



Automated Cucumber Harvesting

Request for Proposals: Pipe Rail Cart Subsystem Addendum #2

December 18, 2020

Vineland Research and Innovation Centre



1.0 Introduction	1
2.0 Inquiries and Responses	1
3.0 Revisions	3
3.1 Replace Request for Proposals: Pipe Rail Cart Subsystem Section 5.2 table:	3
4.0 Appendices	4
4.1 Appendix A1	4
4.2 Appendix A2	5
4.3 Appendix A3	7

1.0 Introduction

This addendum document provides updated information to the original document *Request for Proposals: Pipe Rail Cart Subsystem* and where applicable and denoted, supersedes it. Responses to all inquiries will be provided via addendum format.

2.0 Inquiries and Responses

2.1 At what stage of development is required?

Proof-of-concept level development (~TRL-7).

2.2 Can the physical specifications and geometry of the pipe rails be provided?

Specific design requirements will be worked out as part of the first phase of the development work, see *Addendum #2, Section 4.1: Appendix A1* for an example of pipe rail dimensions.

2.3 Could you provide examples of existing commercial pipe rail carts?

Examples are provided in Addendum #2, Section 4.2: Appendix A2

2.4 Is there a deadline for the project?

Project duration to be defined by the bidder. Example: from PO to commissioning.

Estimated completion date to be no later than June 30, 2021.

2.5 Is there opportunity to develop or test our system in your facility?

Assume that Vineland Staff will have to conduct tests and experiments at the selected bidder's direction.

2.6 Are there height or reach requirements?

Specific design requirements will be worked out as part of the first phase of the development work, height/reach should be designed to allow robotic manipulator payloads to operate in a desirable working range (typically between waste and shoulder height of a typical human).

2.7 Could you provide a diagram or dimensions of the system and its intended operating environment?

Specific design requirements will be worked out as part of the first phase of the development work, the system should likely fit within the same footprint/profile as the solutions shown in *Addendum #2, Section 4.2: Appendix A2*

2.8 Is the pipe rail cart subsystem intended to carry a robotic arm for harvesting, or is it intended to carry a person as shown in Figure 1? If the former, should our RFP include design for the robotic arm?

The system will be required to carry robotic manipulator(s) and other subsystems as well as include room for carrying harvested fruit but is not necessary to carry a person. Strictly speaking, the expected deliverable does not include the manipulator but the interfaces

(mechanical, electrical, communications, etc.) for it will be required as well as the integration of a manipulator provided by Vineland.

2.9 If the cart subsystem is to carry a robotic arm, can you please provide details including, e.g., Dimensions, Weight, Drawings, Power requirements, Communications interface

These items will be defined in the first phase of the project between Vineland and the selected bidder.

2.10 Safety requirements and required certifications: Are there any prerequisite certifications or requirements already identified by Vineland?

There are no requirements for safety certification, but the resultant deliverable should be designed to be as "Safe as Possible".

2.11 Ingress protection: is there any specific requirement, e.g., IP 67 rating? IP67 ingress protection is required.

2.12 Fit within cucumber rows: Can you please provide typical dimensions, e.g., width, height, turning radius.

Refer to response in *Addendum #2, Section 2.2*.

2.13 Vineland supplied layout of operating environment: Is this already available? If not, can this please be made available.

See Addendum #2, Section 4.3: Appendix A3 for examples of greenhouse layouts.

2.14 Granular speed control: can you please provide an intended speed range. The expected speed range would be 0-1 m/s.

2.15 Power to auxiliary systems: Can you please provide power requirements, e.g., voltage, amperage, and total power (Ah or Wh) required for a typical cycle between recharges? Also, how is this power to be provided? USB, 12 V outlets, etc.?

Exact power requirements to be defined between the winning bidder and Vineland during Phase 1 of the project. Power to be provided via terminal block or equivalent at a variety of standard voltages (5V, 12V, 24V).

2.16 Mounting points and hardware for all requisite systems ... : Can you please give us a list of the items to be mounted, and some specifications or drawings? These items will be defined in the first phase of the project between Vineland and the

selected bidder.

2.17 The end effector has been mentioned in the RFP. It is our understanding that the supply of this unit would be in Vineland scope, is this correct? If so are there any specifications that can be supplied to us such as size, weight and electrical requirements etc.?

Vineland will supply any required manipulator and end effector. The Kinova Gen3 is currently being targeted for this application.

2.18 There seems to be limited information on the rails at this time. Is there any more information that can be supplied such as payload capacity and size? If not we can always address this need for information in the pre-engineering phase of the project.

Details to be determined as part of the first phase.

2.19 The RFP mentions the ROS interface. Are you open to other solutions as long as they meet the project goals? We think we are able to offer a better overall solution and are hoping you would be open to our suggestions. This current phase of the project must utilize a ROS interface.

2.20 With regards to the proposal structure, in the past, we have recommended a phased approach to mitigate risk and divide the project into smaller more defined tasks. Would you be comfortable with us structuring our proposal this way? Phased approaches to the structure of the proposal is acceptable.

2.21 The same comment goes for the UBUNTU, as long as we can meet project goals is there flexibility on an alternative solution?

Operating software of the pipe rail cart system is left up to the consultant. However, the pipe rail cart system must interface with a ROS based controller running Ubuntu.

2.22 Could an extension to the RFP submittal deadline be considered?

See Addendum #2, Section 3.1.

3.0 Revisions

3.1 Replace Request for Proposals: Pipe Rail Cart Subsystem Section 5.2 table:

Stage	Stage Name	Date	Note
1	Launch RFP	November 20, 2020.	
2	Deadline for Bidder Inquiries	December 22, 2020.	
3	Bidder Inquiry Response Deadline	January 8, 2021.	
4	Final RFP Submittal Deadline	January 18, 2021	
5	Bidder Selection Deadline	January 27, 2021.	
6	Signing of Contract	February 1, 2021.	
7	Project Kickoff	February 2, 2021.	

With revised *Section 5.2* table:

Stage	Stage Name	Date	Note
1	Launch RFP	November 20, 2020.	
2	Bidder Registration Deadline	December 22, 2020.	
3	Deadline for Bidder Inquiries	January 11, 2020.	
4	Bidder Inquiry Response Deadline	January 18, 2021.	
5	Final RFP Submittal Deadline	January 27, 2021	
6	Bidder Selection Deadline	February 3, 2021.	
7	Signing of Contract	February 8, 2021.	
8	Project Kickoff	February 8, 2021.	

4.0 Appendices

4.1 Appendix A1

Estimated pipe rail dimensions are shown below as well as the distance between pipes and troughs on each side within a row. Note that dimensions may vary between greenhouses and that the dimensions below should not be used for reference during the actual design phase (exact dimensions will be determined by Vineland within the first phase of the design and clearly defined within the design requirements).



[Cm]

4.2 Appendix A2

Examples of manned and unmanned greenhouse pipe rail carts are listed below (follow links for details).

Berg Benomic AGV

https://berghortimotive.com/en/harvest-a-transport/benomic-agv



Bogaerts Qii Harvest Trolley

https://www.bogaertsgl.com/index.php/qii-lift-f



Berkvens GL3500 Trolley

https://www.berkvensgm.nl/en/product/greenlift-gl-3500/



4.3 Appendix A3

The greenhouse configuration is best described by photos of commercial facilities:



[https://www.greenhousecanada.com/lighting-the-way-3693/]



[https://www.producegrower.com/article/cucumbers-101-a-production-guide/]



[https://www.producegrower.com/article/cucumbers-101-a-production-guide/]



[https://www.producegrower.com/article/cucumbers-101-a-production-guide/]



[https://www.producegrower.com/article/cucumbers-101-a-production-guide/]

For comparison, Vineland Research and Innovation Centre's greenhouse environment is similar to a commercial greenhouse facility although smaller in overall scale. Please refer to the following video for a general idea regarding our greenhouse configuration:

https://www.youtube.com/watch?v=-rgdcVsF12g&feature=emb_logo