>0.04</b> | ha    |

| Indicateur              | Valeur      | Unité |
|-------------------------|-------------|-------|
| Worked plot surface [7] | <b>0.03</b> | ha    |
| Worked area [8]         | <b>0.00</b> | ha    |
| Effective area [9]      | <b>0.00</b> | ha    |
| Coverage rate [10]      | <b>0.00</b> | %     |
| Average speed (km/h)    | <b>0.51</b> | km/h  |
| Max speed (km/h)        | <b>3.60</b> | km/h  |



### Economic [11]

| Indicateur              | Valeur       | Unité |
|-------------------------|--------------|-------|
| Electricity price       | <b>0.19</b>  | €/kWh |
| Labor cost per hour     | <b>18.00</b> | €/h   |
| Employees assigned      | <b>0</b>     |       |
| Labor cost per hectare  | <b>0.00</b>  | €/ha  |
| Energy cost             | <b>0.03</b>  | €     |
| Energy cost per hectare | <b>0.72</b>  | €/ha  |
| Total cost              | <b>0.03</b>  | €     |
| Total cost per hectare  | <b>0.72</b>  | €/ha  |

## Environmental <sup>[12]</sup>

| Indicateur                                                                                                 | Valeur                           | Unité |
|------------------------------------------------------------------------------------------------------------|----------------------------------|-------|
| Temperature                                                                                                | <b>20</b>                        | °C    |
| Precipitation type                                                                                         | <b>None</b>                      |       |
| CO <sub>2</sub> emissions <sup>[13]</sup><br><i>Emission factor applied: 317 g CO<sub>2</sub> per kWh.</i> | <b>0.05</b>                      | kg    |
| Plot fragmentation                                                                                         | <b>Consolidated (&lt;0.5 km)</b> |       |

## Mission <sup>[14]</sup>

| Indicateur                                                                       | Valeur        | Unité |
|----------------------------------------------------------------------------------|---------------|-------|
| Planned distance <sup>[15]</sup>                                                 | <b>706.47</b> | m     |
| Performed distance <sup>[16]</sup>                                               | <b>681.24</b> | m     |
| Distance deviation                                                               | <b>-25.23</b> | m     |
| Performed distance (%)                                                           | <b>96.43</b>  | %     |
| Mean lateral deviation<br><i>Without half-turn</i>                               | <b>1.55</b>   | cm    |
| Max lateral deviation<br><i>Without half-turn</i>                                | <b>19.59</b>  | cm    |
| Mean lateral deviation (tool)<br><i>Without half-turn, tool distance: 110 cm</i> | <b>2.12</b>   | cm    |
| Max lateral deviation (tool)<br><i>Without half-turn, tool distance: 110 cm</i>  | <b>19.83</b>  | cm    |
| Worked rows <sup>[17]</sup>                                                      | <b>10</b>     |       |

## Operational <sup>[18]</sup>

| Indicateur                                                                                                             | Valeur        | Unité     |
|------------------------------------------------------------------------------------------------------------------------|---------------|-----------|
| Robot weight                                                                                                           | <b>280.00</b> | kg        |
| Tool weight                                                                                                            | <i>N/A</i>    | kg        |
| Total weight                                                                                                           | <b>280.00</b> | kg        |
| Energy per kg per hectare                                                                                              | <b>0.01</b>   | kWh/kg/ha |
| Mean torque at work (% of nominal) <sup>[19]</sup><br><i>Reference nominal torque: 2.39 N·m — Number of motors: 2.</i> | <b>43.98</b>  | %         |

## Safety <sup>[20]</sup>

| Indicateur       | Valeur   | Unité |
|------------------|----------|-------|
| Geofencing exits | <b>1</b> |       |

| Indicateur                        | Valeur        | Unité |
|-----------------------------------|---------------|-------|
| Time outside geofencing (seconds) | <b>865.00</b> | s     |
| Time outside geofencing (hours)   | <b>0.24</b>   | h     |
| Local emergency stops             | <b>1</b>      |       |
| Remote emergency stops            | <b>0</b>      |       |
| Bumper activations                | <b>0</b>      |       |

### Reliability <sup>[21]</sup>

| Indicateur                    | Valeur        | Unité |
|-------------------------------|---------------|-------|
| Output errors                 | <b>0</b>      |       |
| Input errors                  | <b>0</b>      |       |
| Battery errors                | <b>0</b>      |       |
| Motor errors                  | <b>0</b>      |       |
| Cylinder errors               | <b>0</b>      |       |
| Total errors                  | <b>0</b>      |       |
| Output error time (seconds)   | <b>0.00</b>   | s     |
| Input error time (seconds)    | <b>0.00</b>   | s     |
| Battery error time (seconds)  | <b>0.00</b>   | s     |
| Motor error time (seconds)    | <b>0.00</b>   | s     |
| Cylinder error time (seconds) | <b>0.00</b>   | s     |
| Total error time (seconds)    | <b>0.00</b>   | s     |
| Error rate per hour           | <b>0.00</b>   | /h    |
| System availability           | <b>100.00</b> | %     |

### Localization <sup>[22]</sup>

| Indicateur           | Valeur      | Unité |
|----------------------|-------------|-------|
| Localization errors  | <b>1</b>    |       |
| Error time (seconds) | <b>3.00</b> | s     |
| Error time (hours)   | <b>0.00</b> | h     |

### Time <sup>[23]</sup>

| Indicateur             | Valeur         | Unité |
|------------------------|----------------|-------|
| Total duration         | <b>3484.62</b> | s     |
| Total duration (hours) | <b>0.97</b>    | h     |
| Active time            | <b>1843.67</b> | s     |

| Indicateur            | Valeur         | Unité |
|-----------------------|----------------|-------|
| Active time (hours)   | <b>0.51</b>    | h     |
| Inactive time         | <b>1640.96</b> | s     |
| Inactive time (hours) | <b>0.46</b>    | h     |
| Active time (%)       | <b>52.91</b>   | %     |
| Inactive time (%)     | <b>47.09</b>   | %     |

## Mission 2

|                   |                             |
|-------------------|-----------------------------|
| <b>Trial date</b> | 2026-03-04                  |
| <b>Location</b>   | SABI AGRI, Auvergne, France |
| <b>Operator</b>   | Nicolas                     |
| <b>Start time</b> | 14:00                       |
| <b>End time</b>   | 14:59                       |

### Weather

|                           |        |
|---------------------------|--------|
| <b>Precipitation type</b> | None   |
| <b>Temperature</b>        | 22 °C  |
| <b>Sun position</b>       | Zenith |

### Terrain

|                    |     |
|--------------------|-----|
| <b>Slope</b>       | 0 % |
| <b>Cross slope</b> | 0 % |

### Soil

|                               |                   |
|-------------------------------|-------------------|
| <b>Texture</b>                | Clay loam         |
| <b>Dominant particle size</b> | Gravel 2-20 mm    |
| <b>Moisture condition</b>     | Friable (optimal) |

### Crop

|                          |             |
|--------------------------|-------------|
| <b>Species</b>           | Carrot      |
| <b>Growth stage</b>      | Germination |
| <b>Weed pressure</b>     | 2 %         |
| <b>Planned operation</b> | Sowing      |

### Adjacent environment

|                            |     |
|----------------------------|-----|
| <b>Tall vegetation</b>     | No  |
| <b>Tall buildings</b>      | No  |
| <b>Metallic structures</b> | Yes |
| <b>Ditch or embankment</b> | Yes |
| <b>High voltage lines</b>  | No  |
| <b>Roads</b>               | No  |
| <b>No network zone</b>     | No  |

### Robot configuration

|                     |        |
|---------------------|--------|
| <b>Robot weight</b> | 280 kg |
| <b>Robot width</b>  | 0.64 m |

### Tool

|                          |         |
|--------------------------|---------|
| <b>Tool name</b>         | Semoir  |
| <b>Tool type</b>         | Mounted |
| <b>Tool weight</b>       | 5 kg    |
| <b>Tool length</b>       | 0.8 m   |
| <b>Tool width</b>        | 0.1 m   |
| <b>Tool height</b>       | 0.3 m   |
| <b>Tool total length</b> | 1.1 m   |
| <b>Working depth</b>     | 0.18 m  |



Figure 2.1: Mission presentation photo

## Mission presentation

### Mission parameters

|                        |                                             |
|------------------------|---------------------------------------------|
| <b>Task to perform</b> | Semis carotte                               |
| <b>Trajectory</b>      | rectiligne, square turn                     |
| <b>Working speed</b>   | 0.72 km/h                                   |
| <b>Mission file</b>    | mission_semis_radis_carotte_parcelle_1.json |

### Organization

#### Workforce

|                                  |   |
|----------------------------------|---|
| <b>Total number of employees</b> | 1 |
| <b>Employees on robot task</b>   | 0 |

#### Surface

|                                        |                        |
|----------------------------------------|------------------------|
| <b>Theoretical surface of the plot</b> | 0.0223 ha              |
| <b>Worked plot surface</b>             | 0.0277 ha              |
| <b>Plot fragmentation</b>              | Consolidated (<0.5 km) |

## Trajectory

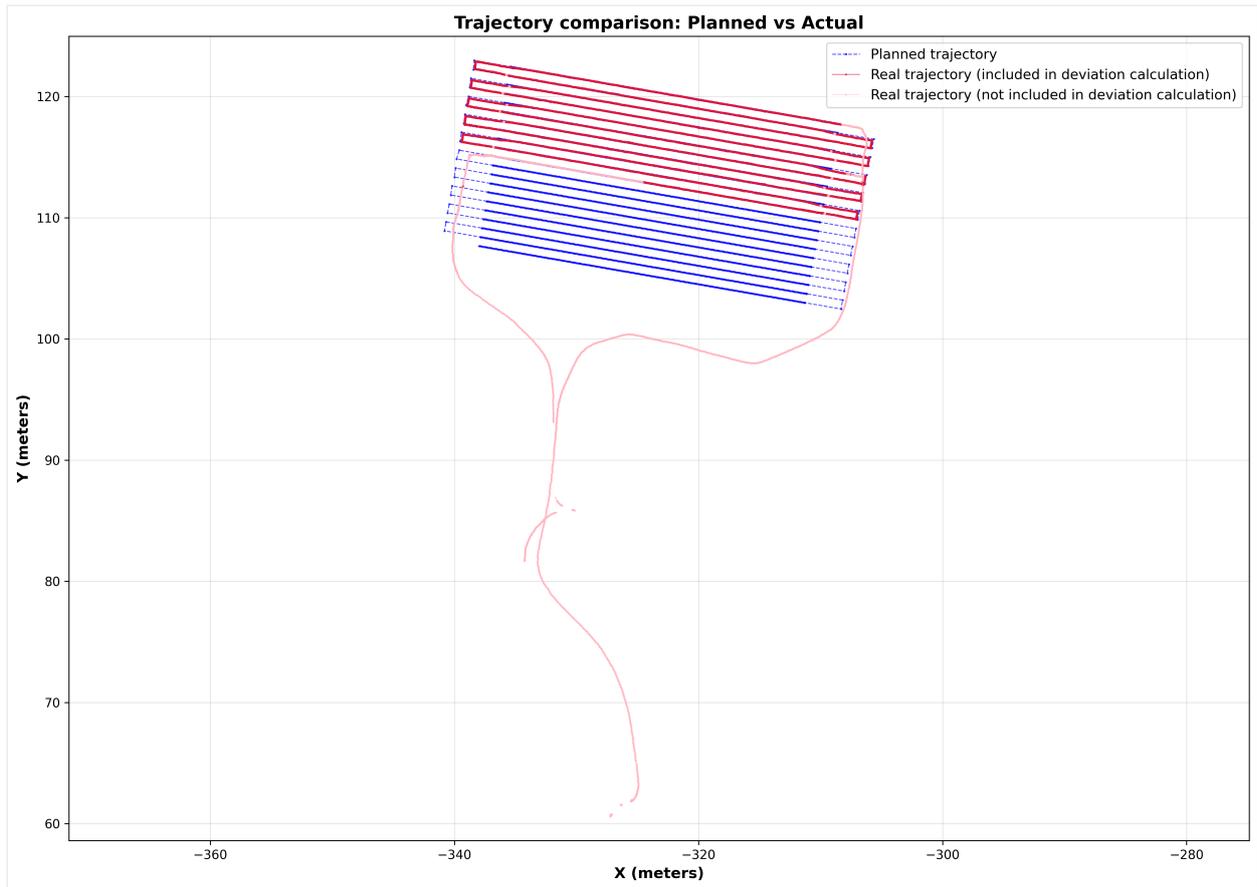


Figure 2.1: Planned vs actual trajectory comparison

## Agronomic Summary

|                      |                  |
|----------------------|------------------|
| Energy per hectare   | 3.89 kWh/ha      |
| Work rate            | 0.05 ha/h        |
| Autonomy per battery | 0.65 ha/batterie |

### Time tracking

|                       |       |
|-----------------------|-------|
| Tool setup            | 0 min |
| GPS connection wait   | 0 min |
| Wi-Fi connection wait | 0 min |
| Supervision time      | 5 min |
| Travel time           | 3 min |
| Restart count         | 0     |
| Stop count            | 0     |

### Work assessment

|                    |                |
|--------------------|----------------|
| Quality assessment | Very satisfied |
| Crop damage        | None           |

## Performance Indicators

### Agronomic <sup>[1]</sup>

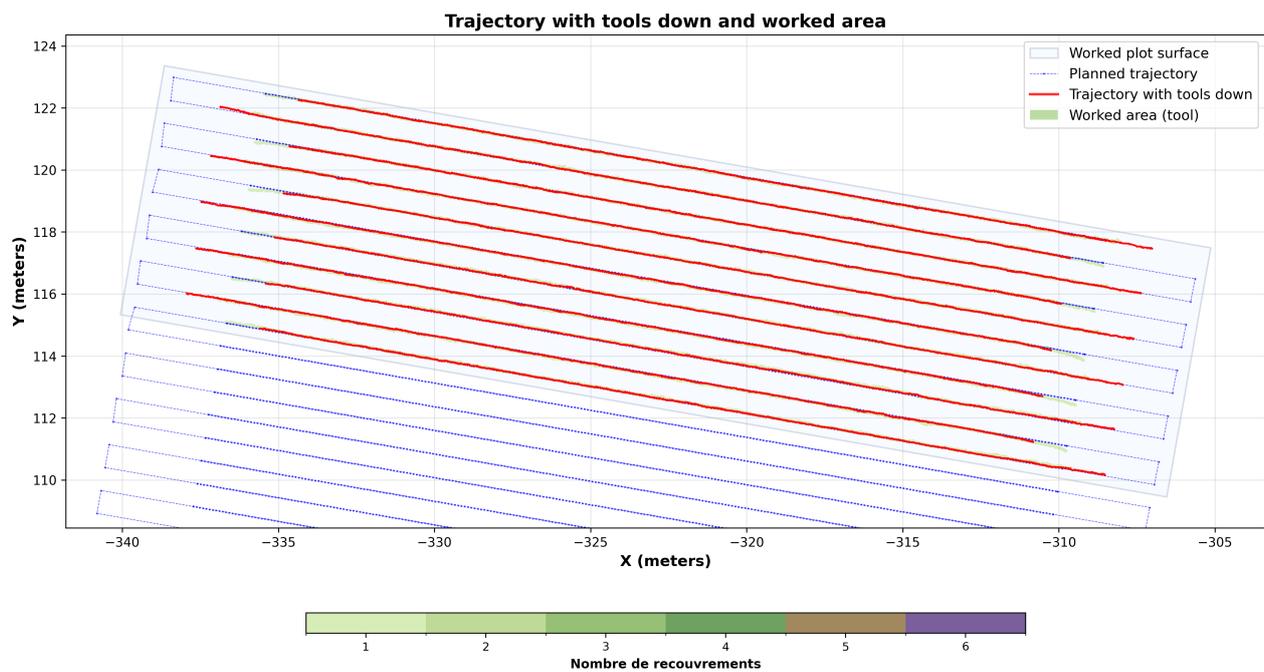
| Indicateur              | Valeur                   | Unité |
|-------------------------|--------------------------|-------|
| Crop species            | <b>Carrot</b>            |       |
| Growth stage            | <b>Germination</b>       |       |
| Soil texture            | <b>Clay loam</b>         |       |
| Soil moisture           | <b>Friable (optimal)</b> |       |
| Weed pressure           | <b>2</b>                 | %     |
| Planned operation       | <b>Sowing</b>            |       |
| Work quality assessment | <b>Very satisfied</b>    |       |
| Crop damage             | <b>None</b>              |       |

### Energy <sup>[2]</sup>

| Indicateur                                                                        | Valeur       | Unité       |
|-----------------------------------------------------------------------------------|--------------|-------------|
| SOC at start                                                                      | <b>80.10</b> | %           |
| SOC at end                                                                        | <b>73.50</b> | %           |
| Total discharge <sup>[3]</sup><br><i>For a battery pack capacity of: 2.54 kWh</i> | <b>7.21</b>  | %           |
| Total energy consumed                                                             | <b>0.18</b>  | kWh         |
| Average power                                                                     | <b>0.19</b>  | kW          |
| Energy per hectare                                                                | <b>3.89</b>  | kWh/ha      |
| Autonomy per battery<br><i>Reference battery: 2.54 kWh</i>                        | <b>0.65</b>  | ha/batterie |

### Work Rate <sup>[4]</sup>

| Indicateur                         | Valeur      | Unité |
|------------------------------------|-------------|-------|
| Work rate <sup>[5]</sup>           | <b>0.05</b> | ha/h  |
| Area covered <sup>[6]</sup>        | <b>0.05</b> | ha    |
| Worked plot surface <sup>[7]</sup> | <b>0.03</b> | ha    |
| Worked area <sup>[8]</sup>         | <b>0.00</b> | ha    |
| Effective area <sup>[9]</sup>      | <b>0.00</b> | ha    |
| Coverage rate <sup>[10]</sup>      | <b>0.02</b> | %     |
| Average speed (km/h)               | <b>0.63</b> | km/h  |
| Max speed (km/h)                   | <b>3.60</b> | km/h  |



### Economic <sup>[11]</sup>

| Indicateur              | Valeur       | Unité |
|-------------------------|--------------|-------|
| Electricity price       | <b>0.19</b>  | €/kWh |
| Labor cost per hour     | <b>18.00</b> | €/h   |
| Employees assigned      | <b>0</b>     |       |
| Labor cost per hectare  | <b>0.00</b>  | €/ha  |
| Energy cost             | <b>0.03</b>  | €     |
| Energy cost per hectare | <b>0.74</b>  | €/ha  |
| Total cost              | <b>0.03</b>  | €     |
| Total cost per hectare  | <b>0.74</b>  | €/ha  |

### Environmental <sup>[12]</sup>

| Indicateur                                                                                                 | Valeur                           | Unité |
|------------------------------------------------------------------------------------------------------------|----------------------------------|-------|
| Temperature                                                                                                | <b>22</b>                        | °C    |
| Precipitation type                                                                                         | <b>None</b>                      |       |
| CO <sub>2</sub> emissions <sup>[13]</sup><br><i>Emission factor applied: 317 g CO<sub>2</sub> per kWh.</i> | <b>0.06</b>                      | kg    |
| Plot fragmentation                                                                                         | <b>Consolidated (&lt;0.5 km)</b> |       |

## Mission <sup>[14]</sup>

| Indicateur                                                                       | Valeur        | Unité |
|----------------------------------------------------------------------------------|---------------|-------|
| Planned distance <sup>[15]</sup>                                                 | <b>706.47</b> | m     |
| Performed distance <sup>[16]</sup>                                               | <b>736.30</b> | m     |
| Distance deviation                                                               | <b>29.83</b>  | m     |
| Performed distance (%)                                                           | <b>104.22</b> | %     |
| Mean lateral deviation<br><i>Without half-turn</i>                               | <b>1.92</b>   | cm    |
| Max lateral deviation<br><i>Without half-turn</i>                                | <b>19.97</b>  | cm    |
| Mean lateral deviation (tool)<br><i>Without half-turn, tool distance: 110 cm</i> | <b>2.83</b>   | cm    |
| Max lateral deviation (tool)<br><i>Without half-turn, tool distance: 110 cm</i>  | <b>19.96</b>  | cm    |
| Worked rows <sup>[17]</sup>                                                      | <b>11</b>     |       |

## Operational <sup>[18]</sup>

| Indicateur                                                                                                             | Valeur        | Unité     |
|------------------------------------------------------------------------------------------------------------------------|---------------|-----------|
| Robot weight                                                                                                           | <b>280.00</b> | kg        |
| Tool weight                                                                                                            | <i>N/A</i>    | kg        |
| Total weight                                                                                                           | <b>280.00</b> | kg        |
| Energy per kg per hectare                                                                                              | <b>0.01</b>   | kWh/kg/ha |
| Mean torque at work (% of nominal) <sup>[19]</sup><br><i>Reference nominal torque: 2.39 N·m — Number of motors: 2.</i> | <b>33.61</b>  | %         |

## Safety <sup>[20]</sup>

| Indicateur                        | Valeur       | Unité |
|-----------------------------------|--------------|-------|
| Geofencing exits                  | <b>1</b>     |       |
| Time outside geofencing (seconds) | <b>75.00</b> | s     |
| Time outside geofencing (hours)   | <b>0.02</b>  | h     |
| Local emergency stops             | <b>2</b>     |       |
| Remote emergency stops            | <b>0</b>     |       |
| Bumper activations                | <b>0</b>     |       |

## Reliability <sup>[21]</sup>

| Indicateur                    | Valeur | Unité |
|-------------------------------|--------|-------|
| Output errors                 | 0      |       |
| Input errors                  | 0      |       |
| Battery errors                | 0      |       |
| Motor errors                  | 3      |       |
| Cylinder errors               | 2      |       |
| Total errors                  | 5      |       |
| Output error time (seconds)   | 0.00   | s     |
| Input error time (seconds)    | 0.00   | s     |
| Battery error time (seconds)  | 0.00   | s     |
| Motor error time (seconds)    | 7.25   | s     |
| Cylinder error time (seconds) | 5.71   | s     |
| Total error time (seconds)    | 7.29   | s     |
| Error rate per hour           | 5.18   | /h    |
| System availability           | 99.79  | %     |

## Localization <sup>[22]</sup>

| Indicateur           | Valeur | Unité |
|----------------------|--------|-------|
| Localization errors  | 15     |       |
| Error time (seconds) | 206.00 | s     |
| Error time (hours)   | 0.06   | h     |

## Time <sup>[23]</sup>

| Indicateur             | Valeur  | Unité |
|------------------------|---------|-------|
| Total duration         | 3476.39 | s     |
| Total duration (hours) | 0.97    | h     |
| Active time            | 2535.45 | s     |
| Active time (hours)    | 0.70    | h     |
| Inactive time          | 940.94  | s     |
| Inactive time (hours)  | 0.26    | h     |
| Active time (%)        | 72.93   | %     |
| Inactive time (%)      | 27.07   | %     |

## 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] CO<sub>2</sub> 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](https://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.