WP4: Evaluation of developed technologies and impact for the society

Task 4.1
Economic assessment

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Introduction

Assessment of economic viability of DSM technology

Goals of the study:

1. Identify the users and their needs (services, tools, leasing…)

2. Estimate the users’ Willingness to Pay (WTP) of various technology configurations in order to prepare the next stages of the workpackage WP4 on economic and technical feasibility.
Study done according to 4 steps:

1. Baseline- DIGISOIL outputs

2. Identification and characterization of potential end-users

3. Identification of potential end-users’ needs

4. Launch a web-based survey (1st phase)

5. According to the respondses, design the survey for estimating the WTP of each attribute, element of the total need (2nd phase)
Study done according to 4 steps:

1. **Baseline- DIGISOIL outputs**
   
   New technology for the assessment of soil properties and soil degradation indicators that can be used for producing high quality geo-referenced soil maps.

2. **Identification and characterization of potential end-users**

3. **Identification of potential end-users’ needs**

4. **Launch a web-based survey (1st phase)**

5. **According to the respondses, design the survey for estimating the WTP of each attribute, element of the total need (2nd phase)**
Study done according to 4 steps:

1. Baseline- DIGISOIL outputs

2. Identification and characterization of potential end-users
   - Research institutes (public and private), agri-business companies, environmental private companies, public organizations (ministries, agencies…)

3. Identification of potential end users’ needs

4. Launch a web-based survey (1st phase)

4. According to the respondents, design the survey for estimating the WTP of each attribute, element of the total need (2nd phase)
Study done according to 4 steps:

0 Baseline- DIGISOIL outputs

1 Identification and characterization of potential end-users

2 Identification of potential end users’ needs

Buying the machine only; Leasing the machine only; getting accurate soil properties map; getting soil map interpretation for agricultural purposes or environmental purposes; Not interested in the technology

3 Launch a web-based survey (1<sup>st</sup> phase)

4 According to the respondses, design the survey for estimating the WTP of each attribute, element of the total need (2<sup>nd</sup> phase)
Study done according to 4 steps:

1. Baseline- DIGISOIL outputs
2. Identification and characterization of potential end-users
3. Identification of potential end users’ needs
4. Launch a web-based survey (1st phase)
5. According to the responses, carry out the survey for estimating the WTP for each attribute, element of the total need (2nd phase)
Soil Projects > DIGISOIL > DSM Survey

The DIGISOIL Consortium, involving the SOIL Action of the JRC, is currently in the process of developing a new technology for the assessment of soil properties and soil degradation indicators that can be used for producing high quality geo-referenced soil maps.

The technology consists of:
- a hardware machine usually a truck or a quad integrating a platform that employs proximal and ground-based soil scan systems (sensors) that can measure accurately (0.5 – 2 m) the signals from the soils;
- software which transform the signals into the following soil properties:
  - Soil texture
  - Water content
  - Organic matter
  - Soil bulk density
  - Electro conductivity
  - Carbonate rate
  - Soil depth

Following these measurements, the technology leads to detailed geo-referenced maps of soil properties. Moreover, from the maps, it is possible to offer end-user targeted services, such as fertilizer recommendations and/or analysis of soil risks degradation intensity.

Before deploying the technology, and in order to better target it to the end user, we are launching a survey which aims to assess the economic feasibility of such an undertaking and its relevance to the end user.

To this aim, as a potential end user, we kindly ask you to indicate whether you are interested in making use of this technology and if so, which services you wish to employ. You should fill out the following questionnaire which takes less than two minutes. You will then be approached after two weeks to fill out a second questionnaire which will take you five minutes of your time. Thanks a lot in advance for your precious contribution.

Concerning the technology, please choose among the following options:

- Interested in buying the machine only. The machine can be sold to the end user. This involves a qualified user to run the machine
- Interested in leasing the machine only. The machine can be leased to the end user for a certain fee per day of use. This involves a qualified user to run the machine
- Interested in the accurate soil properties map. The price depends on the spatial accuracy (number of tracks of the machine/ha) and the spatial extent needed by the user.
- Interested in the soil map interpretation for agricultural purposes (fertilizer recommendation) or environmental purposes (soil risk assessment). The price depends on the spatial accuracy (number of tracks of the machine/ha) and spatial extent needed by the user and on the interpretation asked by the user.
- Not interested in the technology

Additional Information

Can you please indicate:

Your email address (Mandatory):  
Your First/Last Name (Optional):  
Your institute (optional):  

The type of your institute (mandatory):
- Private research centre
- Public research centre
- Agriculture company
- Environmental agency
- Ministries
- Other:  

Submit
Study done according to 4 steps:

1. Baseline- DIGISOIL outputs
2. Identification and characterization of potential end-users
3. Identification of potential end users’ needs
4. Launch a web-based survey (1st phase)
5. According to the responses, design the survey for estimating the WTP of each attribute, element of the total need (2nd phase)
Results of the 1\textsuperscript{st} phase

Assessment of economic viability of DSM technology

Respondents' preferred use of the technology

- Buy: 7%
- Lease: 9%
- Soil properties map: 34%
- Soil Properties & Interpretation: 39%
- Not interested: 11%

Type of institute/organisation

- Private Research Centre: 20%
- Public Research Centre: 53%
- Agribusiness company: 5%
- Environmental Agency: 7%
- Ministries: 7%
- Other: 8%
- Not interested: 5%
Respondents are presented with choices situations, called ‘choice sets’

Each choice set consists of 2 Technology Versions (Alternatives) and an “opt out” option

Alternatives are described in terms of a common set of attributes

The “opt out” option provides an “exit” strategy

The attributes in the other three alternatives change from choice set to choice set, following a statistical design.

By including a ‘Price’ attribute (Euro/ha) we can infer the WTP for changes in each of the other attributes
Respondents’ welfare (Utility) function is represented by:

\[ U = b_0 + b_{\text{resolution}} \cdot \text{Resolution} + b_{\text{depth}} \cdot \text{Depth} + b_{\text{fertilizer}} \cdot \text{Fertilizer} + b_{\text{degradation}} \cdot \text{Degradation} + b_{\text{price}} \cdot \text{Price} + E \]

where E is a random component.

The aim is to estimate the \( b \) parameters that maximize the likelihood of obtaining the observed choices.

The willingness to pay (WTP) for one of the attributes is calculated by dividing \( b_{\text{attribute}} \) by \( b_{\text{price}} \)

\[ \text{e.g. } \text{WTP}_{\text{fertilizer}} = \frac{b_{\text{fertilizer}}}{b_{\text{price}}} \]

By adding up the WTP for all the technology attributes we find the WTP for the version of the technology we wish to develop (i.e. the potential prices the users are willing to pay for the specified outputs)
## Preliminary Results

**Assessment of economic viability of DSM technology**

### Variables Coefficients p-values

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<thead>
<tr>
<th>Variables</th>
<th>Coefficients</th>
<th>p-values</th>
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<td>Price</td>
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</tbody>
</table>

### WTP

- Resolution: €163
- Fertilizer Recommendation: €225
- Soil Degradation Indicators: €277
Further investigations

Assessment of economic viability of DSM technology

- Non-linear utility effects

- Effects of non attributes on WTP

- Cost estimates