AGROBOFOOD – Innovation experiment 2nd call

deadline: 31st May 2021

Proposed title: MARVIN - "Multipurpose Autonomous Robot for the Vineyard"

What we are looking for:

We are looking for partners providing:

1) a crawler (or wheeled) unmanned vehicle of small dimensions, diesel fueled, with radio control, usable for different purposes in the vineyard environment. We are going to transform this machine in a robot, i.e a vehicle with autonomous navigation in the vineyard and able to perform autonomously some activities (in particular PPPs spraying), with remote control and management through a web platform;

2) a sprayer (tower model) to be installed on the robot and to be adapted for integration with a precision spraying kit and an on-board PPPs mising system.

The partners will be involved in the execution of a (possibly) funded project (see the call above). However we look for partners with a strong motivation for maintaining a collaboration even after the project conclusion, for approaching together the entrance into the market with this kind of robotic product.

Description of the project:

Realization of 1 (or eventually 2) prototype of robot, an unmanned ground vehicle for the spraying management of the vineyard, with the following innovative characteristics:

- autonomous navigation through the vineyard rows (based on the fusion of GNSS + Computer Vision)

- intelligent spraying system that targets precisely the vegetation, with on-line adaptive dosing according to the detected canopy volume.

The project includes a test of the robot prototype in a realistic environment (vineyard) concerning all its functions (autonomous navigation, spraying) to asset and improve the overall performance.

The full electronics, sensors set up and software of the prototype are realized by the **leader partner**, working on a pre-existent unmanned vehicle (remote controlled) furnished/adapted by one of the partners and equipped with a basic tower sprayer.

Both the navigation and the spraying system are based on advanced Computer Vision and AI techniques, using innovative GPU-integrated stereo cameras. The navigation system works with a fusion of GNSS data and local 3D maps generated by on board stereo-cameras with object recognition. The robot can be

monitored and instructed about its activities through a web platform, already realized, which can also be connected with weather stations, DSS, and be used for the general management of the field activities.

A first prototype of this kind of robot has already been realized within the ROVITIS 4.0 project (www.rovitisveneto.it), starting from a basic vehicle. The present proposal is a follow-up project by which we aim to reach a higher performance of the whole system, with special reference to the reliability and safety of the autonomous navigation system, which must take into account the complexity of the vineyard environment, thus aiming to a closer position towards the market.

Some video extracts of the work already realized:

- about the navigation system: https://photos.app.goo.gl/YXUNqQ9rehj6W2Ea6
- about the precision spraying: https://photos.app.goo.gl/LgiDBXRCjFzwkgXA6

Possible partnership and role: (up to **5 members**, only Small Medium Enterprises - SMEs)

- **Partner 1 (leader)**: main technology provider, developing the prototype of robot by mounting the electronics/sensors/software system on the existent electro-mechanical basis; training the end-user about the use of the machine, following the trials, giving technical assistance, improving the navigation software according to the trial performances. It also leads the dissemination and marketing actions of the project.

- **Partner 2**: a winery from Italy (end user), hosting the trial in a vineyard parcel, both for specific driving/spraying test and for a real use case of PPPs treatments during the 2022 season; monitoring the disease development in the trial plot.

- **Partner 3?** A second technology partner providing the electro-mechanical set up of the basic machine (may be an existent vehicle with some mechanical adaptations). He can have a role in dissemination and marketing actions of the project.

- **Partner 4 (if not already in the competence of partner 3)?** A third technology partner providing the basic sprayer (tower model) to be installed on the robot, with eventual adaptations for the precision spraying kit. He can have a role in dissemination and marketing actions of the project.

- **Partner 5?** A second end user with a vineyard in different environmental conditions for testing a second prototype (or the same prototype in a given moment of the season), with same role of partner 2.

 For geographical impact we look for partners from countries in **list 1 below**. The more are the countries involved in the partnership from this list (up to 3) the highest the evaluation of the project will be.

List 1 (countries for geographical impact):

Preferred countries: Switzerland, Croatia, Slovenia, Czech Republic, Slovakia, Luxembourg, Norway, Sweden, Poland, Estonia, Hungary, Romania, Moldova, Albania, Bosnia and Herzegovina, Montenegro, Latvia;

Second preference: Tunisia, Georgia, Armenia, Israel, Malta, Turkey, Ukraine;

Other possible countries: Anguilla, Aruba, Bermuda, British Antarctic Territory, British Indian Ocean Territory, British Virgin Islands, Cayman Islands, Falkland Islands, Faroe Islands, French Polynesia, French Southern and Antarctic Territories, Greenland, Iceland, Montserrat, Netherlands Antilles (Bonaire, Curacao, Saba, Sint Eustatius, Sint Maarten), New Caledonia and Dependencies, North Macedonia, Pitcairn Republic of Cyprus, Saint Helena, Saint Pierre and Miquelon, Saint Barthelemy, South Georgia and the South Sandwich Islands, Turks and Caicos Islands, Wallis and Futuna Islands.