TRansition paths to sUstainable legume-based systems in Europe

Scientific and technical manuals/publications for web tool

Work Package: 8

Deliverable (D): D8.5

Lead Author and Institution:
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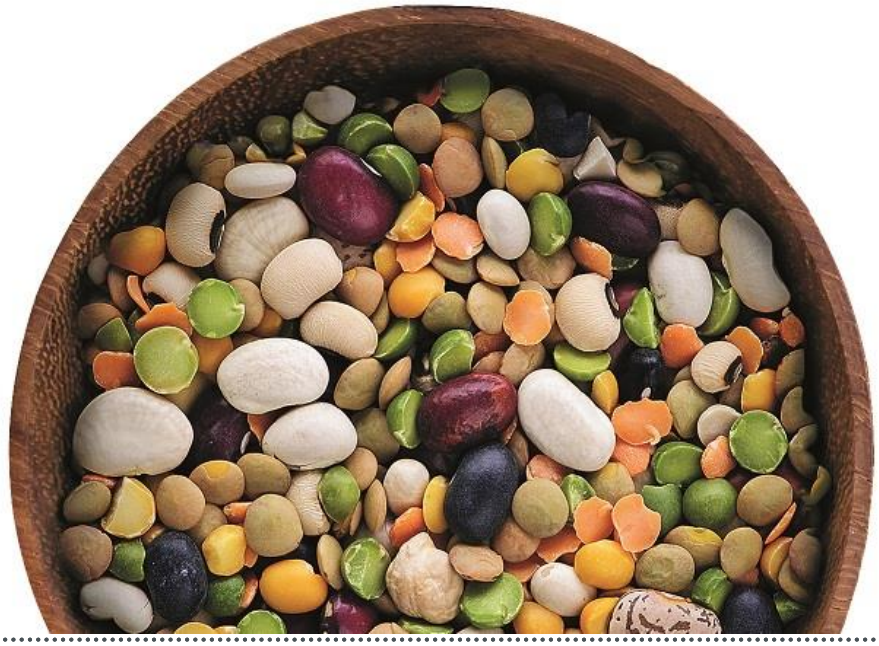
27th September 2021



The TRUE project is a Research and Innovation Action which is fundedby the European Commission *via* the Horizon 2020 Programme and under Grant Agreement number 727973.

Deliverable Description & Contributors

- **Due date**: 30st September 2021
- **Actual submission date**: 30th September 2021
- **Project start date**: 1st April 2017
- **Duration**: 54 months
- **Work package**: Transition Pathways (WP8)
- **Work package leader**: Marko Debeljak (JSI)
- **Deliverable Title**: Modelling sustainable (legume) systems
- **Nature of deliverable**: DEM/OTHER
- **Dissemination level**: Public (PU)

- **Deliverable description:** The final output of WP8 is a web-based Decision Support System Pathfinder for assessment of the sustainability of legume agri-food value chains. The conceptual structure of the system, the decision models that it is comprised of, as well as the technical implementation of the system are described in Deliverables 8.1 to 8.4. This deliverable serves as a user manual with instructions about the use of the PathFinder. It is also included in the web-based Decision Support System PathFinder to guide the users through the functionalities of the system.

- **Contributors**
  - Aneta Trajanov, Tanja Dergan, Marko Debeljak, Bojan Blažica (JSI)
  - Fanny Tran, Pietro Iannetta (JHI)

- **Keywords:** User manual, DSS, Pathfinder

- **Background information regarding the TRUE-Project:** see Appendix I

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Contents

The TRUE project is a Research and Innovation Action which is fundedby the European Commission *via* the Horizon 2020 Programme and under Grant Agreement number 727973.

1. Introduction

The **PathFinder** (*http://pathfinder.ijs.si/*) is a Decision Support System (DSS) for the assessment and management of sustainability of legume agri-food value chains and has been developed within the Horizon 2020 TRUE project. It assesses the sustainability according to the 'three pillars of sustainability': **environmental**, **economic,** and **social**, as well as their intersections: **equitability**, **bearability** and **viability**. The system provides partial sustainability assessments for individual links in the agri-food chain (production, processing, transport and distribution, market and retailers, and consumers) and individual sustainability pillars, as well as an overall sustainability assessment and management of the whole chain. It enables the users to modify the input variables, so as to ascertain optimal combination of input variables of the individual link in the agri-food chain that lead to satisfactory partial or overall sustainability. It also offers suggestions for changes in certain areas of the agri-food chain to improve its overall or partial sustainability.

The DSS is developed primarily for policy makers and researchers, who are responsible for development of sustainability strategies, polices and regulations towards reaching the Sustainable Development Goals 2030. The PathFinder could be also used as an education tool that allows students to learn about those factors, and their functional relationships, which determine the sustainability of agri-food value chains.

To start using the PathFinder, the users must first register and create their own account. This provides them with a personalised experience of the use of the DSS, as well as privacy security regarding the input data and the results obtained. By registering, the user can revisit the input data and the obtained results and work on them continuously for a longer period, without having to input the data repeatedly.

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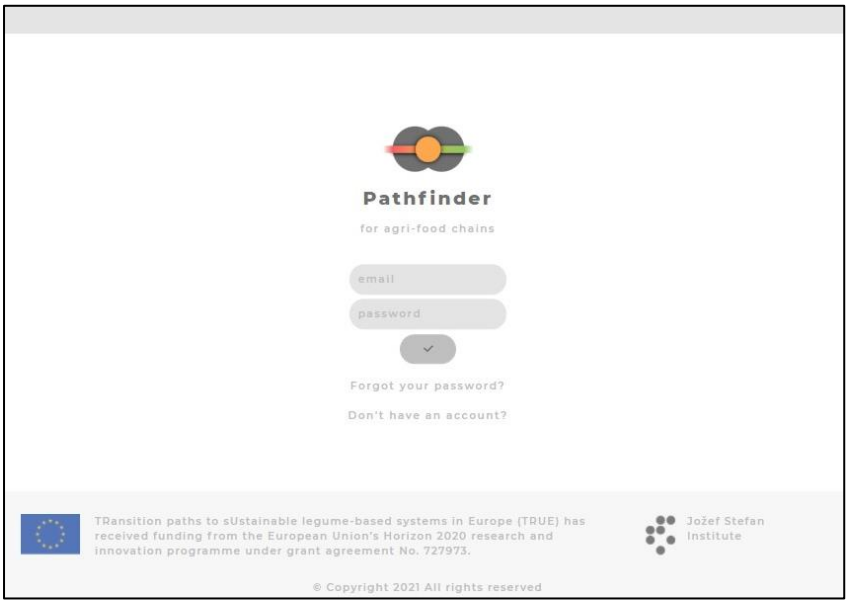
Pathfinder
for agri-food chains
email
password
Forgot your password?
Don't have an account?
TRansition paths to sUstainable legume-based systems in Europe (TRUE) has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 727973.
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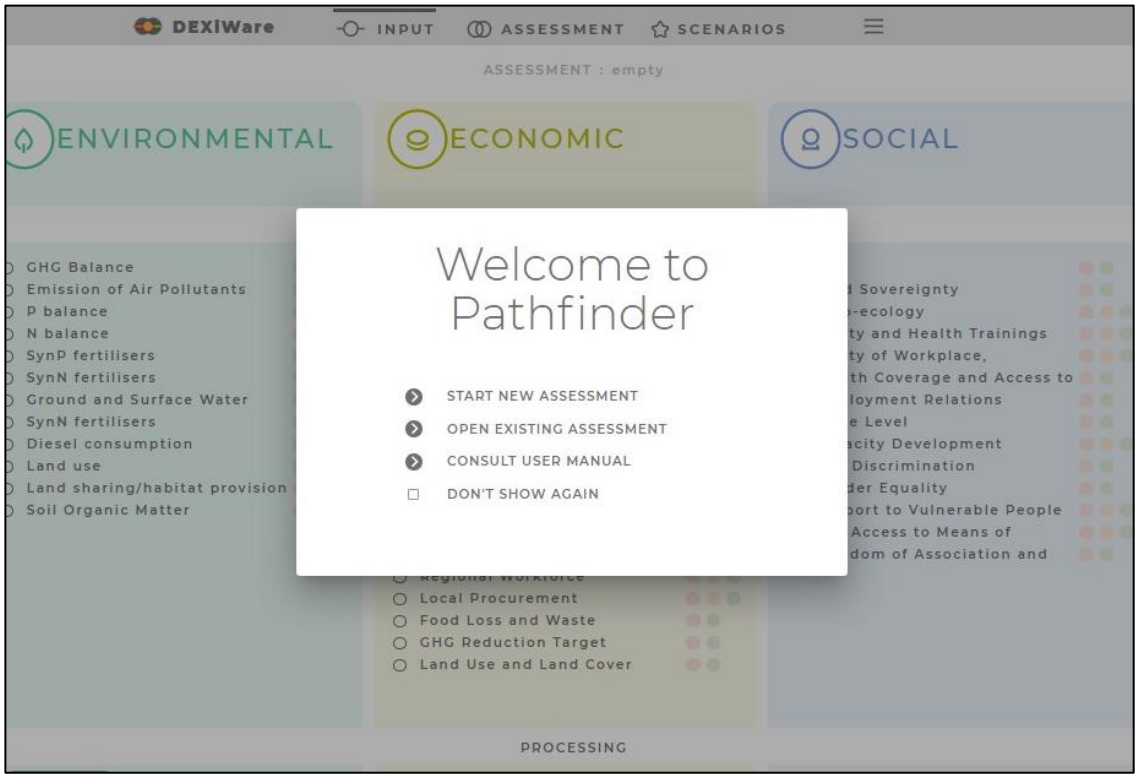
2. Starting the PathFinder

When the user starts the PathFinder, a window opens offering the choice to either create a new assessment, open a previously created assessment or consult the user manual for instructions about the use of the DSS. If the user has previously used the system, they can revisit the data and results of their previous assessments.



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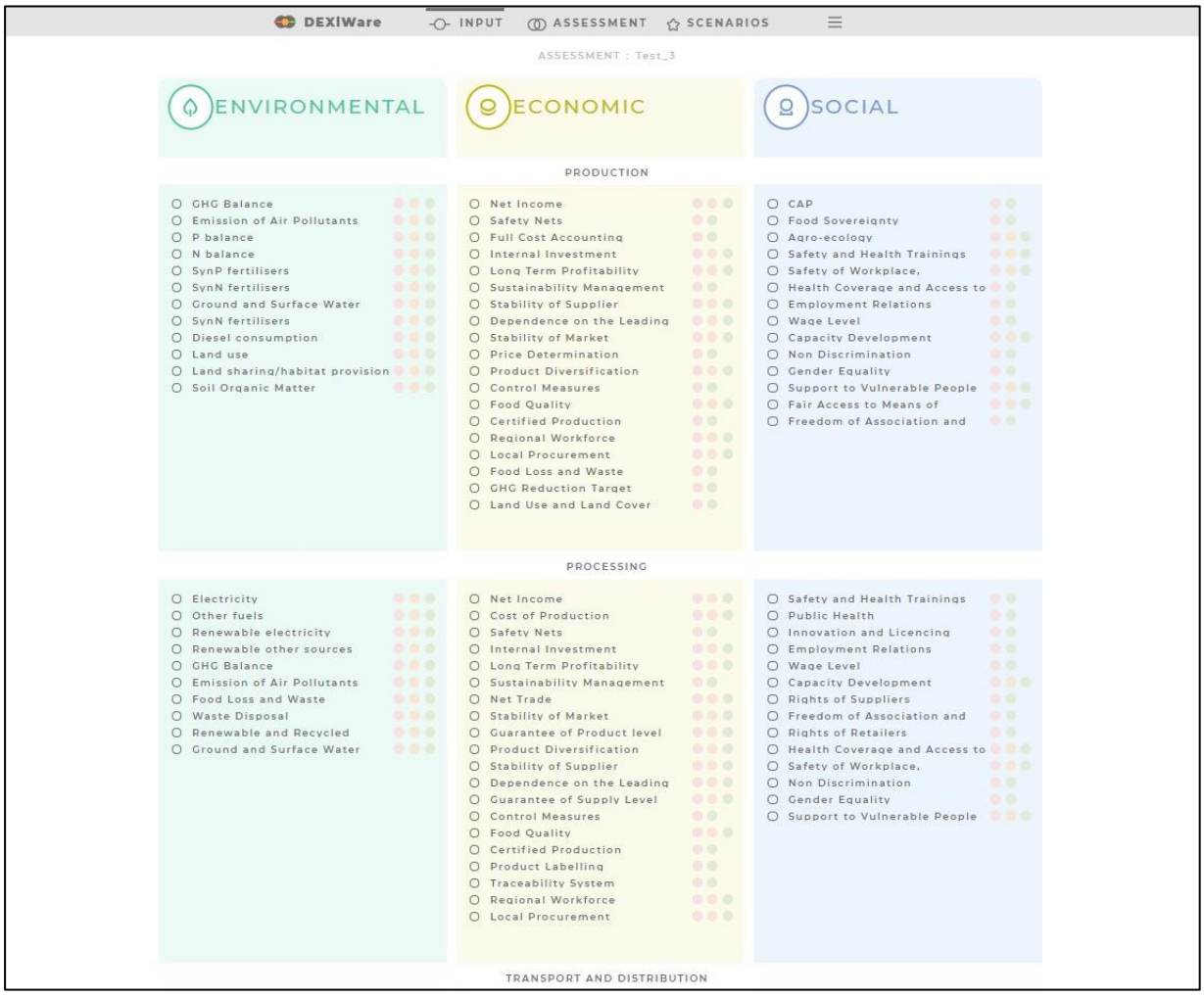
3. Input data

The next step when using the PathFinder is to insert data about the links in the agri-food chain for the three pillars of sustainability: **environmental**, **social,** and **economic**. They represent three categories of input data, which are represented in different sections with different colours. Each of these three categories of input data are further divided into subcategories, representing the links in the agri-food chain (from production to consumers). By clicking on one of the categories (pillars), the user will be guided through the list of input data to insert and populate the DSS with the required data for assessment of the environmental, economic, and social sustainability pillars in the agri-food chain.



4. Inserting data

The input data takes the form of qualitative indicators for which the user chooses one of its qualitative values (*e.g.,* low, medium, high). Both the indicator and its values are provided with short and understandable descriptions that help the user to choose the right input values. By clicking on one of the input data categories (pillars), a page will open, where the first indicator from the list of input data for the chosen category (pillar) will be shown.

1. This part represents the subcategories of input data (*e.g.,* Production) within the selected category (*e.g.,* Environmental). The dots on the horizontal line next to the subcategory title navigate the user through the list of indicators, showing how many indicators have already been inserted and for how many indicators are left. A dot coloured in grey represents an indicator for which a value has been inserted. A white dot represents an indicator, for which a value has not been inserted yet. If the user scrolls over a dot, the name of the indicator is shown. The user can "jump" to an indicator by clicking on a dot representing the indicator.

2. A description of the indicator.

3. This is the part where the user chooses one among the proposed and described qualitative values for the chosen indicator that belongs to the production system that is being evaluated.

4. Navigation buttons to the next or previous indicator.

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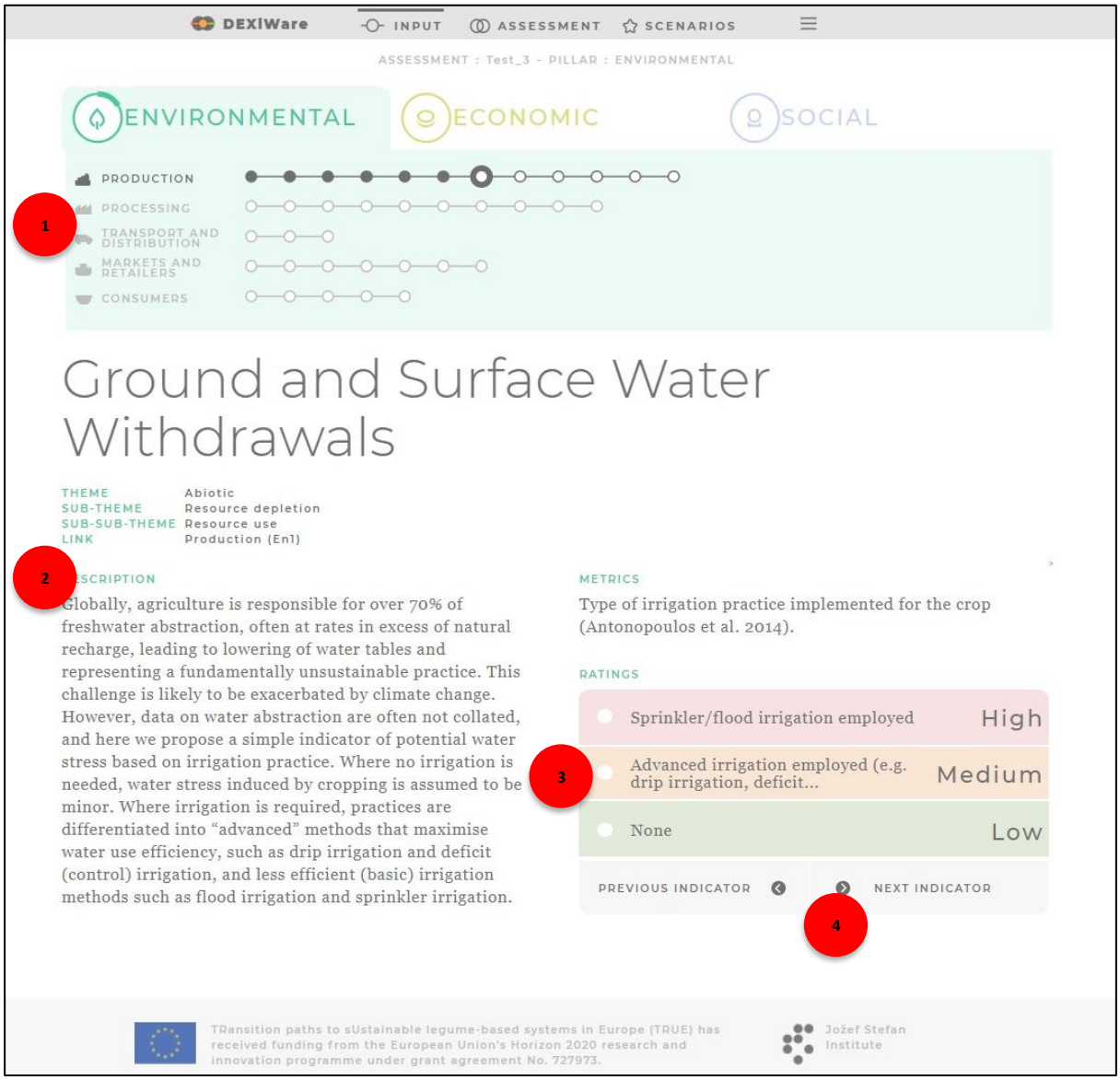
DEXiWare
INPUT
ASSESSMENT
SCENARIOS
ASSESSMENT : Test_3 - PILLAR : ENVIRONMENTAL
ENVIRONMENTAL
ECONOMIC
SOCIAL
PRODUCTION
PROCESSING
TRANSPORT AND DISTRIBUTION
MARKETS AND RETAILERS
CONSUMERS
1
Ground and Surface Water Withdrawals
THEME Abiotic
SUB-THEME Resource depletion
SUB-SUB-THEME Resource use
LINK Production (En1)
2
DESCRIPTION
Globally, agriculture is responsible for over 70% of freshwater abstraction, often at rates in excess of natural recharge, leading to lowering of water tables and representing a fundamentally unsustainable practice. This challenge is likely to be exacerbated by climate change. However, data on water abstraction are often not collated, and here we propose a simple indicator of potential water stress based on irrigation practice. Where no irrigation is needed, water stress induced by cropping is assumed to be minor. Where irrigation is required, practices are differentiated into "advanced" methods that maximise water use efficiency, such as drip irrigation and deficit (control) irrigation, and less efficient (basic) irrigation methods such as flood irrigation and sprinkler irrigation.
METRICS
Type of irrigation practice implemented for the crop (Antonopoulos et al. 2014).
RATINGS
Sprinkler/flood irrigation employed High
3
Advanced irrigation employed (e.g. drip irrigation, deficit... Medium
None Low
PREVIOUS INDICATOR
NEXT INDICATOR
4
TRansition paths to sUstainable legume-based systems in Europe (TRUE) has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 727973.
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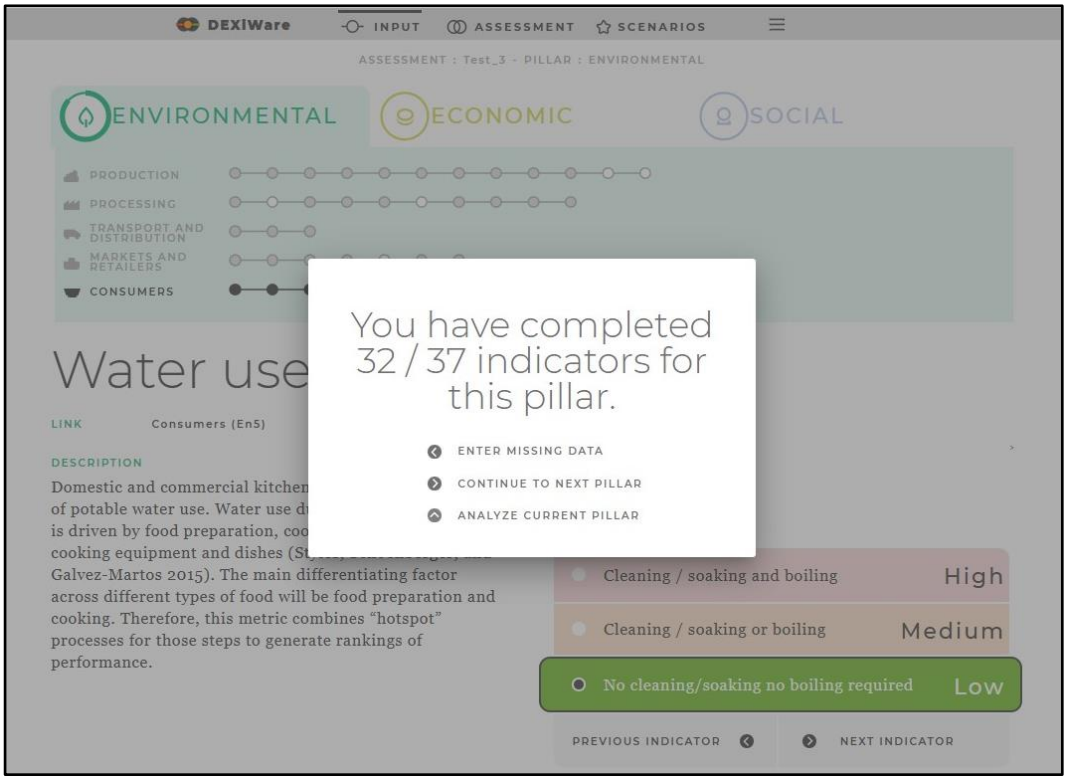
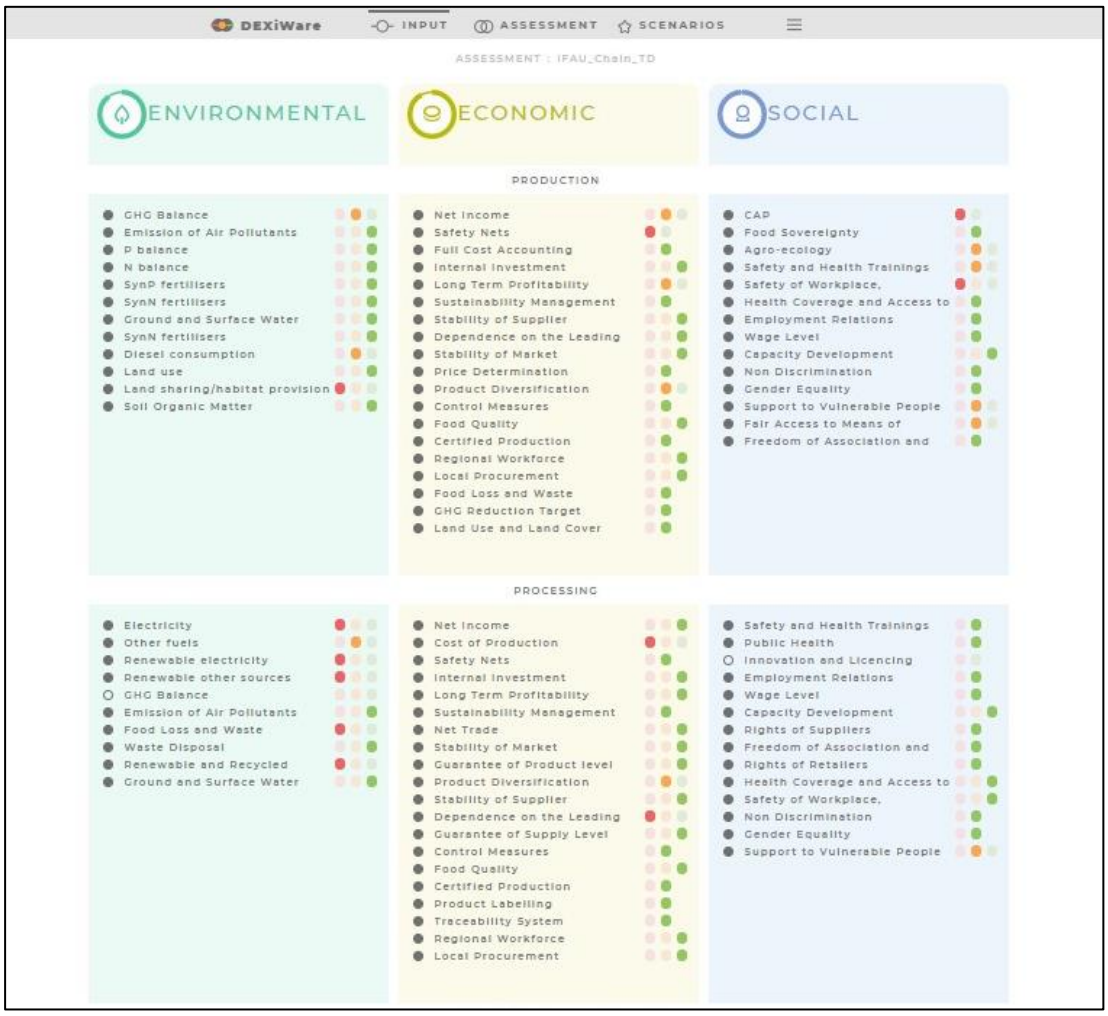
After complete input of data for a category (pillar), a window opens informing the user whether all the required data were entered (note that if the user does not have all required data available, he/she can leave the indicator empty). If all data were entered, the user is prompted to move on to the next pillar. However, the user is advised to enter as much data as possible. The tool assesses each pillar of sustainability for each link in the agri-food chain separately, hence data for only one of these aspects/categories can be inserted to get an assessment for that specific aspect/category.



By clicking on ***INPUT*** in the upper menu bar, the page with the list of all indicators for all categories of input data will be shown, where the user can check which indicators have already been inserted (coloured dot next to the indicator) and which are still empty. This provides to user with an additional overview of the input data before running the analyses.



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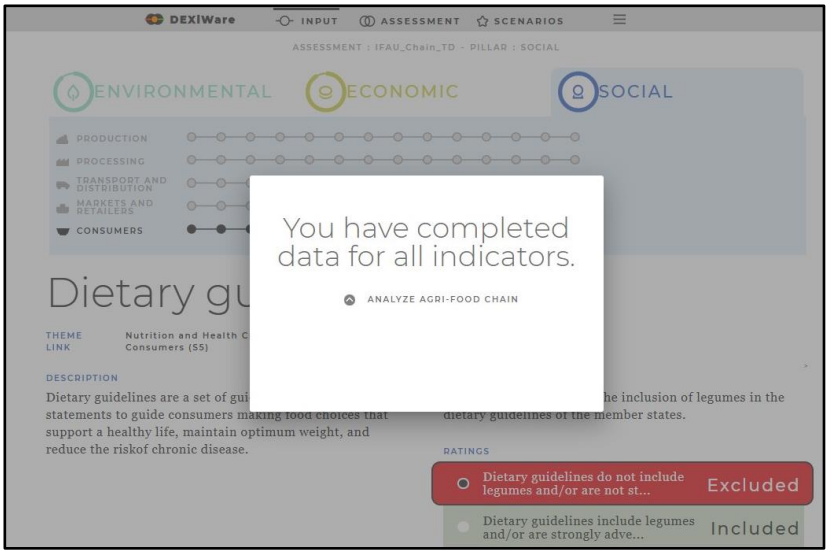
5. Assessment

Once the values of the indicators in all three pillars are entered, a window opens informing the user that they have completed the entries and can proceed with the analysis to obtain a sustainability assessment of the entire agri-food chain.



The results of the sustainability assessment of the chosen agri-food chain are visually presented:

1. The colours of the large circles and their intersections represent the results of the sustainability assessment. The overall sustainability level of the entire agri-food chain is shown in the centre of the rose where all three sustainability pillars overlap. The three circles represent the three sustainability pillars (environmental, economic, and social) and their intersections: bearability, viability and equitability, of the agri-food chain. When data for a certain pillar are completely missing (not inserted), the circle representing that pillar is coloured in grey, to indicate that no assessment for that pillar was performed.

2. This part shows the results of the assessments for the individual links in the agri-food chain for each sustainability pillar (environmental, economic, and social). In case of missing input data, two possible outcomes/assessments are equally probable. In that case, the circle can be one of two colours, representing the combination of possible outcomes.

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3 This button (***BOTTOM-UP SCENARIO***) enables the user to explore in what way the changes at the lower level (input data or link level) influence the sustainability on higher levels (link in the agri-food chain, or the entire chain). This way, the user can perform what-if analysis and see the differences the changed input makes to the final outcome, compared to the original assessment.

4 This button (***TOP-DOWN SCENARIO***) allows the user to choose a desired partial or overall level of sustainability. The system then searches for options that would lead to the desired sustainability level and provides the user with scenarios in which the desired sustainability level is achieved. This would give the user advice on which parts of the agri-food chain changes should be made to achieve the desired level of sustainability.

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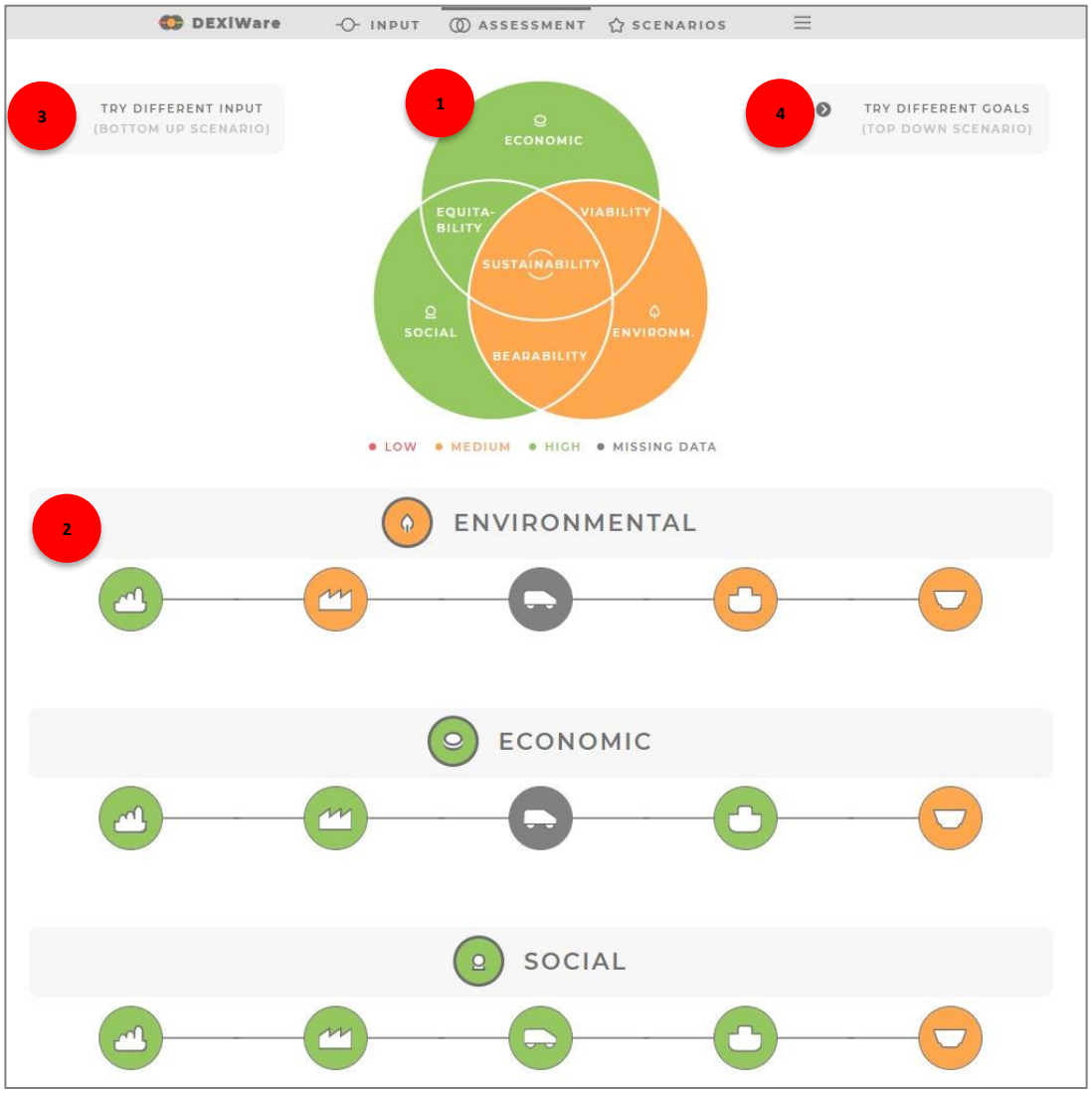

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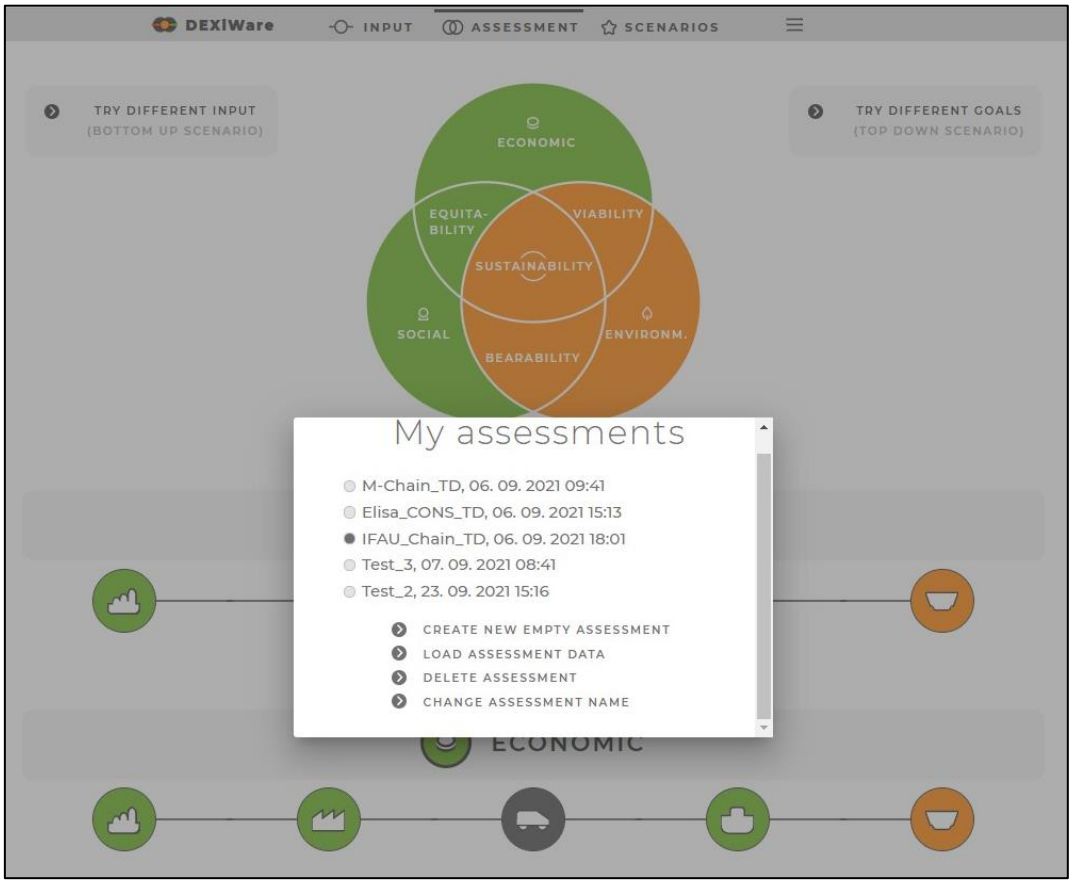
6. Saving the assessment

By clicking on ***SELECT ASSESSMENT*** in the navigation bar ('hamburger button', three short stacked parallel horizontal lines) in the upper right corner, the user can name and save the current assessment. In addition, the user can also open, rename or delete already saved assessments.



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7. Bottom-up scenario

By clicking on the ***TRY DIFFERENT INPUT*** button, the users can explore what impact the changes of the input data would have on the sustainability performance of the agri-food system being assessed. If the users are not satisfied with the assessed level of sustainability, this option will help identifying which parts of the agri-food chain should be improved to enhance the overall sustainability of the agri-food chain. The users must change the values of the input data (indicators) and examine how these changes affect the sustainability performance at the different levels of the assessed agri-food system.

1. The circles on the upper left side represent the assessed overall sustainability and its pillars and their intersections for the chosen scenario.

2. To see what impact changes in the input data would have on the sustainability performance of the agri-food system being assessed, the user first need to change the value of the indicator(s) or sets the desired value for the selected link or pillar by clicking on the corresponding circle. Note that it is not possible to change the values at all levels at the same time.

3. After changing the input values of the indicators, links, or pillars, click on ***EVALUATE CHANGES*** button and the DSS will make a new assessment of all sustainability aspects of the selected agri-food system.

4. A new sustainability assessment of all links and pillars of the selected agri-food system is provided.

5. Clears all changes made to the values of the indicators and the links and shows the original values of the input data. New changes of the input data or links goals can be made.

6. Saves the current assessment scenario for further use and review. The user can choose a name for the scenario for easier navigation.

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8. Top-down scenario

By clicking on the ***TRY DIFFERENT GOALS*** button, the user can explore the pathways that will lead them to the desired sustainability level of the agri-food chain and will provide advises about the necessary changes of the current situation that would lead to the desired sustainability performance of the entire chain or its parts. Once the user sets the goals about the desired level of the sustainability performance, they must change the assessed sustainability levels to the desired levels. By clicking on the triangle button next to the sustainability pillar or pillars' intersections, the user increases or decreases the sustainability levels according to their goals. The DSS then provides pathways (scenarios) that lead the user to the desired sustainability levels. The scenarios give detailed information of the needed changes that will provide the desired sustainability levels. This would give the user advice in which parts of the agri-food chain changes should be made so that the desired sustainability is achieved. The user can then save the optimal scenario for further review.

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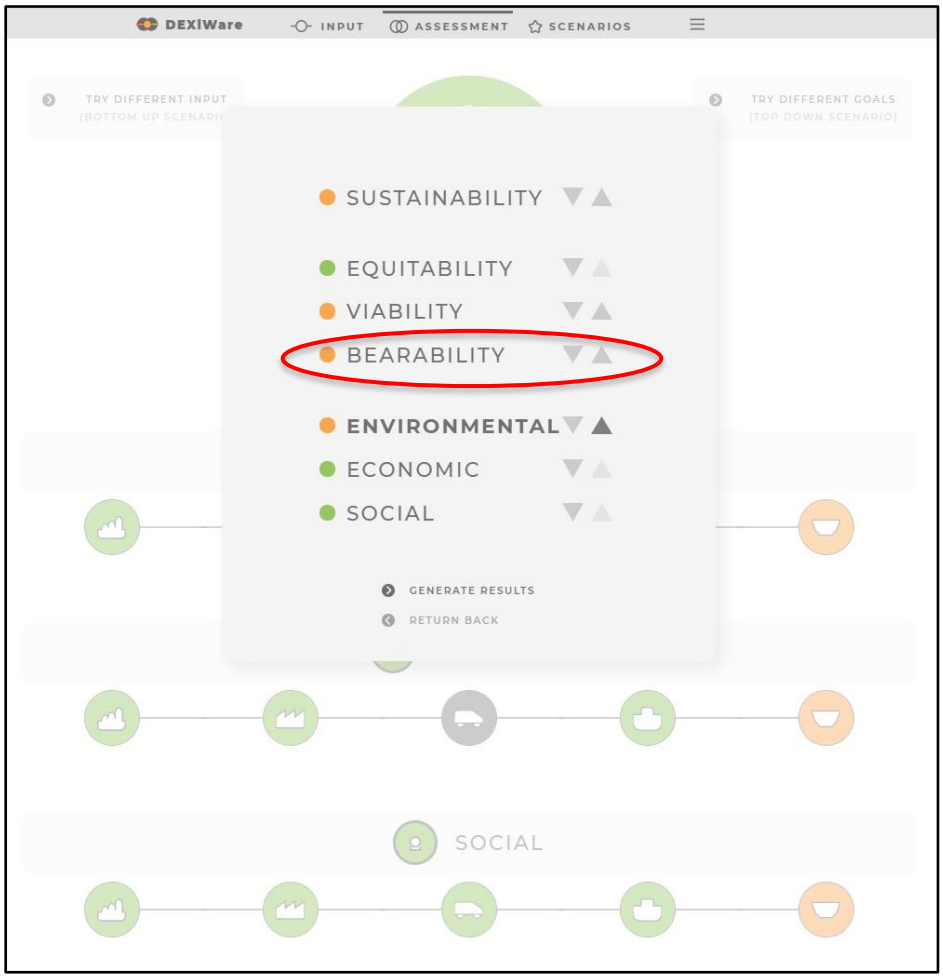

1. Visualization of the results of the currently assessed agri-food chain.

2. Sustainability levels of the links under the changes proposed by Pathfinder.

3. Sustainability levels of the agri-food chain, its pillars and their intersections under the changes proposed by Pathfinder.

4. A list of changes proposed by PathFinder that should be made in the agri-food chain in order to achieve the desired sustainability level.

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5 Save the proposed scenario for further use and inspection. The user can choose a name for the scenario for easier navigation.

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9. Review of saved scenarios

The saved scenarios for both bottom-up and top-down analysis are shown by clicking ***SCENARIOS*** in the upper menu bar. Since the user has the option to create and save several scenarios in the bottom-up analysis and to select and save several variations in the top-down analysis, this option provides a transparent way to review all saved scenarios/variation.

1. Click on ***BOTTOM-UP SCENARIOS*** or ***TOP-DOWN SCENARIOS*** to visualize the scenarios.

2. This button allows the user to see the saved scenarios for the bottom-up analyses. The saved scenarios include the before and after results of the analyses, names of the scenarios/assessments and list of all input changes made by user.

3. This button allows the user to see the saved scenarios for the top-down analyses. The saved scenarios include the before and after results of the assessment of the whole chain and its links and a list of all needed changes that should be made in the agri-food chain.

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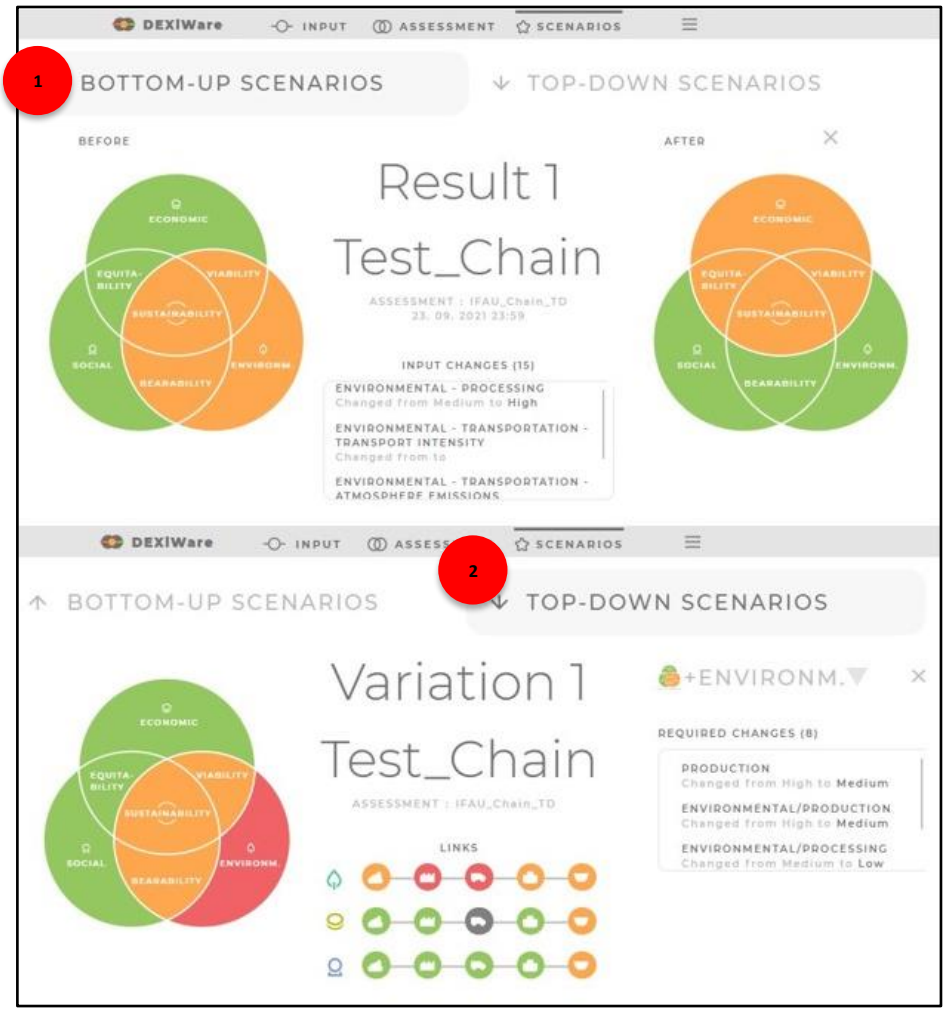

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10. Exporting the results

The PathFinder enables the report of the analysis to be exported as a PDF file. The report contains the input data, the assessment results, and the saved scenarios of what-if and top-down analysis. The PDF document is the only export from the Pathfinder, which can be used for exploitation and communication purposes. The export option is in the navigation bar (hamburger button) in the upper right corner.

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11. User management

The user management functionality of PathFinder, found in the upper right corner, enables all the registered users to invite collaborators to help gather all the needed data and give them different permissions about the input of data. The permissions can be fine-tuned for each data input section (indicator, pillar, link). Due to the complexity of the agri-food chain and large amount of required input data, the user management will facilitate the involvement of data providers for different links or the agri-food chain in obtaining high quality data.

1. By clicking on one of the three pillars, the user has the option to invites collaborators to help with the collection of the data required for that specific pillar.

2. Invite collaborators to use the system, by entering their name and email. Collaborators then receive an invitation to work on the assigned example.

3. List of invited collaborators added to the system. In addition to the collaborators name, it also shows the assigned permissions and how much of it has been completed.

4. List of indicators in the selected pillar, for each link in the agri-food chain. This allows the user to have a better overview of the input data needed and the assignments of different collaborators.

5. By clicking on the sign ( ), the user assigns the collaborator permission to input data or modify the value of the indicator. The collaborator can input data or modify only the indicators assigned to them by the user.

6. By clicking on the sign ( ), the user assigns a read-only permission to a collaborator. The collaborator now has no permission to input data and is therefore participating only as an observer.

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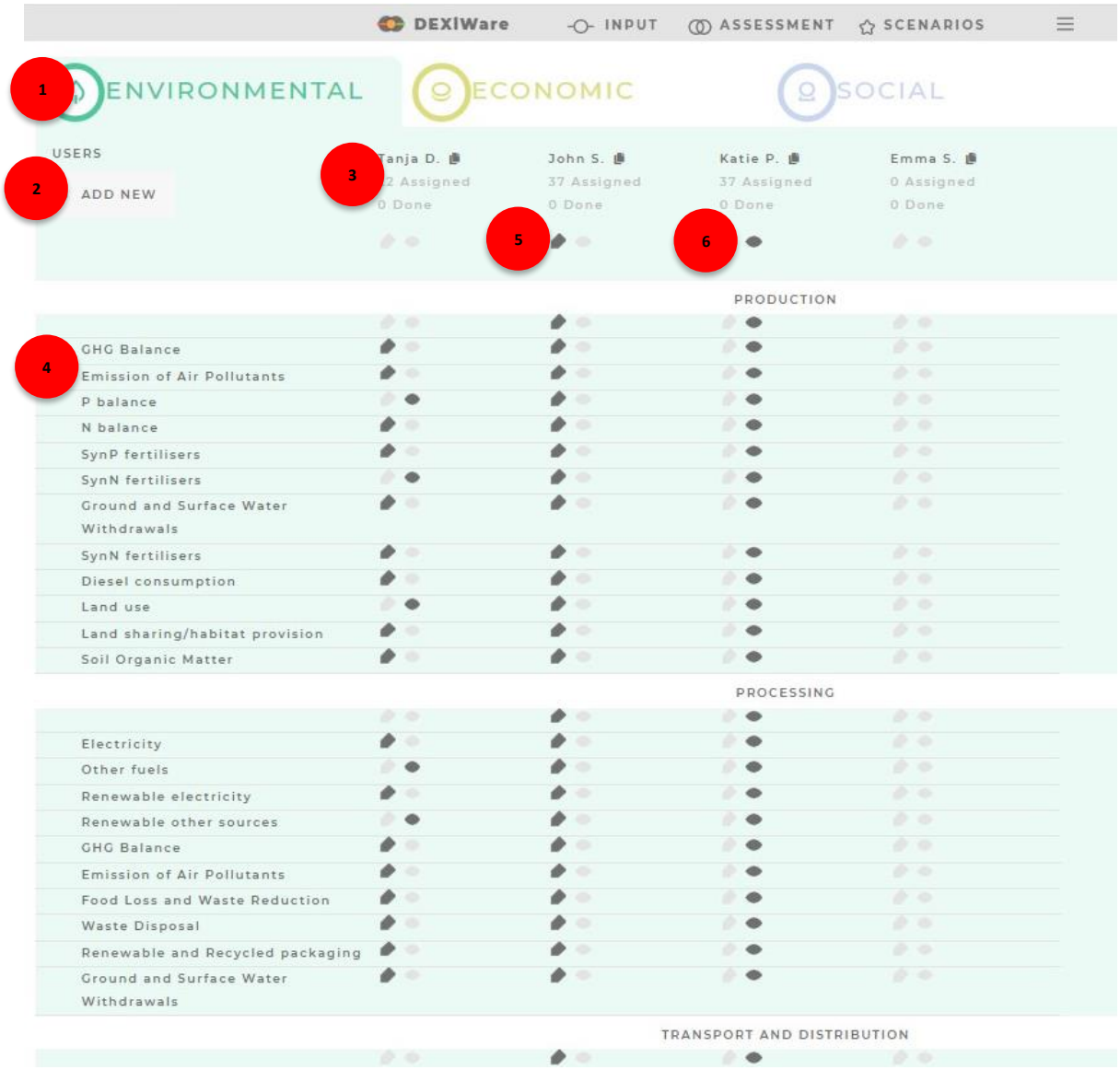

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Acknowledgements

The TRUE-Project is Coordinated by the James Hutton Institute (JHI) (Scotland UK). JHI is supported by the Rural and Environmental Science and Analytical Services (RESAS), a Division of the Scottish Government.

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Please cite this report as follows:

Trajanov A., Dergan, T., Blažica, B., Iannetta, P., Tran, F., Debeljak, M. (2021). Deliverable D8.5 Scientific and technical manuals/publications for web tool for the EU-H2020 funded project, '*TRansition paths to sUstainable legume-based systems in Europe*' (*TRUE),* under Grant Agreement Number 727973. DOI: 10.5281/zenodo.5539940.

Also available online at: www.true-project.eu.

Appendix I: Background to the TRUE project

TRUE Project Executive Summary

TRUE's perspective is that the scientific knowledge, capacities and societal desire for legume supported systems exist, but that practical co-innovation to realise transition paths have yet to be achieved. TRUE presents 9 Work Packages (WPs), supported by an *Intercontinental Scientific Advisory Board*. Collectively, these elements present a strategic and gender balanced work-plan through which the role of legumes in determining '*three pillars of sustainability*' – '*environment*', '*economics*' and '*society*' - may be best resolved.

TRUE realises a genuine multi-actor approach, the basis for which are three *Regional Clusters* managed by WP1 ('*Knowledge Exchange and Communication',* University of Hohenheim, Germany), that span the main pedo-climatic regions of Europe, designated here as: *Continental*, *Mediterranean* and *Atlantic,* and facilitate the alignment of stakeholders' knowledge across a suite of 24 Case Studies. The Case Studies are managed by partners within WPs 2-4 comprising '*Case Studies*' (incorporating the project database and *Data Management Plan*), '*Nutrition and Product Development*', and '*Markets and Consumers'.* These are led by the Agricultural University of Athens (Greece), Universidade Catolica Portuguesa (Portugal) and the Institute for Food Studies & Agro Industrial Development (Denmark), respectively. This combination of reflective dialogue (WP1), and novel legume-based approaches (WP2-4) will supply hitherto unparalleled datasets for the '*sustainability WPs*', WPs 5-7 for '*Environment*', '*Economics*' and '*Policy and Governance'.* These are led by greenhouse gas specialists at Trinity College Dublin (Ireland; in close partnership with Life Cycle Analysis specialists at Bangor University, UK), Scotland's Rural College (in close partnership with University of Hohenheim), and the Environmental and Social Science Research Group (Hungary), in association with Coventry University, UK), respectively. These *Pillar WPs* use progressive statistical, mathematical and policy modelling approaches to characterise current legume supported systems and identify those management strategies which may achieve sustainable states. *A key feature* is that TRUE will identify key *Sustainable Development Indicators* (SDIs) for legume-supported systems, and thresholds (or goals) to which each SDI should aim. Data from the *foundation WPs* (1-4), to and between the *Pillar WPs* (5-7), will be resolved by WP8, '*Transition Design',* using machine-learning approaches (*e.g. Knowledge Discovery in Databases*), allied with *DEX* (*Decision Expert*) methodology to enable the mapping of existing knowledge and experiences. Co-ordination is managed by a team of highly experienced senior staff and project managers based in The Agroecology Group, a Sub-group of Ecological Sciences within The James Hutton Institute.

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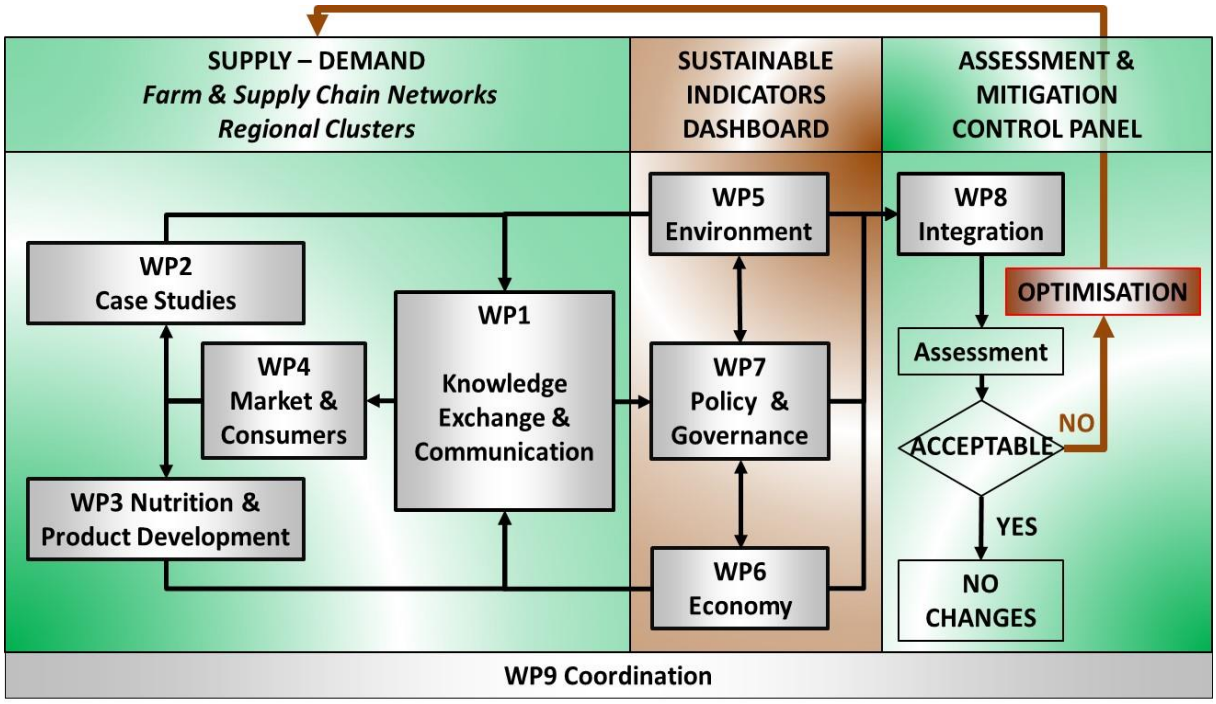
Work Package Structure

Flow of information and knowledge in TRUE, from definition of the 24 case studies (left), quantification of sustainability (centre) and synthesis and decision support (right) (Figure 1).



Work package structure and flow of information and knowledge between work packages.

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Project Partners

Nº.	Participant organisation name (and acronym)	Country	Organisation Type
1 (C*)	The James Hutton Institute (JHI)	UK	RTO
2	Coventry University (CU)	UK	University
3	Stockbridge Technology Centre (STC)	UK	SME
4	Scotland's Rural College (SRUC)	UK	HEI
5	Kenya Forestry Research Institute (KEFRI)	Kenya	RTO
6	Universidade Catolica Portuguesa (UCP)	Portugal	University
7	Universitaet Hohenheim (UHOH)	Germany	University
8	Agricultural University of Athens (AUA)	Greece	University
9	IFAU APS (IFAU)	Denmark	SME
10	Regionalna Razvojna Agencija Medimurje (REDEA)	Croatia	Development Agency
11	Bangor University (BU)	UK	University
12	Trinity College Dublin (TCD)	Ireland	University
13	Processors and Growers Research Organisation (PGRO)	UK	SME
14	Institut Jozef Stefan (JSI)	Slovenia	HEI
15	IGV Institut Fur Getreideverarbeitung Gmbh (IGV)	Germany	Commercial SME
16	ESSRG Kft (ESSRG)	Hungary	SME
17	Agri Kulti Kft (AK)	Hungary	SME
18	Alfred-Wegener-Institut (AWI)	Germany	RTO
19	Slow Food Deutschland e.V. (SF)	Germany	Social Enterprise
20	Arbikie Distilling Ltd (ADL)	UK	SME
21	Agriculture And Food Development Authority (TEAG)	Ireland	RTO
22	Sociedade Agrícola do Freixo do Meio, Lda (FDM)	Portugal	SME
23	Eurest -Sociedade Europeia De Restaurantes Lda (EUR)	Portugal	Commercial Enterprise
24	Solintagro SL (SOL)	Spain	SME
25	Public Institution for Development of Međimurje REDEA (PIRED)	Croatia	Development Agency

*Coordinating institution

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Objectives

Objective 1: Facilitate knowledge exchange (UHOH, WP1)
- *Develop a blue-print for co-production of knowledge*

Objective 2: Identify factors that contribute to successful transitions (AUA, WP2)
- *Relevant and meaningful Sustainable Development Indicators (SDIs)*

Objective 3: Develop novel food and non-food uses (UCP, WP3)
- *Develop appropriate food and feed products for regions/cropping systems*

Objective 4: Investigate international markets and trade (IFAU, WP4)
- *Publish guidelines of legume consumption for employment and economic growth*
- *EU infrastructure-map for processing and trading*

Objective 5: Inventory data on environmental intensity of production (TCD, WP5)
- Life Cycle Analyses (LCA) -novel legumes rotations and diet change

Objective 6: Economic performance - different cropping systems (SRUC & UHOH, WP6)
- *Accounting yield and price risks of legume-based cropping systems*

Objective 7: Enable policies, legislation and regulatory systems (ESSRG, WP7)
- *EU-policy linkages (on nutrition) to inform product development/uptake*

Objective 8: Develop decision support tools: growers to policy makers (JSI, WP8)
- *User friendly decision support tools to harmonise sustainability pillars*

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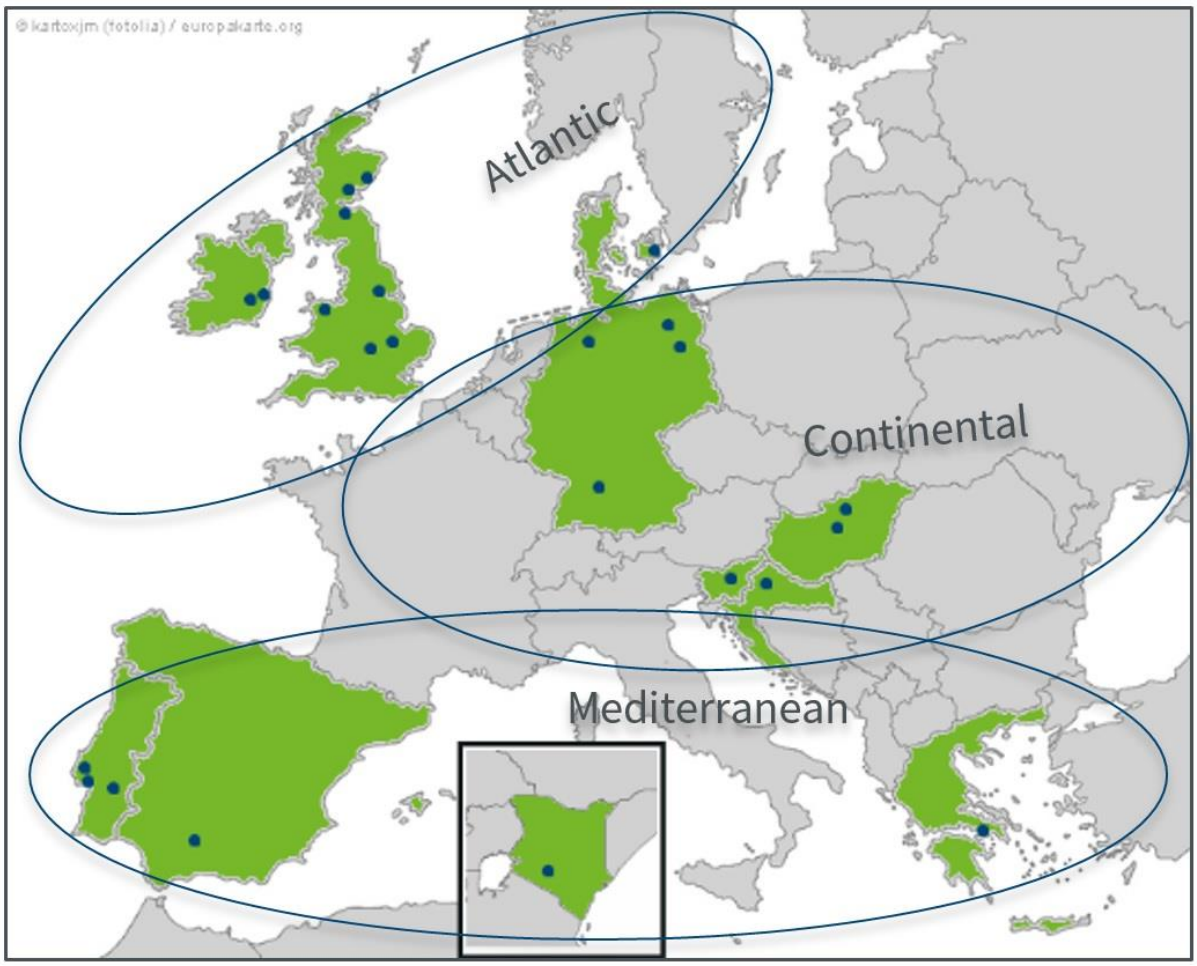
Legume Innovation Networks & Case Studies

Knowledge Exchange and Communication (WP1) events include three TRUE European Legume Innovation Networks (ELINs) and these engage multi-stakeholders in a series of focused workshops. The ELINs span three major pedoclimatic regions of Europe, illustrated above within the ellipsoids for Continental, Mediterranean and Atlantic zones (Figure 2).



Three TRUE European Legume Innovation Networks (ELINs).

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