



DSS Tools Requirements Collection Document

Author: UCY



FARM: Fostering Agriculture
Rural Development and Land Management



Executive Summary:

The purpose of this document is to provide a clear understanding to all partner organizations and other interested readers of the requirements collection process for the FARM DSS tools.

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General Information

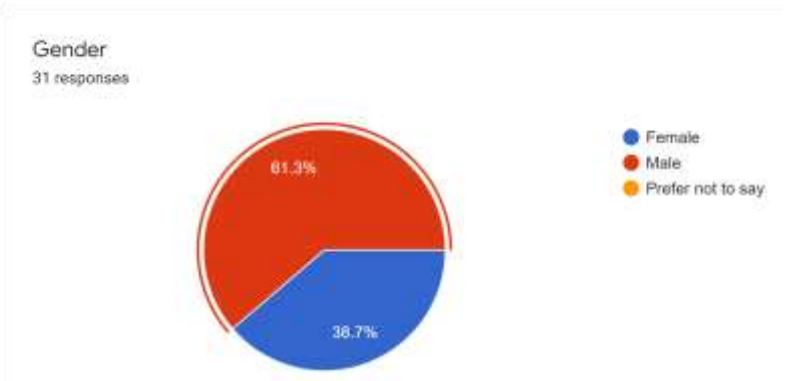
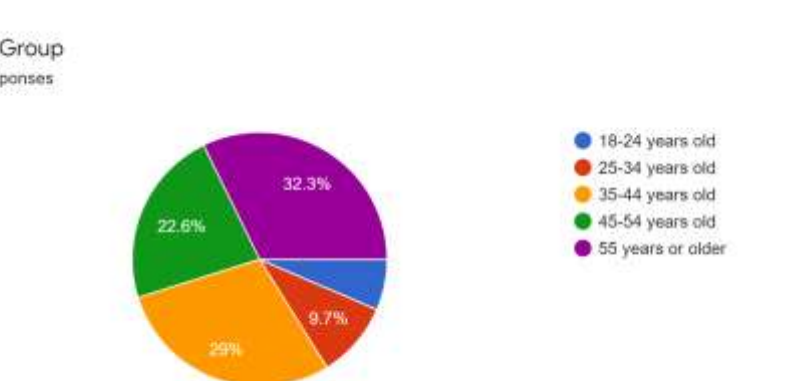
Purpose of the DSS tools:

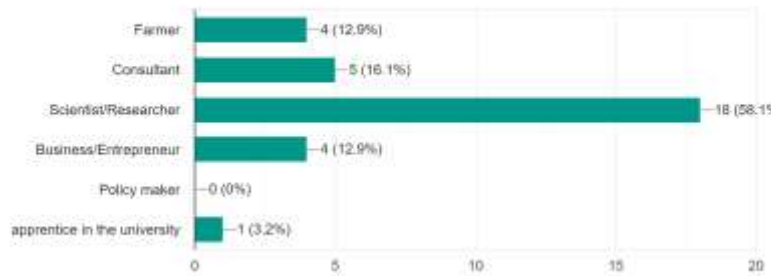
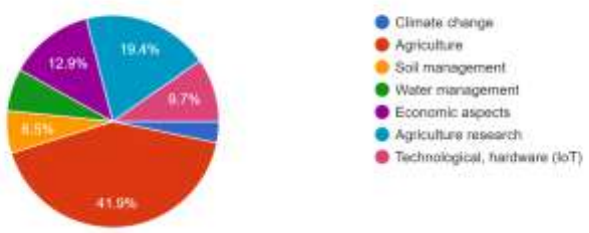
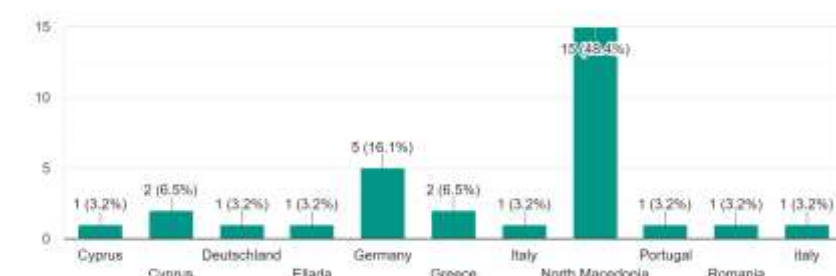
- Two open digital DSS tools in which individuals will be able to manage their plants, and support decision making in ARD.
- To help farmers learn more about their plants.
- To show aggregated statistical information and data on plants.
- To show reminders and alerts for different plants.
- **DSS tools design & development lead:** University of Cyprus
- **Assisted by** all partners in collecting requirements and evaluating and testing the DSS tools.

1. Questionnaires

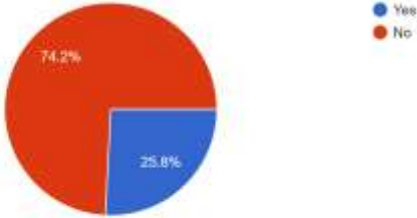
Our questionnaire was answered by 31 people. It was consisted of some demographic questions followed by more specific questions about DSS tools and information regarding the project.

2. Demographic

#	Question	Responses
1.	Gender	 <p>Gender 31 responses</p> <ul style="list-style-type: none">Female: 36.7%Male: 61.3%Prefer not to say: 0%
2.	Age group	 <p>Age Group 31 responses</p> <ul style="list-style-type: none">18-24 years old: 9.7%25-34 years old: 9.7%35-44 years old: 29%45-54 years old: 22.6%55 years or older: 32.3%

3.	Occupation	<p>Occupation 31 responses</p>  <table border="1"> <thead> <tr> <th>Occupation</th> <th>Count</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>Farmer</td> <td>4</td> <td>12.9%</td> </tr> <tr> <td>Consultant</td> <td>5</td> <td>16.1%</td> </tr> <tr> <td>Scientist/Researcher</td> <td>18</td> <td>58.1%</td> </tr> <tr> <td>Business/Entrepreneur</td> <td>4</td> <td>12.9%</td> </tr> <tr> <td>Policy maker</td> <td>0</td> <td>0%</td> </tr> <tr> <td>apprentice in the university</td> <td>1</td> <td>3.2%</td> </tr> </tbody> </table>	Occupation	Count	Percentage	Farmer	4	12.9%	Consultant	5	16.1%	Scientist/Researcher	18	58.1%	Business/Entrepreneur	4	12.9%	Policy maker	0	0%	apprentice in the university	1	3.2%															
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3. DSS tools Specific Questions

#	Question	Response						
1.	Use of DSS tools	<p>Do you currently use any DSS tools on your field of work (or other similar tools with a similar purpose that help in decision making)?</p> <p>31 responses</p>  <table border="1"> <caption>Response Data for Question 1</caption> <thead> <tr> <th>Response</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>Yes</td> <td>25.8%</td> </tr> <tr> <td>No</td> <td>74.2%</td> </tr> </tbody> </table>	Response	Percentage	Yes	25.8%	No	74.2%
Response	Percentage							
Yes	25.8%							
No	74.2%							
2.	If you have selected "yes" in the previous question, please explain which are those and the purpose you are using them for	<ol style="list-style-type: none"> 1. "Fruchtfolge", a DSS focusing on the question which crop to cultivate on which field and how to fertilise it 2. https://www.gaiasense.gr/gaiasense in the context of EU projects to provide support and advise to farmers regarding irrigation, fertilization and pest management. 3. My working group is currently developing a DSS 4. we develop and run DSS's in for Crop Protection items see here: http://www.zepp.info 5. Forecast models in crop protection, mainly against fungal diseases 6. Yes, we use them in cooperation with the meteorological station, but not specifically for the agriculture. 7. I use tools for following the moves of the cattle. 8. ISIP to observe the risk of an infection or sickness of my cultures 						

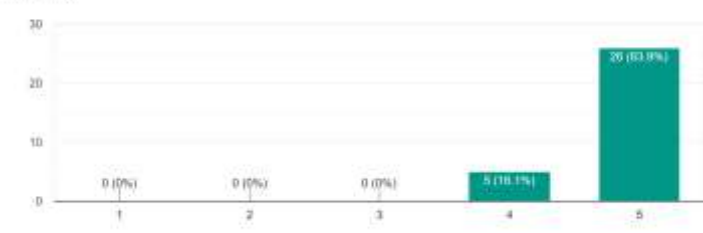
4. DSS tools to assess, monitor, and support the reduction of negative impacts

1.	Importance of DSS tools to assess negative impacts	<p>How important do you think it is to develop and use digital tools to assess negative impacts of agricultural methods and techniques for the environment? 31 responses</p> <table border="1"> <thead> <tr> <th>Importance Level</th> <th>Number of Responses</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>0</td> <td>0%</td> </tr> <tr> <td>2</td> <td>1</td> <td>3.2%</td> </tr> <tr> <td>3</td> <td>3</td> <td>9.7%</td> </tr> <tr> <td>4</td> <td>5</td> <td>16.1%</td> </tr> <tr> <td>5</td> <td>22</td> <td>71%</td> </tr> </tbody> </table>	Importance Level	Number of Responses	Percentage	1	0	0%	2	1	3.2%	3	3	9.7%	4	5	16.1%	5	22	71%
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2.	Please explain why. Please be specific.	<ol style="list-style-type: none"> 1. I have orchard of hazelnuts. It will be easier to know which trees need more water maybe pesticides etc 2. To modernize agriculture 3. Quality of soil 4. It will be helpful for the research I make in phytopathology. 5. To support the research I make. 6. save resources and climate 7. I think digital tools can help to show the benefits of sustainable agricultural methods and techniques as well as agri-environmental measures for an individual farm. This has the potential to make the decision of whether to adopt such a new technique or not a lot more clear for these farmers. 8. DSS are important to deal with climate change, to reduce production costs and help farmers reduce their environmental footprint. Using smart farming methods, Big Data and IoT integrated in DSS, farmers will be able to reduce their inputs (irrigation, fertilizers, pesticides) and thus protect the environment. 																		

		<p>9. Assessment is important, but it is more important to prevent negative impacts. Therefore, a decision support system should be used prior to application, i.e. to select the right method, application rate, time of application, etc.</p> <p>10. making agriculture more sustainable is urgent and I believe digital tools can have a real impact in supporting farmers and advisers in this - generally speaking, digital tools are easily accessible and a bigger number of farmers and other practitioners are getting used to them. Assessing the environmental impacts is step 1 in this, so that actors are able to take a well-based decision in an easy way, which is not time-consuming.</p> <p>11. I believe such tools needs to be built upon an agreed assessment framework which identifies 1) what needs to be measured and 2) how to measure. Than a DSS could be created as a tool that serves a pre-defined purpose.</p> <p>12. it helps to optimize plant production</p> <p>13. Digital tools can help to better combat plant diseases and pests, but the elimination of active ingredients, more precisely: their approvals, results in dwindling efficiency in the long term and causes additional uses and / or reduced yields + yield security.</p> <p>14. I am not very familiar, I need some practice.</p> <p>15. It is good to keep the nature</p> <p>16. Because they might help people to take decisions</p> <p>17. Especially for the environmentalists, this is very improtant.</p> <p>18. DSS tools are innovative technology which is very important for the climate change studies and approaches today.</p> <p>19. This is important so as to know how to improve our job.</p> <p>20. solving. problems and making decisions faster</p> <p>21. Use new and efficient technoligies to minimize the use of plant protection products, to protect the environment and</p>
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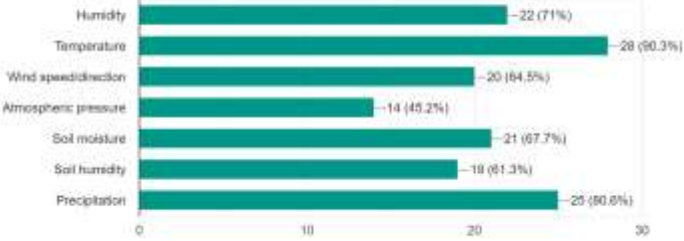
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4.	Please explain why. Please be specific.	<ol style="list-style-type: none"> 1. Not sure, but I approve technology 2. Because I need to know if the environment is ecologically clean. I am a beekeeper. 3. Healthy life 4. It will be helpful to know which process to continue and which to stop. 5. To support the research I make. 6. save resources and climate 7. Mostly because they allow for a much better analysis given the size of the data, and allow to react to spatial differences much better 8. DSS support the construction of large databases that allow the long term monitoring of farming practices and benchmarking exercises. 9. Monitoring is always necessary. It is also important to observe impacts of new/changed methods which are developed to reduce the burden on the Environment. 																			

		<p>10. agricultural methods and tools need monitoring since their environmental impact often varies /changes with time - this allows farmers and other practitioners to access a more accurate view on the real impact and thus to act accordingly</p> <p>11. I believe such tools needs to be built upon an agreed assessment framework which identifies 1) what needs to be measured and 2) how to measure. Than a DSS could be created as a tool that serves a pre-defined purpose.</p> <p>12. Digital tools allow large areas to be monitored using standardized methods</p> <p>13. Digital tools can help to improve existing methods and to keep environmental impacts low or to reduce them. The mere monitoring can be made easier, but a consideration must be given to whether the measurement standards are functional and b are currently too few experts in a position to come up with overall systemic approaches. In short: a tablet is more convenient than a clipboard, but it does not automatically make the user competent enough to be able to evaluate ecological entirety.</p> <p>14. Since we all rely on the technology, I think that the DSS tools should be very effective.</p> <p>15. It will help me to know if a method or technology is not right</p> <p>16. as above</p> <p>17. This is important for the environment and natural protection.</p> <p>18. I believe the DSS will help improve the overall work in agriculture by providing precise tech-decisions.</p> <p>19. increase awareness of farmers</p> <p>20. Important because only with new data it is possible too improve existing methods or find new solutions</p>
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5.	Digital Tools Importance to support the reduction of negative impacts	<p>How important do you think it is to develop and use digital tools to support the reduction of negative impacts of agricultural methods and techniques for the environment? 31 responses</p>  <table border="1"> <thead> <tr> <th>Importance Level</th> <th>Number of Responses</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>0</td> <td>0%</td> </tr> <tr> <td>2</td> <td>0</td> <td>0%</td> </tr> <tr> <td>3</td> <td>0</td> <td>0%</td> </tr> <tr> <td>4</td> <td>5</td> <td>16.1%</td> </tr> <tr> <td>5</td> <td>20</td> <td>63.9%</td> </tr> </tbody> </table>	Importance Level	Number of Responses	Percentage	1	0	0%	2	0	0%	3	0	0%	4	5	16.1%	5	20	63.9%
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6.	Please explain why. Please be specific.	<ol style="list-style-type: none"> 1. We will know not to waste water, or apply too much pesticides 2. Modernization 3. Health ecology and modernization 4. It will be helpful to know in which direction to focus my research. 5. To support the research I make. 6. save resources and climate 7. See answer above 8. Developing DSS tools is unquestionably important to support the reduction of negative impacts of agricultural methods and techniques for the environment. However, the actual use and implementation of these tools depend largely on end users decisions. For example, farmers appear reluctant to use the advise and apply a different farming technique on their fields. The reasons for this behavior vary, but the most important is probably the economic factor (e.g. they avoid the risk of production/income lost). In general, it seems that in many 																		

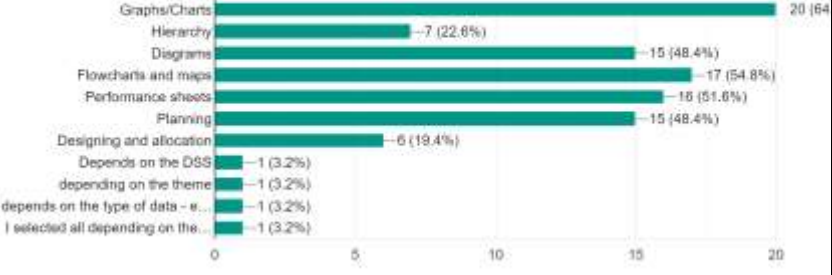

		<p>countries farmers do not yet trust DSS.</p> <ol style="list-style-type: none"> 9. DSS can, for example, help to adjust the correct application or dosage at the right time depending on the specific situation in the field. In this way, it is possible to avoid excessive, non-adapted application rates of plant protection products or fertilisers. 10. Whatever method, tool, process, etc. that supports the reduction of environmental impact is most needed and important. Digital tools can play a most relevant role in this because they can be easily accessible, user-friendly and provide results in a short time 11. If such tools could help reduce negative impacts then it is critical to develop them but even more important to make sure they are being used by farmers and foresters 12. Waste of water 13. the combination of digital tools and farmer experience complement each other to produce an optimal result 14. The use of digital means can support the user in using means and methods more efficiently, but as in any natural system there are always limits to efficiency. 15. I think this is important for environmental protection. 16. I think this can be important for the research in the climate change. 17. as above 18. Again, this is important in terms of environmental protection. 19. sometimes cumulative impact of techniques and practices in agriculture is neglected. Hence, we need more awareness 20. Important in order to be able to feed future generations
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5. Specific FARM DSS tool requirements

1.	Environmental Parameters	<p>Which environmental parameters are or could be important in your area of work and should be taken into consideration developing the DSS? 31 responses</p>  <table border="1"> <thead> <tr> <th>Parameter</th> <th>Count</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>Humidity</td> <td>22</td> <td>71%</td> </tr> <tr> <td>Temperature</td> <td>28</td> <td>90.3%</td> </tr> <tr> <td>Wind speed/direction</td> <td>20</td> <td>64.5%</td> </tr> <tr> <td>Atmospheric pressure</td> <td>14</td> <td>45.2%</td> </tr> <tr> <td>Soil moisture</td> <td>21</td> <td>67.7%</td> </tr> <tr> <td>Soil humidity</td> <td>18</td> <td>58.1%</td> </tr> <tr> <td>Precipitation</td> <td>25</td> <td>80.6%</td> </tr> </tbody> </table>	Parameter	Count	Percentage	Humidity	22	71%	Temperature	28	90.3%	Wind speed/direction	20	64.5%	Atmospheric pressure	14	45.2%	Soil moisture	21	67.7%	Soil humidity	18	58.1%	Precipitation	25	80.6%
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2.	Results	<ol style="list-style-type: none"> 1. Apply pesticides; Irrigation; Harvesting; Estimate production 2. Hazelnuts orchard is big farm and threes are bushes. I will be supported by DSS to know how many and on which trees the hazelnuts are ready to be collected, or previously how much water is needed 3. Everything you can in beekeeping 4. For grapevine 5. I want DSS for early detection of diseases of pepper 6. the right pesticides 7. all economy aspects 8. Horticulture; Watering; Fertilizing; Planting 9. weed monitoring 10. Which crop to plant where → make economically optimal decisions; how much fertiliser to put where in accordance to the fertiliser ordinance → similar; when to buy or rent machinery (?) 11. Decisions about irrigation, fertilization and pest management to support farmers reducing their costs and 																								

		<p>apply at the same time environmentally-friendly practices.</p> <ol style="list-style-type: none"> 12. Most important features should be related to agricultural inputs that are able to have a bigger environmental impact if they are not applied correctly, such as pesticides and fertilizers 13. Time of planting and time of performing various farming practices, quantities of inputs needed. 14. All features of fish breeding 15. Mostly for waste of water and redirection water lines 16. All the decisions the farmers need help with. Mostly, in my case, they need help on how to deal with the climate change and the lack of water. 17. For olive tree 18. If, when, how using fertilizers and pesticides 19. The quality of the soil. The needs for fertilizers and manufacturing. 20. All spheres of agriculture: from orchard to soil and farm management. 21. How to combine sorts of grapes for better quality? 22. All fields of agriculture should be covered with DSS. 23. time/ direction 24. Decisions for cattle farm management (exp. pasture) 25. The decisions the DSS should support need to be very specific, accurate and detailed. Example, in terms of pesticides and new parasites, the DSS should provide details on the parasite and the type of pesticide needed. 26. Markets 27. When to treat the culture with plant protection products and fertilizer, how much plant protection products and fertilizer 28. Optimal injection time: -Because a product that is used optimally can show the best effectiveness. <p>How often inject: -Because the spraying distance in crops like the</p>
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	<p>potato is of crucial importance for the resource reduction.</p> <p>Is it worth using PSM: -Because profitability is still not paid enough attention to and so many funds deployed could already fail over the damage threshold.</p> <p>What are the long-term alternatives: -Because many young farmers would like to use alternatives, but are unsure which alternatives are available. A less academic approach that increases the availability of field reports would be beneficial here as this creates trust.</p> <p>Resistance prevention: -Because due to the dwindling range of resources, there is already a massive resistance problem that will become so serious in the long term that we can expect decisive shortfalls in yields and the risk of famine.</p> <p>Crop rotation: -Because too little information is readily available. There is only a small range of crops that are presented in clear tables and that expanded knowledge, including the order in which they are grown, has great potential to make the cultural landscape more varied.</p> <p>Marketability of the crops: -As part of the crop rotations, communication options must be created between producers and the processing industry so that fair prices can be negotiated and new crop rotations are not abolished after a few years due to a lack of profitability.</p> <p>Operation survivability: -This point is particularly important because politics and society throw too much sand in the eyes of young professionals. A tool that takes into account all realistic factors, from production costs and revenues to hourly wages and long-term political decisions, would accelerate structural change in agriculture. At the same time, however, more operating space could remain with small-scale ownership, which harbors greater potential for regeneration during times of crisis.</p>
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3.	Presentation of data	<p>How should the data be presented in the DSS? 31 responses</p>  <table border="1"> <thead> <tr> <th>Method</th> <th>Count</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>Graphs/Charts</td> <td>20</td> <td>64.5%</td> </tr> <tr> <td>Hierarchy</td> <td>7</td> <td>22.6%</td> </tr> <tr> <td>Diagrams</td> <td>15</td> <td>48.4%</td> </tr> <tr> <td>Flowcharts and maps</td> <td>17</td> <td>54.8%</td> </tr> <tr> <td>Performance sheets</td> <td>18</td> <td>51.6%</td> </tr> <tr> <td>Planning</td> <td>15</td> <td>48.4%</td> </tr> <tr> <td>Designing and allocation</td> <td>6</td> <td>19.4%</td> </tr> <tr> <td>Depends on the DSS</td> <td>1</td> <td>3.2%</td> </tr> <tr> <td>depending on the theme</td> <td>1</td> <td>3.2%</td> </tr> <tr> <td>depends on the type of data - e...</td> <td>1</td> <td>3.2%</td> </tr> <tr> <td>I selected all depending on the...</td> <td>1</td> <td>3.2%</td> </tr> </tbody> </table>	Method	Count	Percentage	Graphs/Charts	20	64.5%	Hierarchy	7	22.6%	Diagrams	15	48.4%	Flowcharts and maps	17	54.8%	Performance sheets	18	51.6%	Planning	15	48.4%	Designing and allocation	6	19.4%	Depends on the DSS	1	3.2%	depending on the theme	1	3.2%	depends on the type of data - e...	1	3.2%	I selected all depending on the...	1	3.2%
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All the responses collected were analysed through quantitative and qualitative analysis, and were used to produce the DSS Tools Specification document.