Field Robot Event 2026 – Task Descriptions

0. Introduction

More or less the same as in the previous years. With the exceptions that:

- *Two robots run directly after each other on two parallel tracks (A and B) to keep the pace high and maintain audience engagement.*
- *Give each team two chances. One on field A and one on field B. Average the results.*
- *There is no second change for a robot on the same field!*

Task 1: Navigation in a Maize Field

General Description
Robots navigate autonomously through a maize field (fig. 1) with parallel straight rows (0.75 m apart). The difficulty increases gradually:
- Plant rows 1–4: no gaps, straight driving, adjacent turns.
- Plant rows 5–6: introduce single gaps (missing plants).
- Plant rows 6–n: follow a given turning pattern (e.g., 1L – 1R – 2L – 3R).
- Final plant rows: more gaps and irregularities.

The size of the field roughly corresponds to the distance a robot travels in 3 minutes at a speed of 1 m/s (180 m), taking into account the turning pattern (each turn takes approximately 1.2 m). Row length app. 10-12 m.

Rules for Robots
- Start within 1 minute after the acoustic signal.
- Maximum time: 3 minutes.
- Must stay between rows; damaging maize plants leads to penalties.
- Robot starts at a clearly marked start line.

Scoring
- Distance travelled correctly along the defined path.
- Bonus: 1.0 m × t, where t is the seconds finished faster than 3 minutes.
- Penalty: 5 m per damaged plant.
Formula:
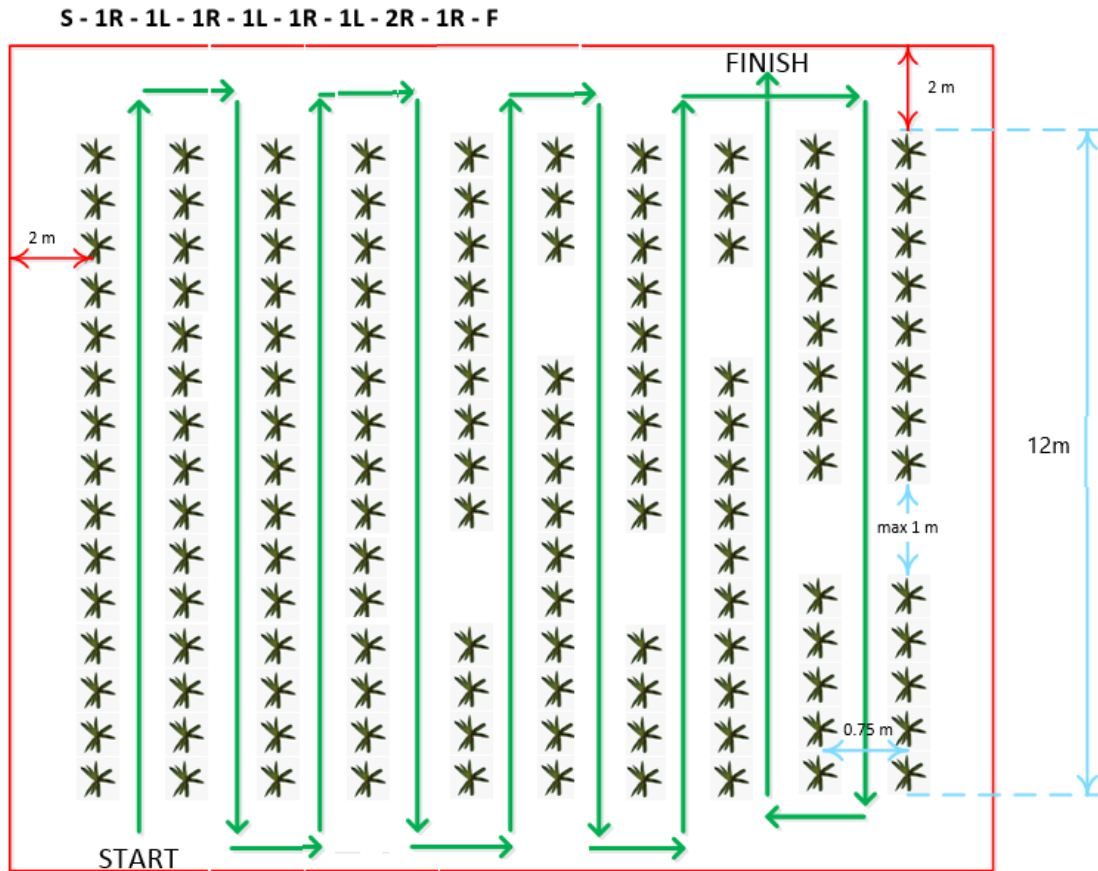$P_{Task1} = P_{Distance} - P_{Penalty} + P_{Bonus(t)}$

Figure 1 Example of task 1 (illustrative)

Task 2: Plant Health Detection

General Description

Robots must detect signs of unhealthy plants in a maize field. Some maize plants will have yellow or brown leaves (markers: piece of colored paper or jute strips attached to a leaf or a stick. fig. 3 and 4) Robots should identify and signal when a diseased plant is detected. To make this visible for the audience, robots must show a clear external signal (e.g., a bright flashing LED, colored spotlight, or spoken audio cue such as "diseased plant detected on the left!"). If the robot searches in multiple rows at the same time, the row must also be specified. Healthy plants should not trigger a signal.

Rules for Robots
- Robots traverse 5, most likely curved, rows within 3 minutes. (fig. 2)
- Every diseased plant must be detected within 40 cm. The robots are equipped with two clearly visible markers for the jury and the public, indicating the start and end of this 40 cm detection area.(fig. 5)
- Indication must be both public (light, sound, or spoken message) and as bonus digital (CSV file, with one line per detected diseased plant containing the position consisting of the row number (1-5) and distance from the start (0.0 - 20.0m) with 0.1m resolution).

Scoring
- +2 points per correctly detected diseased plant.
- −2 points per false positive (healthy plant marked as diseased).
- −1 point per missed diseased plant.
- −5 points per damaged maize plant.

Bonus for speed: 1 point × t, where t is the seconds finished faster than 3 minutes.

Bonus upon submission of the log file:
+2 per correct position of identified diseased plant,
-2 point per false positive and
-1 for missed plant.
The bonus cannot be negative.

Formula:
$$P_{Task2} = P_{Scoring} + 0.5P_{Bonus\ speed(t)} + 0.5P_{Bonus\ digital}$$
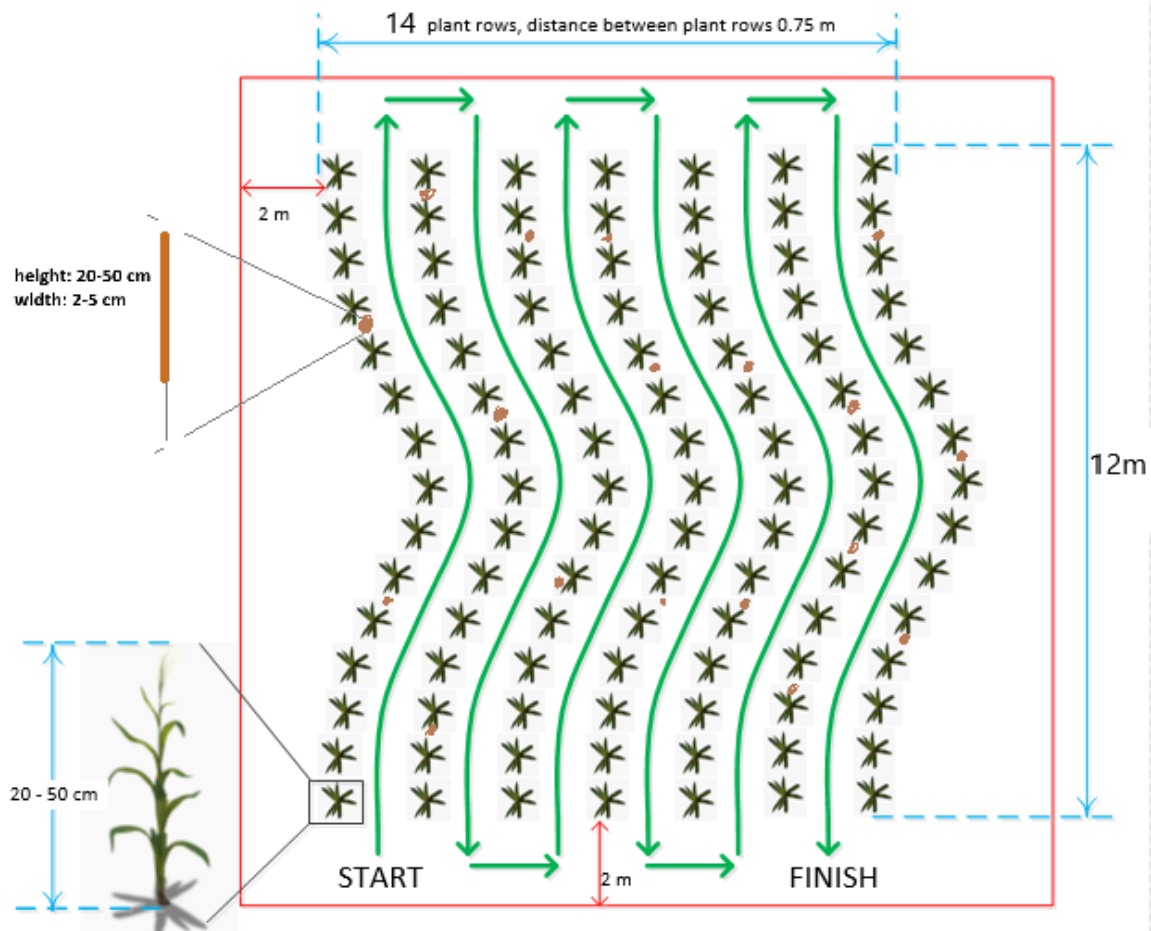

Figure 2 Example of task 2 (illustrative)

Figure 3 Marker with jute stripe

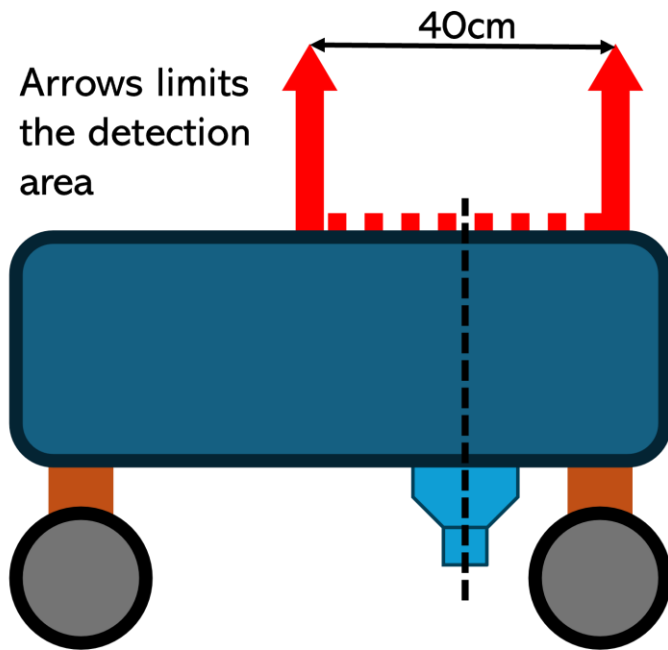**Figure 4 Marker with yellow paper**

Figure 5: Schematic of detection area. Two markers (e.g. red arrow) mounted to the robot indicate detection area.

Task 3: Biodiversity Monitoring

General Description

Robots encounter images or models of insects placed along the (straight) rows (same field as task 1):
- Bee (beneficial)
- Beetle/aphid (pest) (Lady birds indicate the presence of aphids: TBD)
- Butterfly (neutral)

Figure 6 6 Example of a bee (illustrative)

Figure 7 7 Example of Ladybirds indicate the presence of aphids (illustrative)

Figure8 8 Example of a butterfly (illustrative)

Each insect is attached to a green stick at the height of the leaves. The insects are (plastic) imitations and resemble those in figures 6 to 8. (Where these can be ordered will be announced later.)
To make it clear to the audience which insect needs to be detected, the stick extends above the crop and is decorated with an image, text or soft toy of the insect.

Robots must correctly classify the insect type. To involve the audience, robots must visibly and audibly react:
- Green light or "bee – good!" for bees.
- Red light or "pest detected!" for beetles/aphids.
- Yellow light or "neutral" for butterflies.

Rules for Robots
- Robots must start within 1 min.
- Task duration: 3 min.
- Robots pass 10 insect stations. (Max 3 per row)
- Each station must be classified within 40 cm. The robots are equipped with two clearly visible markers for the jury and the public, indicating the start and end of this 40 cm detection area. (fig. 5)
- One signal per station (light, sound, or display). First classification counts.

Scoring
- Correct classification: +3 points.
- Incorrect classification: −3 points.
- Missed station: -1 points.
- −5 points per damaged maize plant.

7

Task 4: Soil Spot Treatment

General Description

Robots operate in a test strip where soil spots (marked by colored pads) indicate areas needing treatment. To make this attractive to the audience and agronomically relevant, robots must perform a visible and application-oriented action at each spot, for example:
- Spraying a small jet of water (visible in sunlight).
- Dropping a biodegradable marker pellet.
- Weeding with a (rotary)hoe, harrow.

Treatments have to remain visible after finishing task.

Bonus for soil engaged treatment

Test strip:

Bare ground or stubble. Field measuring 60 to 70 m². (Large enough to be prepared in 3 minutes at a speed of 0.5 m/s, with a working width of 0.75 m.) Unknown shape, without right angles. Marked out with corner flags, for example.
Teams are given the opportunity to measure the corner flags themselves in advance.
If the robot goes outside the field, it must be stopped using the emergency stop and returned to the field by hand.

Markers:

Markers consist of coloured round discs, approx. 5 cm in diameter, with a hole in the middle, which are secured in the ground with a nail or tent peg. Touching the marker is allowed, but pulling it out is a fault (damage).
There are no markers along the edges (minimum 0.5 m from the edge).

Rules for Robots
- Robots must start within 1 min.
- Task duration: 3 min.
- Spots are randomly distributed, not more than 2 m apart.
- Robots must not damage markers. (Any action that changes the colour of the ring, e.g. spray painting, flame thrower ;) is considered damage.)

Scoring

To determine the correct distances for scoring, a set of concentric rings with the correct diameters is placed over the marker.
- Correct action within 15 cm of spot: +2 points.
- Correct action within 30 cm of spot: +1 point.
- Missed spot: −1 point.
- Wrong action, > 45 cm of spot: −2 points.
- Damaged marker: −5 points.
- Bonus for soil engaged action within 15 cm of spot: +1 point.
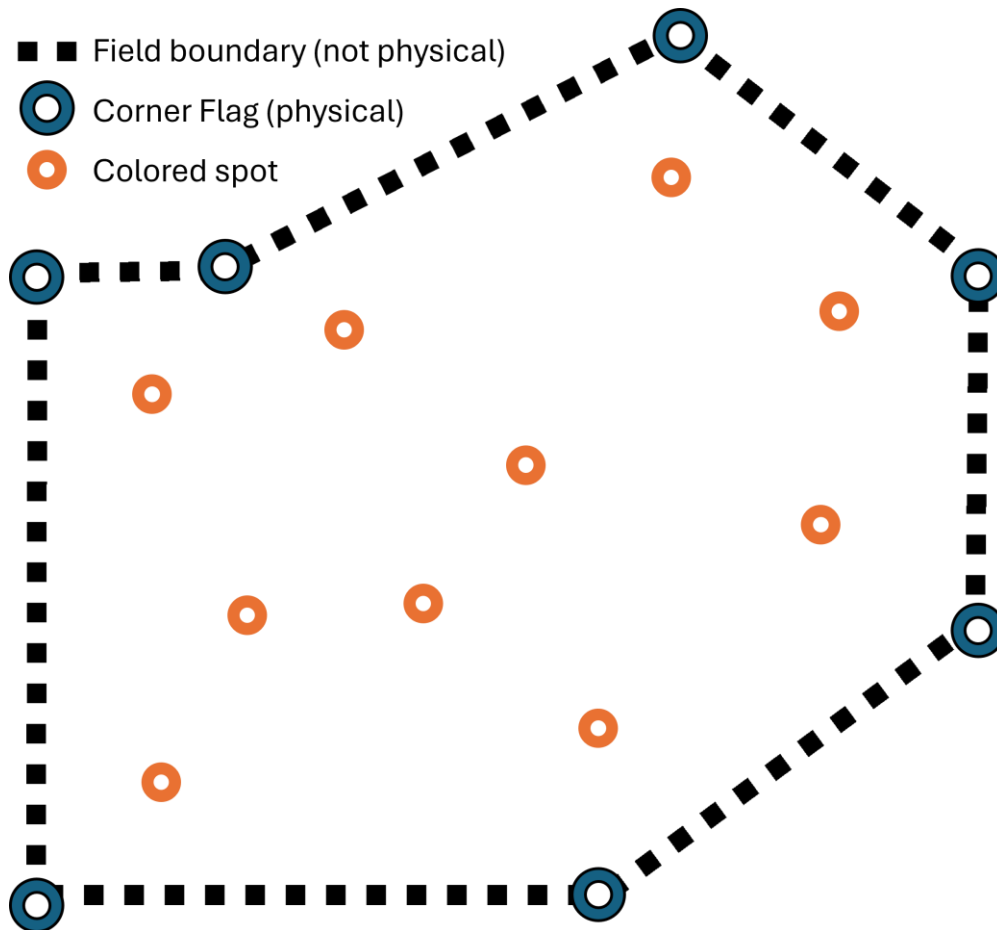
Figure 9: Example of task 4 (illustrative)

Task 5: Freestyle

General Description

Teams demonstrate their creativity with an agricultural application of their choice. In 2026, the emphasis is on sustainability – water saving, energy efficiency, biodiversity support, or reduced chemical input. Teams are encouraged to make this focus explicit in their performance.

Rules for Robots
- Max. 5 minutes including explanation.
- Robot performance must be safe and visible to jury and spectators.

Scoring
- Hand out balls to the audience (not to team members!) and place a bucket next to each team where they can put their balls.
- Also give the team captains two balls to distribute. They are not allowed to give balls to their own team! (Give them balls with their team number on them).

- Each judge receives three balls to award to the best agronomic idea, the most complex technique and the best execution.

Overall Result

The overall winner is determined by combining the results of Tasks 1–4 (each with equal weight). Task 5 (Freestyle) is scored separately as a creativity and sustainability prize.