

Forest maker reforestation platform hardware and components with embedded software design and interface for accurate global digital marking and documentation in a silvicultural context

Risutec Oy requests an offer to design and build a digital grid marking and GPS location documentation solution for row planting in a silvicultural context. The system will enable recording precise tree planting coordinates with timestamps in a two-row planting configuration.

The functionality will be implemented as part of the forwarder-based Forest Maker continuous reforestation platform. The solution will enable recording in real time the GPS location, timestamp, and various other related inputs during the planting process.

You will design, implement and build the hardware and components necessary for marking and documentation in a forest planting setting. Your responsibility in addition to providing the mechanical and electronic components necessary for the complete functioning of the GPS positioning and control will be to design and implement the firmware and embedded systems along with an interface for data extraction.

Your design will ensure the precise recording of GPS locations and include any corrective apparatus and mathematical modeling necessary to account for errors in location.

Objective

The objective of the tender is the acquisition of hardware and firmware that enable the automatic recording of two planting rows taking as its input the forwarder's flow-control system, eg. Parker IQAN or equivalent sensor-based impulse. The work is closely related to the development of Risutec's Forest Maker continuous reforestation platform and the solution provider must be available for on-site work on a regular basis, because the solution will be developed together with Risutec's forwarder provider partner.

The device enables continuous forest regeneration using a forwarder as a platform. This solution component will be a part of the larger digital solution which will enable the planning, documentation, reporting, and analysis functionalities of precision forestry for continuous forest regeneration. The hardware and firmware will enable the low-level functioning of the digital recording and planning system.

Scope of the Tender

The scope of this tender will be the GPS location and control system for capturing the accurate location of planting spots. Hardware design and implementation (mechanics, electronics, assembly) and firmware design and implementation are part of the scope. Also, egress and ingress to and from the system will need to be built. The solution must be designed in such a way that the provided GPS coordinates are accurate between +-2cm.

Design and Interface

The solutions should include the design of the physical components of the system (GPS unit(s), any control units with the necessary motherboard and casing design, connections between control and GPS units, inputs and outputs for any links between base machine systems and the control units, like USB) and the machine-readable interface for integration to and from the system. Your offer should include the design and implementation of how tablet-based computers can interface with the system and process the data whether it's provided in RAW/NMEA format or any other format.

Manufacture and Testing

The solution will include the manufacturing of all components, their assembly, and testing. Tenderers should have a clear view and indicate how they will test the system such that it works globally.

Testing should take into consideration the different operating conditions globally. The system needs to handle heat dissipation and have active cooling for hot climates. The system also needs to handle cool climates.

Manufacturing considerations and relevant tests for selling globally eg. CE markings need to be implemented and met by the offered solution.

Warranty and IPR

The tenderer must indicate the scope and duration of the warranty for each and combined components of the system.

The tenderer needs to consider and meet all trademark and other IPR restrictions, and ensure full compliance with any trademarks, like Bluetooth, WiFi, and include compliance with any other IPR.

Support and Installation

A model for support should be suggested, i.e. how will you support the functioning of the device during its lifetime? Installation and installation support need to be outlined and implemented. Will you be able to offer installation services globally, or can the system be installed remotely? Do you expect us to install the devices with your support? And how will you provide this support? You should outline any support system and practices you intend to use in relation to your solution.

Output and Integration

Provide a suggestion for outputs from the system. We suggest you use a standard output with GPS location, timestamp, and other relevant variables in GeoJSON format. Other formats can be suggested, however, in that case, provide integration examples with your offer. If you offer RAW data as output, you should provide examples of how the data should be calculated/processed.

How will the output be delivered, via USB or some other link? If you intend to use USB to deliver data, how will your solution ensure that the connection remains stable in-field? If you intend to use another link between systems, please provide a detailed description.

Data Persisting, Logging, Monitoring, and Backup

How will the system ensure that data is not lost from work areas? Describe how the system will persist data. Planting areas are usually vast and data points are quite many (from several hundred thousand to a million per work area). What is the capacity of your solution for storing data? What happens if the primary method of egress fails? Please describe how data will be backed up and how your solution will make data available for later fetching. Describe the logging facility of your solution.

How will your solution be monitored? Will there be a remote link for troubleshooting scenarios? Please describe in detail how your solution will track and solve issues and errors.

Planting Input

The tenderer needs to describe how the system will record the planting points. What impulse will provide the input for recording GPS locations and timestamping?

Please review the initial design of the Forest Maker platform. Where will your solution be placed? How will you ensure that data moves from GPS devices to the output/tablet in a reliable way? Describe the positioning of your solution in relation to the Forest Maker platform.



Summary

The solution must include solution options for the following subject areas and entities:

- Design and implementation of hardware and components, firmware, embedded code, and interface
- Support and support model for the complete solution

- Warranty for all parts of the tender
- Technical documentation of all parts of the tender
- Installation of all parts of the tender
- Interface design
- Interface implementation
- Interface support and support model
- Interface life cycle model and update cycle
- Interface technical documentation
- Interface code

The scope of hardware component design and implementation is to have the capability to record cultivation and planting spots in an automated manner. The forwarder moves in a continuous fashion and the hardware components need to be able to integrate with the forwarder processing unit to record each planting location. The hardware components need to be able to record these positions at no less than $\pm 2\text{cm}$ accuracy globally. The tenderer must undertake to provide all electronic and other work necessary in order to record these positions.

There will be two cultivation tools, i.e. the platform plants two rows at a time with adjustable spacing. The tenderer can offer a solution for GPS devices on each of the tools or a single GPS unit that accounts for both lines. Planting spots need to be recorded accurately in either case $\pm 2\text{cm}$ globally.

The tenderer must undertake the design and implementation of hardware and components. They should also provide support and a support model for the hardware and components. They also need to provide a warranty for hardware and components.

Tenderers need to understand global component supply situations and account for the sudden gaps in supply with their own stock of hardware and electric components so that units can be delivered in a timely fashion.

The tenderer must undertake the design and implementation of the firmware. They should also provide support and a support model for the firmware, which needs to have the capability to be updated remotely. They also need to provide lifecycle management and a roadmap in addition to documentation for the firmware.

The tenderer must undertake the design and implementation of the embedded systems. They should also provide support and a support model for the embedded systems, which need to have the capability to be updated remotely. They also need to provide lifecycle management and a roadmap in addition to documentation for the embedded systems.

The tenderer must undertake the design and implementation of the data interface. The system should provide an interface for ingestion to an Android and or Windows-based mobile tablet/phone device. They should also provide support and a support model for the interface.

They also need to provide lifecycle management and a roadmap in addition to documentation for the interface.

Selection Criteria

- Cost of development
- Cost of proposed solution
- Cost of running the solution
- Customer and industry-specific references
- Delivery schedule
- Availability of development and support staff
- Quality, reliability and resilience of proposed solution
- Suppliers financial standing in relation to their ability to develop the proposed solution
- Qualifications of proposed personnel who will develop and support the solution

Tenderers need to have a solid understanding and experience of the forest industry, specifically silviculture. Tenderers need to be able to travel to Risutec's company headquarters and be available for extended periods of time on short notice. Tenderers need to have a proven track record for developing high-accuracy positioning systems. Tenderers need to have a proven track record in implementing high-quality, critically available, robust, and resilient embedded systems.