



D1.8 – Update and testing of the decision support tool (DSS)

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1 Publishable executive summary

Several studies agree on the existence of a considerable amount of land in Europe deemed less favourable for conventional agriculture. This land has been either abandoned because of its productivity, or it is used as grassland. MAGIC is based on the premise that cultivation of selected industrial crops on areas facing natural constraints (e.g. extreme climatic conditions, low soil productivity, steep slope, etc.) can i) ensure the production of resource-efficient feedstocks, with low indirect land-use change (iLUC), for a growing bio-based industry, and ii) increase farmers' incomes through access to new markets and the revalorization of marginal land.

MAGIC Deliverable D1.8 – A second prototype of the decision support tool (DSS) aims to provide the underlying information as required above and generated within the MAGIC project to the various interested stakeholders across Europe. What is new in this second version as compared to the former version is the spatial detail at which the marginal land data are displayed and the inclusion of Ukraine. The marginal land area can now be consulted at the LAU I and II level which is municipal level in most countries, and this is a much more spatially detailed level than the Nuts 2/3 level used in the former prototype versions.

This second prototype will be improved upon in the final version at the end of the project. All three current information platforms (MAGIC-Maps, MAGIC-Crops and the DSS) are currently available in a prototype version at <http://magic-h2020.eu/>.

2 Introduction

The second prototype of the Decision Support System (MAGIC-DSS) has been developed to address the information needs of the MAGIC stakeholders (i.e. industry and farmers). The MAGIC-DSS accesses the spatially explicit database of marginal lands (MAGIC-MAPS) (Task 2.4) which also includes the MAGIC-CROPS (Task 1.2) providing a set of tools for decision support enabling at a minimum the most promising industrial crops at any geo-location in Europe. MAGIC-DSS will also visualize the current and future marginal land in Europe resulting from the mapping exercise (Task 2.4). This information, presented both in tabular and map format, will eventually allow farmers and industry to determine at any marginal land location the optimal selection of crops.

With the final version of the MAGIC-DSS at the end of the project, users will be able to venture beyond the current NUTS3 level to a higher resolution representation of marginal land and associated crops taking account of areas delineated by specific bio-physical characteristics typical for marginal lands. A user needs assessment (farmers and industry) was the first step in the DSS set-up determining its design. The final version of MAGIC-DSS will be built on the accumulation of the data on marginal land (task 2.4) and the MAGIC-CROPS (task 1.2) and will provide more functionalities and interactions to the end-users. The second prototype of the MAGIC Maps, MAGIC Crops and MAGIC DSS is now available on the MAGIC website (Figure 1). At this stage the Magic-Maps have been updated significantly displaying the marginal land at the spatial resolution of LAU 1 and 2 (municipal level) and also including Ukraine, while the DSS has only back-end improvements.

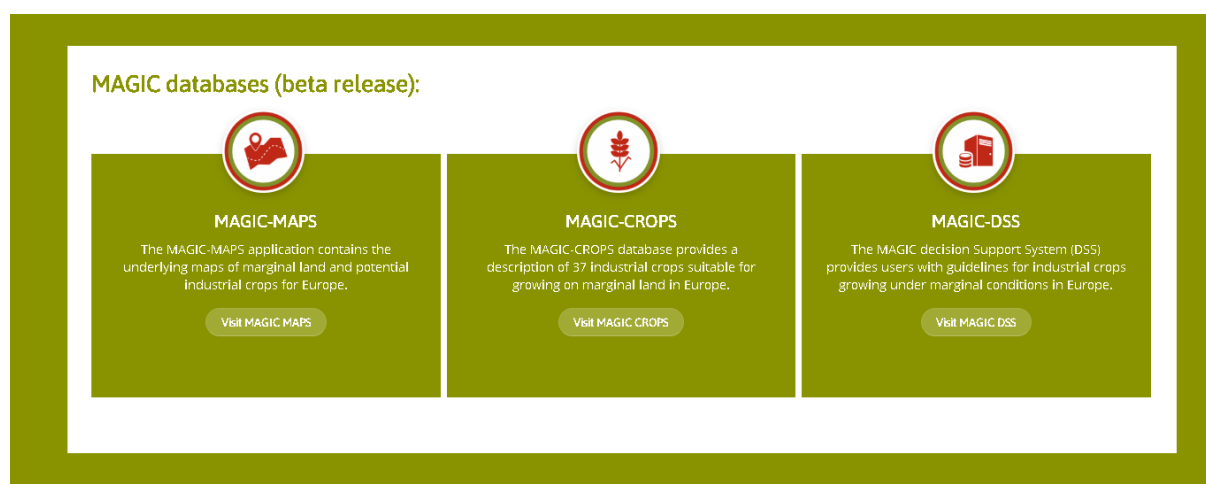


Figure 1: Magic Maps, Crops and DSS on the MAGIC website (<http://magic-h2020.eu/>).

3 Methods

The MAGIC DSS brings together a variety of datasets being developed across the MAGIC project (Figure 2). This includes the MAGIC-Maps, MAGIC-Crops and MAGIC-DSS. Furthermore, a variety of additional datasets are being produced within MAGIC and could potentially linked to the DSS. The following schematic diagram outlines the connection of the various spatial datasets within MAGIC, ultimately feeding into the MAGIC DSS.

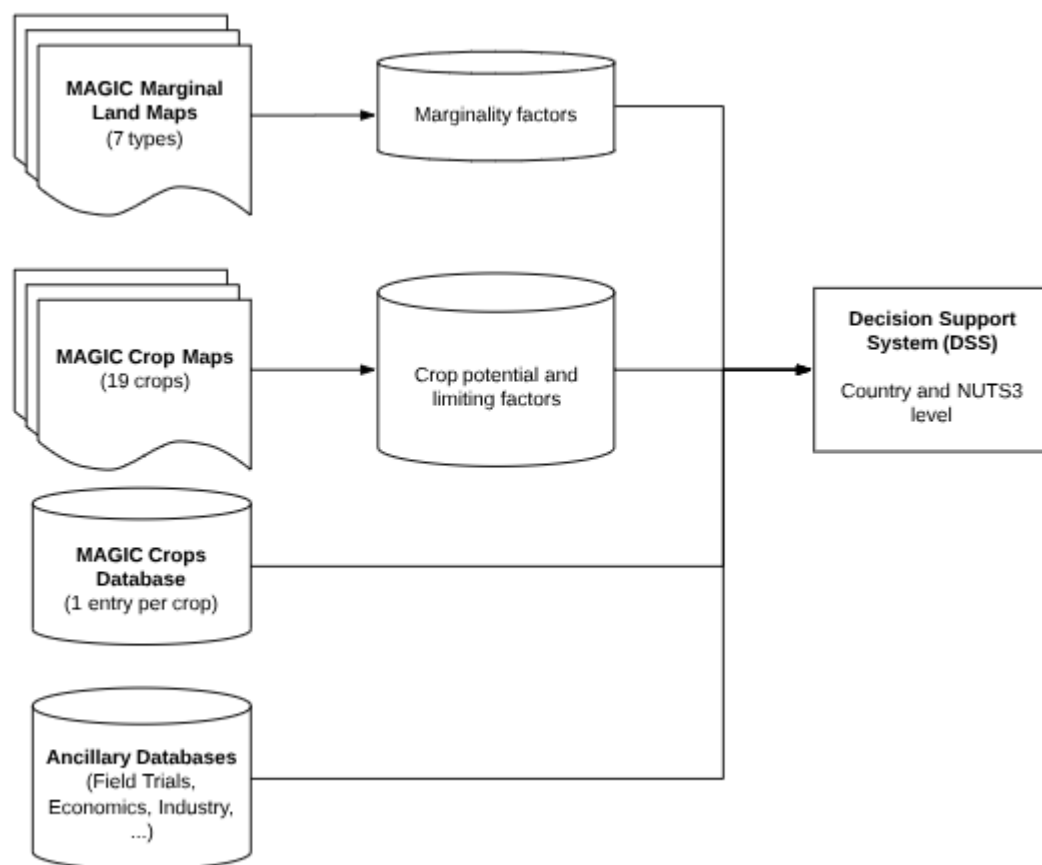


Figure 2 The design of the MAGIC-DSS and related data.

4 Results

4.1 MAGIC Maps

The purpose of MAGIC MAPS is to characterize and analyse projections for current and future marginal lands in Europe facing natural constraints. The elements that were considered in building the classification include biophysical limitations clustered in six main groups. In addition, the resulting marginal land map was further classified according to, land use management, socio-economic limitations, ecosystem services and drivers and pressures influencing the ecosystem functions present. As a result, in total 29% of the agricultural land (i.e. land classified as agricultural by Corine Land Cover since 1992) in the European Union are classified as marginal. The most common limitations are rooting limitations, over 12% of the agricultural area. This is followed by adverse climate and excessive soil moisture occurring in respectively 11% and 8% of the agricultural land.

Further assessments are now made to identify more precisely the current status of land management and abandonment in these marginal lands. This is important information to have as it provides a better understanding of the opportunities to use these marginal lands for industrial crops without competing with food production on these lands. Further characteristics on current and future land use opportunities will be made accessible over the next project years through MAGIC MAPS. MAGIC-Maps provide the basic marginal land mapping by marginal land type. The data has now been updated in terms of spatial resolution, going from the previous NUTS-3 level to the Local Administrative Units (LAU) level.

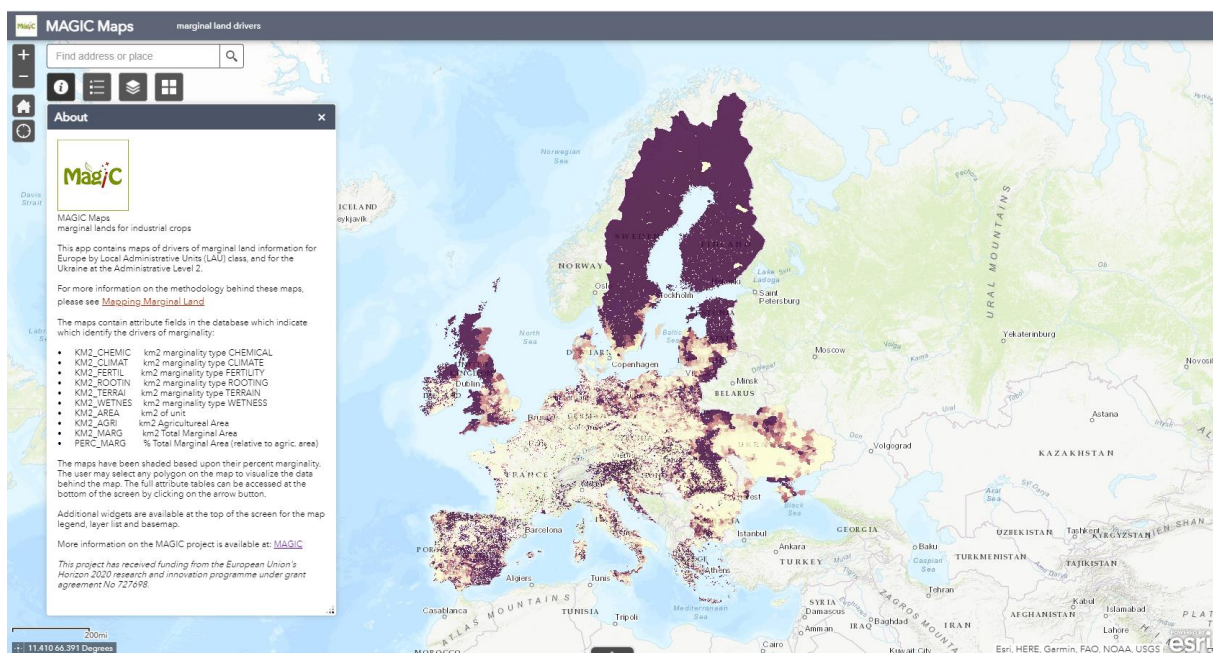
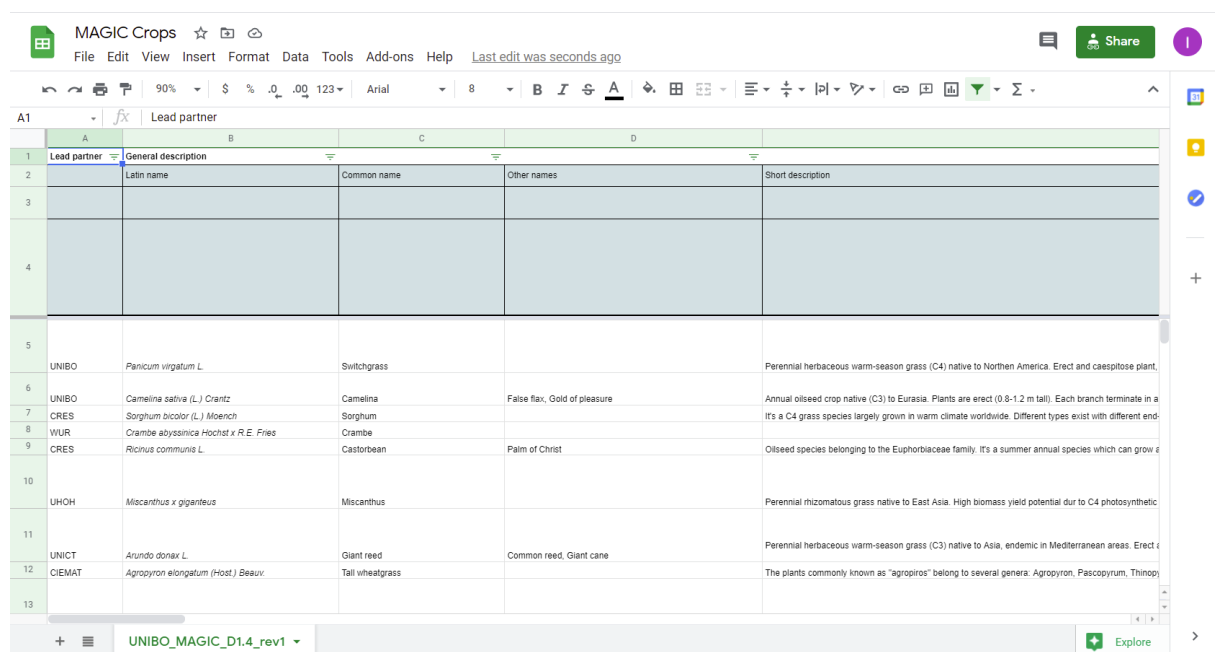


Figure 3 The MAGIC-Maps prototype, LAU version.

4.2 MAGIC Crops

The dataset MAGIC Crops contains information on existing resource-efficient industrial crops suitable for cultivation on different types of marginal land. Industrial crops can broadly be classified into oil, lignocellulosic, carbohydrate or specialty crops. Moreover, MAGIC CROPS provides information on agronomic management, input requirements, yield performance and quality characteristics for end user applications. For this purpose, the results of several long-term field trials with important industrial plants such as Miscanthus, Giant Reed, Reed Canary Grass, Camelina, Hemp and Poplar, which are carried out European-wide under the most important marginal growth conditions, are collected and evaluated in MAGIC. Many of these field trials are still on-going. In addition, the best low-input agricultural cultivation strategies for crop categories such as 'tillage', 'nitrogen fertilization', 'weed control' and 'irrigation' will be identified and made accessible over the next project years through MAGIC CROPS.

The MAGIC-Crops database is made available via an online sheet. This allows for simple viewing and querying of the database, along with downloading and commenting. We are currently in the process of adding representative crop photos to the database. Finally this dataset will be linked to the spatial MAGIC-Maps and be available via the DSS.



The screenshot shows a Google Sheet titled 'MAGIC Crops'. The sheet has a table with the following columns: A1 (Lead partner), B (General description), C (Common name), D (Other names), and E (Short description). The table contains data for various crops, including Panicum virgatum L., Camelina sativa (L.) Orantz, Sorghum bicolor (L.) Moench, Crambe abyssinica Hochst x R.E. Fries, Ricinus communis L., Miscanthus x giganteus, Arundo donax L., and Agropyron elongatum (Host.) Beauv.

A1	Lead partner	B	C	D	E
1	Lead partner	General description	Common name	Other names	Short description
2		Latin name	Common name	Other names	Short description
3					
4					
5	UNIBO	Panicum virgatum L.	Switchgrass		Perennial herbaceous warm-season grass (C4) native to Northern America. Erect and caespitose plant.
6	UNIBO	Camelina sativa (L.) Orantz	Camelina	False flax, Gold of pleasure	Annual oilseed crop native (C3) to Eurasia. Plants are erect (0.8-1.2 m tall). Each branch terminate in a
7	CRES	Sorghum bicolor (L.) Moench	Sorghum		It's a C4 grass species largely grown in warm climate worldwide. Different types exist with different end-
8	WUR	Crambe abyssinica Hochst x R.E. Fries	Crambe		
9	CRES	Ricinus communis L.	Castorbean	Palm of Christ	Oilseed species belonging to the Euphorbiaceae family. It's a summer annual species which can grow a
10	UHOH	Miscanthus x giganteus	Miscanthus		Perennial rhizomatous grass native to East Asia. High biomass yield potential due to C4 photosynthetic
11	UNICT	Arundo donax L.	Giant reed	Common reed, Giant cane	Perennial herbaceous warm-season grass (C3) native to Asia, endemic in Mediterranean areas. Erect
12	CIEMAT	Agropyron elongatum (Host.) Beauv.	Tall wheatgrass		The plants commonly known as "agropyros" belong to several genera: Agropyron, Pascopyrum, Thinopy
13					

Figure 4 The MAGIC-Crops database.

4.3 DSS

The MAGIC Decision Support System is a culmination of the entire MAGIC information system, and contains the information on the marginal land, marginal crops and related information. The prototype has been developed taking into consideration the feedback from the initial survey, along with experience gained from past projects and previous developed systems.

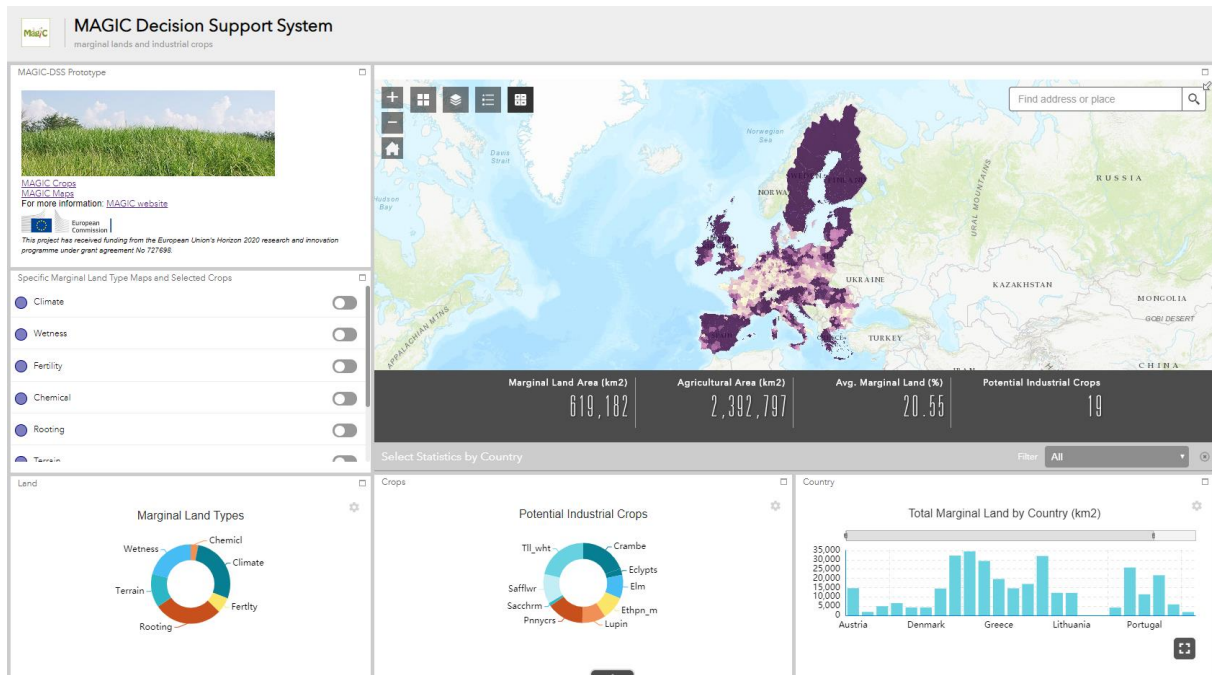


Figure 5 The MAGIC DSS prototype.

The MAGIC DSS combines all MAGIC datasets and is designed to allow practitioners, policy-makers and the general public to gain access to information about marginal land and potential industrial crops across Europe. Information is provided at the NUTS3 administrative level in this version. On the map, users can visualize the proportion of marginal land that is estimated to occur within each administrative unit and the main factors determining the marginal conditions. The individual marginal land types are depicted on a graph, as are the potential industrial crops and the amount of marginal land by country. As users explore the map, zooming in and out or select features, the graphs are updated in real-time. Clicking on any administrative unit on the map exposes the full database, which is also available for download. It is also possible to change the underlying base map to add for example satellite imagery. Additional features and an increase in information is planned for the future and all feedback are welcome.

4.4 Update and Testing

The MAGIC DSS and related data has been online for over one year and has been widely shared and advertised via MAGIC's partners and stakeholders. In addition, the Project has generated press releases and advertised the results online via a variety of channels including via conferences, webinars and online newsgroups. Based on this variety of feedback, a number of suggestions were received for improvements to the various online portals. These include but are not limited to: adding download capabilities for all datasets (including spatial data), high-quality photos to accompany the various marginal crops, improved meta-data to accompany the MAGIC Crops database online, yield information to accompany both the MAGIC Crops data and the spatial maps and more. We are in the process of updating the various portals online and as various components are ready for public consumption they will be placed online.

5 Conclusion

The MAGIC-Maps, MAGIC-Crops and MAGIC-DSS have been produced in a prototype version and placed on the MAGIC website (<http://magic-h2020.eu/>). Testing and improvement is ongoing and new data will be added as it comes in. A final version will be produced and available online at the end of the project.