



SUPER-G

SUSTAINABLE PERMANENT GRASSLAND

Deliverable 5.1

Review of existing tools available for use on permanent grassland

FINAL

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Dissemination Level

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1 Introduction

1.1 Aims and objectives

Work Package 5 (WP5) of the SUPER-G project will develop Decision Support Tools (DSTs) to assist farmers and policy makers to assess Ecosystem Service (ES) provision on Permanent Grassland (PG). Within WP5, the overall aim of Task 5.1 (this task) was to undertake a survey and review of existing DSTs used by farmers, advisors, policy makers and others to support any aspect of permanent grassland management within Europe. Based on this, the review has identified key gaps (geographical, sectorial and thematic) currently lacking in DSTs for the biogeographic regions and farming systems. The review will be used to inform the development of farm-level (Task 5.4) and policy level (task 5.6) tools to support profitable and sustainable PG systems.

1.2 Definitions and scope

Decision support tools are designed to help users make more effective decisions. This is usually achieved by guiding the user through one or more decision stages and then, based on this, providing information or guidance specific to the user.

Decision support tools can be provided in a range of formats. This review has considered any software, spreadsheet or paper-based DSTs that can be used to inform grassland management, based on the following definitions:

- **Paper-based:** a written DST available in hard copy (i.e. book, manual or leaflet) and/or available to view/download on the internet.
- **Spreadsheet:** spreadsheet-based DSTs (i.e. Excel or similar)
- **Software – desk-based:** software which is installed on a computer
- **Software – web-based:** software which requires a web-browser to run.
- **Software – mobile application or ‘app’:** software which runs on a smartphone or tablet.

The review has not included ‘human-based’ DSTs such as farm advisers or workshops/meetings. Although this type of advice and ‘decision support’ can be very effective it is not easily deployed and replicated at a large scale. Decision support tools can help support and supplement, but should not replace, ‘human’ advice and support.

The review has considered DSTs that could be used to inform any aspect of PG management, and includes DSTs targeted specifically at PG as well as other more general DSTs not specific to grassland, for example nutrient management and soil management DSTs are often applicable to grassland and arable cropping.

The review has focussed on defining the range of DSTs available and based on this identifying the key gaps (geographical, sectorial and thematic) currently lacking in DSTs for each biogeographic region and farming system. The review has not considered the usability or uptake of the DSTs, although these factors have been considered in detail in reviews by Rose *et al.*, (2016) (all agricultural DSTs), Bufe *et al.*, (2018) (dairy sector DSTs) and Waterson *et al.*, (2018) (slurry management DSTs).

2 Methods

The SUPER-G project partners worked together to identify relevant DSTs in each of their countries using:

- Their own existing knowledge of grassland DSTs.
- Consultation with relevant national experts to identify other available DSTs.
- Google and web of science searches using the search terms below and (i) Google optimised to return results for each partner country with search terms in English, and (ii) search terms in country own language.

Decision support tool OR Software tool OR Guidance tool OR Guidance software OR Decision support software OR Decision support system OR Decision management system OR Decision assistance tool OR Calculator OR Mobile App*	AND Grass*
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The majority of DSTs included in the review were identified by the project partners based on their own existing knowledge. Google and Web of Science searches were of very limited use in identifying DSTs. Publishing within the scientific literature is likely to only be a priority for DSTs developed by academics/researchers from publicly funded projects and very few of the DSTs identified in this review have been published in the scientific literature. In addition, the search terms used above focused on DSTs targeted at grassland management; however, many of the DSTs identified by the project partners are applicable to all crops and not specifically targeted at grassland.

A proforma template was used to collect information on each of the DSTs including:

- DST provider and funder
- Brief description and relevant links/references
- Date of release and last update
- Main purpose of the DST in terms of ecosystem services
- Target audience and number of users
- Format and cost
- Country of origin, language and whether the DST is specific to a country or region
- Whether the DST is specifically targeted to grassland/permanent grassland management.
- Whether the DST is specifically targeted at particular grassland or livestock management system
- Data input required and the ability of the DST to utilise data from other existing datasets (e.g. weather data, herd/flock data, farm maps, soil analysis/maps etc.).
- Data storage by the DST and ability to export data from the DST

- Ability of the DST to provide benchmarking
- The approach used to generate the outcome from the DST
- The ability of the DST to deliver an impact (e.g. improve efficiency on grass growth/utilisation, reduce input costs, improve net farm profit or improve ES delivery).

The ecosystem service(s) relevant to each DST were identified. The ecosystem services (ES) considered were:

1. Biodiversity and pollination
2. Carbon storage and greenhouse gas (GHG) emission regulation
 - a. Carbon calculator
 - b. Carbon sequestration / storage
3. Flood and erosion control
4. Water quality
5. Landscape and recreation including cultural values
6. Grass for livestock, biomass (bioenergy) and other products
 - a. Nutrient management (including fertilisers and organic manures)
 - b. Grass measurement & short term budgeting
 - c. Whole season/long term modelling or forecasting
 - d. Soil management
 - e. Grass variety selection.

The proforma templates were completed as fully as possible, although it was not possible to collect all the information for every DSTs; this was often the case for charged for DSTs where it was not possible to view the DST without purchasing it. The completed proforma templates are included in Appendix 1.

3 Results and Discussion

The review identified a total of 127 DSTs from 16 countries used by farmers, advisors, policy makers and others to support permanent grassland management in Europe. Information on each of the DSTs is included in Appendix 1.

3.1 DST by country

The SUPER-G project includes 20 project partners from 14 European countries (Table 1 and Figure 1). Partners from 12 countries identified one or more DSTs used for grassland management. Only partners in Slovenia (UL) and Montenegro (UOM) were unable to identify any grassland DST used in their countries.

Because most DSTs included in the review were identified by the project partners based on their own existing knowledge, the list of DSTs reflects the countries participating in this project. The only exceptions were one DST developed in the Ukraine ([Landviewer](#)) which is available in other EU countries and six DSTs from Ireland identified by the project partners in Northern Ireland. In addition, three DSTs originated outside the EU, but are now used within the EU: [Visual Soil Assessment](#) developed in New Zealand, now used globally, [Farmax](#) developed in New Zealand, now used and marketed in the UK and Ireland, and [Agriwebb](#), developed in Australia, now used and marketed in the UK.

The lack of DSTs from other EU countries such as Denmark, Belgium, Norway, Austria and Greece does not necessarily indicate that there are no grassland DSTs in these countries, rather that the project consortium did not have the knowledge/contacts to identify DSTs from these countries. Nevertheless, this review represents a comprehensive overview of the range and type of grassland DSTs in Europe.

The greatest number of DSTs were identified in the UK (29), followed by the Netherlands (21), Czech Republic (14) and France (10). The Atlantic biogeographic region had the greatest number of DSTs (66) and all participating countries in this region identified multiple DSTs. The Continental/Pannonian region included 23 DSTs, although these were mainly from Czech Republic and Germany; only 1 DST was identified in Hungary and 1 in Poland. Project partner MTA ÖK (Hungary) noted that the majority of grassland in Hungary is low or no input semi-natural grassland, and that the only DSTs used by farmers are paper-based books focused on 'nature friendly' grassland management.

There were 16 DSTs identified from Italy and Switzerland in the Alpine biogeographic region, but none from Slovenia within this region. Similarly, there were 10 DSTs identified in Spain and Portugal in the Mediterranean regions, but none from Montenegro.

Although there were only 4 DSTs identified from the Boreal region, there was only one country (Sweden) from this region represented in the project.

All DSTs were assessed as to whether they were specific to (i.e. should only be used in) a particular country or region. 75 (59%) of the DSTs were specific to a particular country or region, often because the tools used data derived from or only relevant to that country or region. The remaining 52 DSTs were not specific to a country or region and therefore could potentially be used outside the country of origin. However, in many

cases language and/or knowledge of the DST effectively restricted use to the country of origin. The DSTs were all available in the language of the country of origin and 14 DSTs were available in more than one language.

Table 1. Number of grassland DSTs by country and biogeographic region

Biogeographic region	Country	SUPER-G Partners	Number of DSTs
Atlantic	France	CRAN, LBM, CRAGE	10
	Netherlands	WR	21
	United Kingdom	ADAS, UNEW, UABDN, AFBI, AgriSearch	29
	Ireland	<i>None</i>	6
	Total		66
Boreal	Sweden	SLU	4
	Total		4
Continental/ Pannonian	Czech Republic	MENDU	14
	Germany	UGOE	7
	Hungary	MTA ÖK	1
	Poland	WULS	1
	Ukraine	<i>None</i>	1
	Total		23
Alpine	Italy	UNITO	9
	Slovenia	UL	0
	Switzerland	ETHZ	7
	Total		16
Mediterranean	Montenegro	UOM	0
	Portugal	CONSULAI	2
	Spain	UCO	8
	Total		10
Other	EU	All	4
	Australia	<i>None</i>	1
	New Zealand	<i>None</i>	2

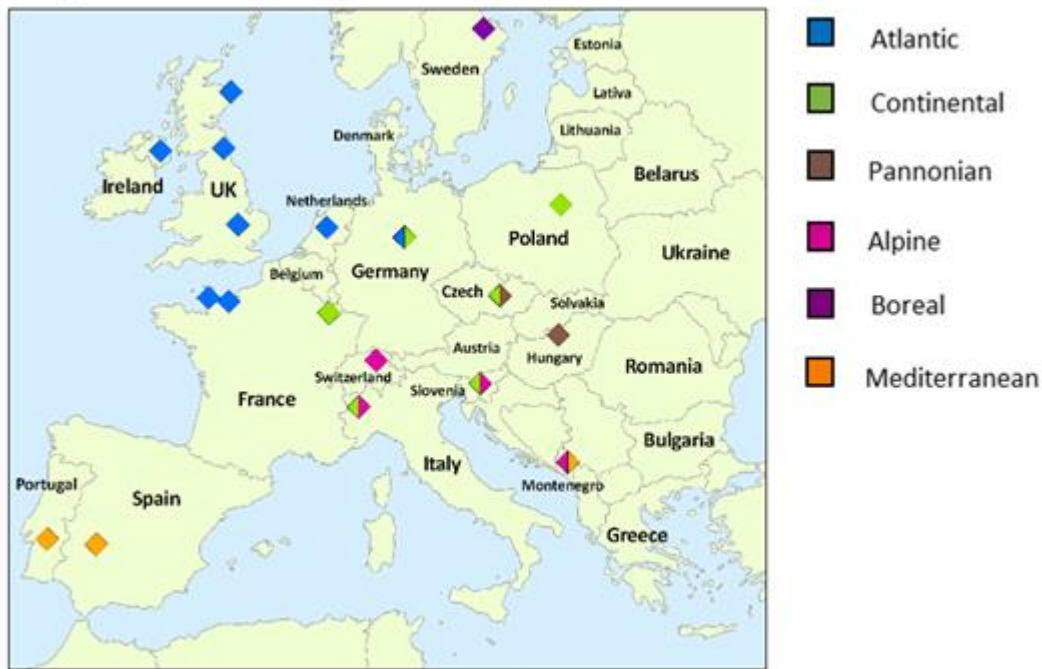


Figure 1. SUPER-G project partners by biogeographic region

3.2 DST by format

Over half of the DSTs (71 DSTs 56%) identified were available with at least one software element (e.g. desk-based program, web-based program or mobile app), with web-based tools the most common software format (Table 2). 55 of the DSTs (44%) were the more ‘traditional’ paper-based tools, although of these, 51 (>90%) were available to download from the internet, increasing their ease of accessibility. Eleven DSTs were spreadsheet-based tools; all of which were excel tools available to download from the internet. Four DSTs were ‘physical’ tools; three included a pasture ruler ([Herbomètre](#)) or plate meter ([Grasshopper](#) and [Spring rotation planner](#)) as part of a grass budgeting DST and one included GPS livestock collar ([Digitanimal](#)) to monitor grazing by animal location.

Table 2. Number of DST by format

DST Format	Number of DSTs
Paper-based	55
Spreadsheet based	11
Desk-based software	22
Web-based software	44
Mobile ‘apps’	25
Physical tools	4

Twenty-nine of the DSTs were available in more than one format. Eleven DSTs were available in both web-based and mobile app format, 5 DST were available in both desk-based and web-based format and 6 DSTs were available in paper-based and software format. Five DSTs were available in three formats:

- [Recommended grass and clover lists](#) (UK) is available in web-based, paper-based and spreadsheet format.
- [Grasshopper](#) (Ireland) is available in desk-based and mobile 'app' format with a linked 'physical' tool.
- [AgroBI](#) and [ISAMARGEM](#) (Portugal) are available as desk-based, web-based and mobile 'app' format.
- [Digitanimal](#) (Spain) is available in desk-based and mobile 'app' format with a linked 'physical' tool.

Tools that provided “Biodiversity and pollination” and “Landscape and recreation” services were primarily produced in paper-based formats. Whereas tools providing other ES were represented largely by one or more types of software.

A key advantage of software-based DSTs is the ability to save and store data. This can speed up the decision-making process as information only needs to be entered once and also means that the tool is a record keeping as well as decision support tool. Furthermore, the use of web-based tools enables sharing and 'pooling' of data which can be used to improve the decision-making process as decisions can be made based on a larger data set, for example:

- [GrassCheck](#) (Ireland and UK) records grass growth information from farms in Ireland and UK and uses this data to provide grass growth rate forecasts to the industry in weekly bulletins.
- [PastureBase Ireland](#) is a web-based grassland management application which incorporates a dual function of grassland decision support and a centralized national database to collate commercial farm grassland data. This database facilitates the collection and storage of vast quantities of grassland data from grassland farmers (Hanrahan *et al.*, 2017).

3.3 DST by ecosystem services

In order to understand the purpose of the DST, the DSTs were ranked based on the ES they provide. Some DSTs target one main ecosystem service. Others target more than one. Where a DST covers more than one ecosystem service, they were ranked the order of importance. Although in some cases the ES targeted were considered of equal importance and ranked equally.

Eighty-seven of the DSTs targeted only one of the ES. Twenty-three DSTs targeted two ES. Thirteen DSTs targeted 3 ES. One DST targeted four ES. Two DSTs targeted 5 ES. One DST targeted all 6 ES.

Table 3 lists the number of DSTs addressing each ecosystem and Table 4 lists the number of DSTs by country and ecosystem service.

Table 3. Ecosystem services and number of DSTs addressing each ecosystem service

Ecosystem service		Number of DSTs
Number	Description	
1	Biodiversity and pollination	22
2	Carbon storage and GHG	8
3	Flood and erosion control	9
4	Water quality	18
5	Landscape and recreation including cultural value	20
6	Grass for livestock, biomass, bioenergy and other products	115

Table 4. Number of grassland DSTs by country and ecosystem service

Biogeographic region	Country	Ecosystem service					
		1 B&P ¹	2 Carbon	3 Flood	4 WQ ²	5 Landscape	6 Production
Atlantic	France						10
	Netherlands		1		2		20
	UK	2	3	1	8		24
	Ireland						6
Boreal	Sweden						4
Continental/ Pannonian	Czech Republic	5	2	2	3	7	10
	Germany				1		7
	Hungary						1
	Poland						1
	Ukraine						1
Alpine	Italy	7	1	2		9	7
	Slovenia						
	Switzerland	3		1	2	1	7
Mediterranean	Montenegro						
	Portugal						2
	Spain	2		1			8
Other	EU	2	1	1	1	2	3
	Australia						1
	NZ			1	1		2

¹ Biodiversity & Polination

² Water Quality

3.3.1 Biodiversity and pollination

Twenty-two of the DSTs (17%) targeted the “Biodiversity and pollination” ecosystem service; 11 of these had this ecosystem service as a primary focus of the DST and the remainder had it as a secondary focus. These included DSTs from UK (2), Czech Republic (5), Italy (7), Switzerland (3), Spain (2) and EU (2).

The majority of the “Biodiversity and pollination” DSTs were paper-based guidance documents (20 of the 22 DSTs) focusing on the management of grassland to enhance and preserve biodiversity, for example:

- [Metodické pokyny k ekologické obnově travních porostů](#) (Czech Republic) provides guidance on the restoration of species-rich grasslands.
- [Manuale pratico per la raccolta di seme e il restauro ecologico delle praterie ricche di specie](#) (Italy) provides guidance for seed-harvesting and restoration of species-rich grasslands

3.3.2 Carbon storage and greenhouse gases

Eight of the DSTs (6%) targeted the “Carbon storage and greenhouse gases” ecosystem service; 6 of these had this ecosystem service as a primary focus of the DST and 2 had it as a secondary focus. These included DSTs from the Netherlands (1), UK (3), Czech Republic (2), Italy (1) and the EU (1).

Five of the eight “Carbon storage and greenhouse gases” DST were software based. These included 3 web-based calculators, a web-based model and online mapping tool:

- [Kringloopwijzer](#) (Netherlands) – nutrient budget calculator.
- [AHDB Environmental and Agricultural Resource Efficiency Tool \(EAgRET\)](#) (UK) – farm emissions calculator.
- [Cool Farm Tool](#) (UK, used worldwide) – greenhouse gas calculator.
- [ECOSSE model](#) (UK) – soil carbon and nitrogen model.
- [NaturEtrade](#) (UK) – web-based mapping tool that assesses the ecological potential of land in terms of the ES that it provides.

The 3 paper-based DSTs provided guidelines on grassland management and have “Carbon storage and greenhouse gases” as a secondary focus.

3.3.3 Flood and erosion control

Nine of the DSTs (7%) targeted the “Flood and erosion control” ecosystem service; 4 of these had this ecosystem service as a primary focus of the DST and the remainder had it as a secondary focus. These included DSTs from the UK (1), Czech Republic (2), Italy (2), Switzerland (1), Spain (1), the EU (1) and New Zealand (1).

Three of these DST focused on soil erosion/management:

- [PROTIEROZNÍ KALKULAČKA](#) (Czech Republic) – soil erosion calculator.
- [Think soils](#) (UK) – guidelines and assessing and management soils.
- [Visual Soil Assessment](#) (New Zealand, used worldwide) – guidelines on assessing soil structure and reducing the risk of soil erosion.

The [NaturEtrade](#) (EU) DST is a web-based tool for mapping a range of ES. The other five DSTs provided more general guidelines on good grassland management, which can be linked to reducing the risk of flooding and erosion.

3.3.4 Water quality

Eighteen of the DSTs (14%) targeted the “Water quality” ecosystem service; 7 of these had this ecosystem service as a primary focus of the DST and the remainder had it as a secondary focus. These included DSTs from the Netherlands (2), UK (8), Czech Republic (3), Germany (1), Switzerland (2), the EU (1) and New Zealand (1).

Two were software-based DSTs that calculate the risk of diffuse water pollution from farms: [BedrijfsWaterWijzer](#) (the Netherlands) and [Farmscoper](#) (UK).

Five were nutrient balance/budget calculators. These DSTs help support measures to reduce farm nutrient surpluses and in turn reduce the risk of nutrient losses to water:

- [Balance živin \(Farm Nutrient Balance\)](#) (Czech Republic).
- [Kringloopwijzer - annual nutrient cycling assessment \(ANCA\)](#) (the Netherlands).
- [N max for grassland calculator](#) (Northern Ireland).
- [Nitrogen loading calculator](#) (Northern Ireland).
- [Phosphorus balance calculator](#) (Northern Ireland).

Four of the DSTs provided fertiliser recommendations/guidance. Like the farm nutrient balance/budget DSTs, these DSTs support good nutrient management and in turn reduce the risk of nutrient losses to water:

- [GRUD 2017 – Fertilisation recommendations \(Düngung von Grasland\)](#) (Switzerland).
- [Crop Nutrient Recommendation Calculator](#) (Northern Ireland).
- [Grassland temperature sum guidance for fertiliser application \(Beratungsmodul Grünlandtemperatursumme GTS\)](#) (Germany).
- [Swiss Grassland Society information sheets](#) (Switzerland).

Three of the DST focused on soil erosion/management and target both the “Flood and erosion control” and “Water quality” ES (see Section 3.3.3). Of the remaining four DSTs in this ecosystem service, three were software based tools, which included a water quality component (but not as the primary focus) ([Cool Farm Tool](#), [EAgRET](#) and [NaturEtrade](#)), and one provided guidance on grassland management, which was indirectly linked to water quality ([Přísevy jetelovin a trav do trvalých travních porostů](#)).

3.3.5 Cultural value including landscape aesthetics and recreation

Twenty of the DSTs (16%) targeted the “Cultural value” ecosystem service; 8 of these had this ecosystem service as a primary focus of the DST and the remainder had it as a secondary focus. These included DSTs from the Czech Republic (7), Italy (9), Switzerland (1) and the EU (2).

The majority of the “Cultural value” DSTs were paper-based guidance documents (19 of the 20 DSTs) focusing on the management of grasslands in areas of high landscape value. The majority (16 of the 20 DSTs) targeted both the “Biodiversity and pollination” and “Landscape and recreation” ES; a reflection of the fact that measures to enhance biodiversity will also benefit its landscape value.

Eleven of the DSTs provided guidance that is ‘region’ specific including all of the DSTs from Italy in this category, for example:

- [Linee guida per la disciplina delle attività di pascolo nel Parco Nazionale Gran Sasso - Monti della Laga](#) (Italy) provides guidelines for grazing activities in the Gran Sasso Monti della Laga National Park
- [I tipi pastorali delle Alpi piemontesi](#) (Italy) provides guidelines on grassland management in Piedmont Alps region of Italy.

3.3.6 Grass for livestock, biomass, bioenergy and other products

The majority of DSTs (115 o 127, 91%) targeted the “Grass for livestock, biomass, bioenergy and other products” ecosystem service; 109 of these had this ecosystem service as a primary focus of the DST and the remainder had it as a secondary focus. Decision support tools in this category provided guidance/support on how to increase grass production. All countries that provided information on DSTs included DSTs in this ecosystem service category.

Decision support tools in this ecosystem service were sub-categorized according to the type of grass production guidance/support they provided (Table 5). Most DSTs in this ecosystem service provided guidance on nutrient management (44 DSTs) and/or grass measurement and short-term budgeting (34 DSTs). Fifty of the DSTs provided guidance relevant to more than one of these sub-categories.

Table 5. Grass for livestock, biomass, bioenergy and other products – ecosystem sub-categories

Grass production ecosystem service sub-category	Number of DST
Nutrient management (including fertilisers and organic manures)	44
Grass measurement & short term budgeting	34
Whole season/long term modelling or forecasting	18
Soil management	21
Grass variety selection	19

The **nutrient management** DSTs provide recommendations or guidance on the application of fertiliser and/or manures. Nineteen of the 44 DSTs targeted ‘All crops’ including national fertiliser recommendations such as the [AHDB Nutrient Management Guide](#) (UK), [Teagasc Green Book](#) (Ireland) and [GRUD 2017 Fertiliser Recommendations](#) (Switzerland). Other DSTs in this category can be used to help manage nutrients supplied by organic manures (for example [MANNER-NPK](#) and [Farm Crap App](#) from the UK, and [Excretiewijzer](#) and [CowVision Grond&Gewas Fertilization Planner](#) from the Netherlands) or used to calculate nutrient budgets/balances (for example [Phosphorus balance calculator](#) from Northern Ireland)

The majority of the **grass measurement & short-term budgeting** DSTs either provide guidance on grass utilization and/or calculate available grass from plate meter or grass height measurements. For example, [Herbomètre](#) and [PaturNet](#) from France, [Grip op Gras](#) from the Netherlands, [AHDB feed budget planner](#) from the UK and [Grasshopper](#) from Ireland all calculate available grass from grass cover measurements entered by the user. This sub-category also included DSTs which provide regular updates on grass growth/quality from a monitoring network, including [GrassCheck](#) (UK), [Grassland maturity monitoring \(Grünlandreifepfung\)](#) (Germany) and [Gras Monitor](#) (NL). The

majority of **whole season/long term modeling or forecasting** DSTs were also within the “grass measurement and short-term budgeting” category, with most designed to calculate available grass over the season.

Four of the **Soil management** DSTs were targeted specifically at soil management/assessment ([Healthy Grassland Soils](#), [Think Soils](#) and [Visual Evaluation of Soil Structure](#) from the UK and [Visual Soil Assessment](#) from New Zealand). The remainder provide more general grassland/nutrient management guidelines including soil management.

Six of the **grass variety selection** DSTs provide information on grass varieties/mixtures: [HerbeBook](#) (France), [Recommended grass & clover lists for England and Wales](#), [Pasture Profit Index](#) (Ireland), [Přehled vlastností odrůd trav a jetelovin](#) (List of recommended varieties of grasses and legumes) (Czech Republic), [Seed mixtures with quality label](#) (Qualitäts-Standard-Mischung für Grünland, QSM) (Germany) and [Standardmischungen für den Futterbau](#) (standard mixtures for forage production) (Switzerland). The remainder provide more general information on over-sowing or management of different sward mixes.

3.4 DST by end user

The majority of DST were targeted at farmers (124) and/or advisors (102). All of the DSTs that targeted advisors also targeted farmers; none of the DST were advisor only tools.

Twenty of the DSTs included policy makers in the target audience, however only two of the DSTs targeted just policy makers ([Farmscoper](#) and [EAgRET](#) from the UK). All the other DSTs that targeted policy makers, also targeted farmers and/or advisors; these generally included tools where the advice/guidance is primarily focused at farmers, but is also of relevance to policy makers, for example nutrient management planning tools such as the [Nutrient Management Guide](#) (UK) and [Teagasc Green Book](#) (Ireland).

3.5 DSTs by crop type

Of the 127 DSTs, 46 were relevant to ‘all crops’ – these include tools such as nutrient management planning or soil management tools that are relevant to and used for both arable and grassland cropping. Sixty four DSTs were relevant to ‘all grassland’ including both permanent and temporary grassland.

Only 13 of the DSTs were assessed as relevant to permanent grassland only; 2 from Czech Republic, 1 from Hungary, 7 from Italy, 2 from Spain and 1 EU-wide tool. Six of these tools provided guidance on grassland management in specific regions (5 in Italy and 1 in Spain) and their relevance to permanent grassland reflects the prevalence of permanent grassland within those regions. Only one of the tools specifically mentions ‘permanent grassland’ ([Linee guida mantenimento prati permanenti](#) - Guidance document on the implementation by member states of permanent grassland provisions in the context of the payment for agricultural practices).

3.6 Cost of DSTs

Ninety-eight (77%) of the DSTs were free or had a free version available. Use of the remaining DSTs incurred a charge. A number of the commercial farm management software packages had a monthly or annual subscription cost.



3.7 Number of users

Information on the number of users was not available for most of the DSTs. This information was usually only available if one of the project partners was involved in the development of the tool and so had access to this information, or if the DST developer was willing to share this information. Of the DSTs where this information was available, four have more than 10,000 'users' including the [PLANET](#) nutrient management tool (18,000 users) and the [Better Returns](#), [Forage for knowledge](#) and [GrassCheck](#) newsletters distributed to 25,000, 11,000 and 10,000 people respectively.

In some countries the need to record information to assess and demonstrate compliance with regulations is an important factor encouraging use of DST. For example, demonstrating compliance with EU Nitrates Regulations is an important factor encouraging use of DSTs such as [PLANET](#) in England, Wales & Scotland, [Crop Nutrient Recommendation Calculator](#) in Northern Ireland and [Perceelverdeler](#) in the Netherlands.

3.8 Gaps

- The review identified the uneven distribution in the availability of grassland DSTs across Europe. Most DSTs were identified in the Atlantic biogeographic region in France, the Netherlands, UK and Ireland. In contrast, Hungary, Poland, Slovenia, and Montenegro all had two or fewer DSTs.
- Most DSTs were targeted at grass production and all of the countries that identified DSTs included DSTs in the grass production 'ecosystem service'. In contrast, far fewer of the DSTs address the other ES, and in many cases, countries had no DSTs addressing one or more of the other ES. For example the review included 21 DSTs from the Netherlands, and of these 21 targeted the 'grass production' ecosystem service, two targeted 'water quality' and one targeted 'carbon storage and GHG'; there were no DSTs addressing the 'biodiversity and pollination', 'flood and erosion control' or 'landscape and recreation' ES.
- Most of the DSTs targeted only one of the ES (usually grass production). This highlights an opportunity to expand the remit of existing DSTs to consider other ES and this could be particularly effective for DSTs with an existing user base.
- Most DSTs were aimed at farmers and advisors as the end user. The review only identified one DST targeted specifically at policy makers.

4 References

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Appendices


List of tools

Number	Tool name	Country/region
1	Chronopature	France
2	Date N Prarie	France
3	GrassMan	France
4	Herb'avenir	France
5	HerbeBook	France
6	Herbomètre	France
7	Herdect	France
8	Pature Plan	France
9	PaturNet	France
10	Smart Grazing	France
11	Agro weatherapp	The Netherlands
12	AgroMineraal	The Netherlands
13	Akkerweb	The Netherlands
14	Barenbrug Graslandapp	The Netherlands
15	BedrijfsWaterWijzer	The Netherlands
16	Berekeningssignaal	The Netherlands
17	Boerenbunder	The Netherlands
18	CowVision Grond&Gewas Fertilization Planner	The Netherlands
19	Excretiewijzer	The Netherlands
20	Gras Monitor	The Netherlands
21	Grascheck	The Netherlands
22	Grasland APK	The Netherlands
23	GraslandGebruiksWijzer	The Netherlands
24	Graslandkompas	The Netherlands
25	Grip op Gras	The Netherlands
26	Kringloopwijzer - annual nutrient cycling assessment (ANCA)	The Netherlands
27	Mestverdelingswijzer	The Netherlands
28	Milieumeetlat	The Netherlands
29	Perceelverdeler	The Netherlands
30	Weidevoerkompass	The Netherlands
31	Yara Grass N	The Netherlands
32	AgLime Lime calculator	UK
33	AHDB Better Returns Programme	UK
34	AHDB Environmental and Agricultural Resource Efficiency Tool (EAgrRET)	UK
35	AHDB feed budget planner	UK
36	AHDB Nutrient Management Guide (RB209)	UK
37	Cool Farm Tool (CFT)	UK
38	Corteva Grassland App	UK
39	Crop Nutrient Recommendation Calculator	UK
40	ECOSSE model	UK
41	Farm crap app	UK

Number	Tool name	Country/region
42	FarmGRAZE	UK
43	Farmscoper	UK
44	Forage for knowledge	UK
45	Gatekeeper	UK
46	Grass SAT by Rezatec	UK
47	GrassCheck	UK
48	Greenlight Grower Management	UK
49	Healthy grassland soils	UK
50	MANNER-NPK	UK
51	N max for grassland calculator	UK
52	Nitrogen loading calculator	UK
53	Phosphate and potash nutrient calculator	UK
54	Phosphorus balance calculator	UK
55	PLANET	UK
56	Recommended grass & clover lists for England and Wales	UK
57	SRUC Technical Notes	UK
58	Think soils	UK
59	Tried and tested	UK
60	Visual Examination of Soil Structure (VESS)	UK
61	AgriNet	Ireland
62	Grasshopper	Ireland
63	Pasture Profit Index	Ireland
64	PastureBase Ireland (PBI)	Ireland
65	Spring Rotation Planner (SRP)	Ireland
66	Teagasc Green Book	Ireland
67	Beteskalendern (Grazing calendar)	Sweden
68	Govfoderkalkylen	Sweden
69	Räknehjälpen	Sweden
70	Vallprognos	Sweden
71	Bilance živin (Farm Nutrient Balance)	The Czech Republic
72	Metodické pokyny k ekologické obnově travních porostů (Methodological instructions to organic restoration of species-rich grasslands)	The Czech Republic
73	Metodika na zlepšení travních porostů v Národním hřebčíně Kladruby nad Labem (Methodology for grasslands improvement utilized by horses)	The Czech Republic
74	Metodika optimalizace Mulčování s ohledem na výskyt fuzárií (Methodology of grasslands mulching optimization with regards to Fusarium fungi occurrence)	The Czech Republic
75	Metody regulace plevelů na trvalých travních porostech (Methods of weed control on permanent grasslands)	The Czech Republic
76	MOŽNOSTI REGULACE ŠIROKOLISTÝCH ŠŤOVÍKŮ V TRAVNÍCH POROSTECH V SYSTÉMU EKOLOGICKÉHO ZEMĚDĚLSTVÍ (Broad-leaved docks control in grasslands within organic farming)	The Czech Republic


Number	Tool name	Country/region
77	OBHOSPODAŘOVÁNÍ TRAVNÍCH POROSTŮ ve vztahu k agro-environmentálním opatřením (Grassland management in relation to Agri-environmental schemes)	The Czech Republic
78	Ověřená technologie produkce osiva kokrhele luštince (<i>Rhynanthus alectorolophus</i> (Scop.) Pollich) (Technology for <i>Rhynanthus alectorolophus</i> seed multiplying)	The Czech Republic
79	Přehled vlastností odrůd trav a jetelovin (List of recommended varieties of grasses and legumes)	The Czech Republic
80	Přísevy jetelovin a trav do trvalých travních porostů (Methodology for grasslands overseeding)	The Czech Republic
81	PŘÍSEVY travních porostů (Grasslands overseeding)	The Czech Republic
82	PROTIEROZNÍ KALKULAČKA (Erosion calculator)	The Czech Republic
83	Trávy jako energetická surovina (Grasses as an energetic raw material)	The Czech Republic
84	Zakládání porostů trav na semeno (Methods of grass stands establishment for seed production)	The Czech Republic
85	Fertiliser recommendations for permanent grassland	Germany
86	Grassland maturity monitoring (Grünlandreifepfung)	Germany
87	Grassland temperature sum guidance for fertiliser application (Beratungsmodul Grünlandtemperatursumme GTS)	Germany
88	Grünland-Online	Germany
89	Hinweisdienst Grünland	Germany
90	Riswick pasture planner (Riswicker Weideplaner)	Germany
91	Seed mixtures with quality label (Qualitäts-Standard-Mischung für Grünland, QSM)	Germany
92	Természetkímélő gyepgazdálkodás c. könyv (Conservation grass management)	Hungary
93	Kalkulator porównawczy Nowy zasiew (Grassland renovation calculator)	Poland
94	Landviewer	Ukraine/USA
95	Azioni di conservazione LIFE RICOPRI - Ripristino e conservazione delle praterie aride dell'Italia centrale e meridionale	Italy
96	I tipi pastorali delle Alpi piemontesi	Italy
97	Linee Guida Nazionali Di Produzione Integrata 2020	Italy
98	Linee guida per la disciplina delle attività di pascolo nel Parco Nazionale Gran Sasso - Monti della Laga	Italy
99	Linee guida per la gestione degli habitat di interesse comunitario in Trentino	Italy
100	Linee guida per la gestione dei pascoli a Nardo	Italy
101	Linee guida per la gestione delle aree pascolive del Parco Nazionale d'Abruzzo, Lazio e Molise	Italy
102	Manuale pratico per la raccolta di seme e il restauro ecologico delle praterie ricche di specie	Italy

Number	Tool name	Country/region
103	WebGras	Italy
104	Feedbase – The Swiss Feed Database	Switzerland
105	GRUD 2017 – Fertilisation recommendations (Düngung von Grasland)	Switzerland
106	L'enquête stades phénologiques des prairies (Phenological stages of grasslands in Western Switzerland)	Switzerland
107	Standardmischungen für den Futterbau (standard mixtures for forage production)	Switzerland
108	Swiss Grassland Society information sheets	Switzerland
109	Water vole radar (AGFF Schermausradar)	Switzerland
110	Wiesengräser: Grass species determination App	Switzerland
111	AgroBI	Portugal
112	ISAMARGEM	Portugal
113	Digitanimal	Spain
114	Forage-SAFE	Spain
115	Guideline book "Gestión de los pastos en la dehesa"	Spain
116	Mejora de pastos de secano en Extremadura	Spain
117	Red RIA	Spain
118	Redalan DoVIVO	Spain
119	Servifapa	Spain
120	SIA UCO	Spain
121	Grazemore	EU
122	JRC MARS Explorer	EU
123	Linee guida mantenimento prati permanenti	EU
124	NaturEtrade	EU
125	Agriwebb	Australia
126	Farmax	New Zealand
127	Visual Soil Assessment	New Zealand

DST 1 Chronopature SUPER-G partner: France Chambre Regionale D'agriculture De Normandie		
DST provider	Adventiel	
Funder	Commercial tool developed by Adventiel	
Brief description	Chronopature measures the time spent grazing by cattle. The cattle are fitted with a GPS collar. Data is collected remotely, and farmers are provided with data on grazing time. The application records grazing time of the herd, location of the grazing area, and calculates the associated grazing areas. This system is useful to provide information on grazing days which is required for various farm quality labels, such as AOC ('Pasture milk') certification.	
Links and references	Chronopature	
Date of first release	In development	
Last update	2020	
Main purpose (ecosystem service)	6. Grass for livestock, biomass (bioenergy) and other products	
Main purpose	Calculates cattle herd grazing time	
Target audience	Farmers	
Format	Software – mobile application 'app'	
Cost/availability	Unknown (tool in development)	
Number of users	None, tool currently in development	
Country of origin	France	
Is it country or region specific?	Not specific to a particular country. Developed and manufactured in France.	
Language	French	
Is the tool specifically targeted to permanent grassland?	All grassland types.	
Grassland and livestock management	Grazing cattle	
Data input required for the DST	The GPS collar sensor measures grazing time and this information is used to calculate grazing time	
Use of data from other existing datasets	Data from GPS collar	
Data export	Unknown (tool in development)	
Data storage	Unknown (tool in development)	
Benchmarking	No	
Ability of the DST to deliver an impact	Tool helps farmers to provide information on grazing time which is required for various quality labels.	
Approach used to generate the outcome from the DST and degree of user interaction	Data from GPS collar is used to calculate grazing time.	


<p>Additional comments</p>	<p>A number of processors (dairies, slaughterhouses etc.) now specify a minimum time for cattle spent at pasture/grazing. Most farmers keep a paper pasture book to record this information. The Chronopature is a digital solution which records this information and removes the need for a paper record – bringing advantages to both the farmer and processors. For the operators of the sector, this solution offers a guarantee of pasture time, which can be used for the labeling of milk (local pasture, hay milk, compliance with regulations, collection areas).</p>
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DST 2 Date N Prairie SUPER-G partner: France Chambre Regionale D'agriculture De Normandie		
DST provider	Arvalis	
Funder	Arvalis	
Brief description	This tool is specific to France and evaluates the optimal date for the first nitrogen fertilisation. The tool calculates the cumulative temperature since January 1 st . It predicts when this will reach 200°C and this date is recommended for the first N fertilisation.	
Links and references	Date N Prairie	
Date of first release	2009	
Last update	2020	
Main purpose (ecosystem service)	6. Grass for livestock, biomass (bioenergy) and other products <ul style="list-style-type: none"> • Nutrient management (including fertilisers and organic manures) 	
Main purpose	Determine optimal date for first N fertiliser application	
Target audience	Farmers Advisors	
Format	Software – web based	
Cost/availability	Free	
Number of users	Unknown	
Country of origin	France	
Is it country or region specific?	The tool is specific to regions in France (uses regional weather data).	
Language	French	
Is the tool specifically targeted to permanent grassland?	All grassland types	
Grassland and livestock management	Not specific to a particular management system or livestock type.	
Data input required for the DST	Postal code	
Use of data from other existing datasets	Altitude and weather data to calculate cumulative temperatures.	
Data export	No	
Data storage	No	
Benchmarking	No	
Ability of the DST to deliver an impact	Optimal scheduling of the first nitrogen fertilization prevents slowdown in growth and detrimental effects in quality associated with late application as well as losses by volatilization or denitrification associated with early applications.	
Approach used to generate the outcome from the	Predicts the date at which 200°C will have been accumulated for optimal nitrogen application. Users input their postal code only.	


DST and degree of user interaction	
Additional comments	None.



DST 3 GrassMan <i>SUPER-G</i> partner: France Chambre Regionale D'agriculture De Normandie		
DST provider	Mas Seeds, Idele, Jouffray-Drillaud and developer Croisix	
Funder	Idele, Jouffray-Drillaud and MAS Seeds provider	
Brief description	<p>GrassMan's ambition is to simplify and make grassland management more accessible in order to optimize its productivity and its value. Designed as a toolbox for breeders and their technicians, GrassMan includes 6 separate modules focusing on:</p> <ul style="list-style-type: none"> • Grassland species mixes • Identification of species • Fertiliser advice • Weed control • Optimal date of cutting • Forage quality <p>The modules can be used separately or together. GrassMan allows its users to obtain an answer instantly "in the meadow" when the question arises on the choice of species and composition of seedlings, the adjustment of nitrogen fertilization, identification of grassland species, proposals for weed control strategies, recommendations on mowing periods and harvest types, and evaluation of the quality of harvested hays</p>	
Links and references	<ul style="list-style-type: none"> • GrassMan website • Instructional video (in French) 	
Date of first release	2018	
Last update	2018	
Main purpose (ecosystem service)	6. Grass for livestock, biomass (bioenergy) and other products (1 st) <ul style="list-style-type: none"> • Nutrient management 	
Main purpose	Grassland management – including fertiliser, weed management, cutting dates and forage quality	
Target audience	Farmers Advisors	
Format	Software – web based Software – mobile application 'app'	
Cost/availability	Charged for €49/year	
Number of users	500	
Country of origin	France	
Is it country or region specific?	The tool is not specific to France – it can be used in any country, but it is only available in French and is set up with French reference data such as climate & grazing management	
Language	French	
Is the tool specifically targeted to permanent grassland?	All grassland types	
Grassland and livestock management	Not specific to a particular management system or livestock type.	


Data input required for the DST	Selection of plots on maps online
Use of data from other existing datasets	Weather data is imported from international data maps (IBM Monde)
Data export	No
Data storage	No
Benchmarking	No
Ability of the DST to deliver an impact	GrassMan helps farmers to make decisions on fertiliser applications, cutting dates, weed management
Approach used to generate the outcome from the DST and degree of user interaction	Farmers enter type of grassland, fertilization management and objective of production and seeds and fertilization recommendation are given. The optimal date of cutting is proposed based on the weather forecast and forage type.
Additional comments	None

DST 4 Herb'avenir SUPER-G partner: France Chambre Regionale D'agriculture De Normandie		
DST provider	Inra	
Funder	Agrotransfert Bretagne et Inra	
Brief description	Herb'avenir is an excel file which estimate available grazing days. The farmer enters weekly grass growth measurement measurements and information on livestock diet, type of grazing and number of animals.	
Links and references	Herb'avenir	
Date of first release	2005	
Last update	2016	
Main purpose (ecosystem service)	6. Grass for livestock, biomass (bioenergy) and other products <ul style="list-style-type: none"> • Grass measurement & short term budgeting • Whole season/long term modelling or forecasting 	
Main purpose	Estimate grass production and number of grazing days.	
Target audience	Farmers Advisors	
Format	Spreadsheet	
Cost/availability	Free after a training	
Number of users	Unknown (but used more in the west of France)	
Country of origin	France	
Is it country or region specific?	No	
Language	French	
Is the tool specifically targeted to permanent grassland?	All grassland types	
Grassland and livestock management	Targeted at grazing. Developed for dairy farmers, but not specific to the dairy sector.	
Data input required for the DST	Grass heights in each plot, grazing dates, and the type and number of grazing animals.	
Use of data from other existing datasets	No	
Data export	Yes	
Data storage	Yes on excel files	
Benchmarking	No	
Ability of the DST to deliver an impact	Improve efficiency of grass growth/utilisation, reduce input costs and adapt nutrition of livestock	
Approach used to generate the outcome from the DST and degree of user interaction	The tool helps the farmer to estimate grass production. This information can be used to plan grazing and grassland management.	
Additional comments	None	

DST 5 HerbeBook SUPER-G partner: France Chambre Regionale D'agriculture De Normandie		 Herbe-book
DST provider	GNIS	
Funder	Seeds company	
Brief description	Inventory of different varieties and species of grassland. 458 varieties are referenced by different seeds companies. Filters are useful to select the good varieties by grazing management options. Possibility to export data on Excel files. HerbeBook allows comparisons of all listed varieties and species so growers can choose whichever suits their conditions and production targets best.	
Links and references	HerbeBook	
Date of first release	2011	
Last update	2019	
Main purpose (ecosystem service)	6. Grass for livestock, biomass (bioenergy) and other products <ul style="list-style-type: none"> • Grass variety selection 	
Main purpose	Grass variety selection	
Target audience	Farmers	
Format	Software – web based Software – mobile application 'app'	
Cost/availability	Free	
Number of users	Unknown	
Country of origin	France	
Is it country or region specific?	No	
Language	French	
Is the tool specifically targeted to permanent grassland?	All grassland types	
Grassland and livestock management	Not specific to a particular management system or livestock type.	
Data input required for the DST	User chooses the criteria (i.e. grassland type and management) they want to sort by using built in filters.	
Use of data from other existing datasets	None	
Data export	User can export sheets specific to variety or excel files	
Data storage	None	
Benchmarking	The tool compares varieties and different mixes of grass	
Ability of the DST to deliver an impact	Grass variety selection helps users to select the most appropriate varieties for their system.	
Approach used to generate the outcome from the DST and degree of user interaction	Farmers can compare different varieties and their management requirements.	


Additional comments	All the varieties are tested for 3 years before they are added to the HerbeBook
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DST 6 Herbomètre® SUPER-G partner: France Chambre Regionale D'agriculture De Normandie		
DST provider	Arvalis and Aurea	
Funder	Arvalis and Aurea	
Brief description	HerboMETRE® is a tool for measuring grass cover. The height of the grass is interpreted and provides guidance to farmers for stocking rate in paddocks, days of grazing or biomass available.	
Links and references	Product page	
Date of first release	1990	
Last update	2017	
Main purpose (ecosystem service)	6. Grass for livestock, biomass (bioenergy) and other products <ul style="list-style-type: none"> • Grass measurement & short term budgeting 	
Main purpose	Measure grassland and estimate biomass	
Target audience	Farmers Advisors	
Format	Physical tools – pasture meter (ruler and plate meter)	
Cost/availability	Version 1 (ruler) cost 87 € Version 2 (plate meter) 125€ Version 3 (Automatic ultrasound) 870 €	
Number of users	Unknown	
Country of origin	France	
Is it country or region specific?	Not specific to a particular country. Developed and manufactured in France.	
Language	Physical tool; instructions are in French.	
Is the tool specifically targeted to permanent grassland?	All grassland types.	
Grassland and livestock management	Tool is targeted at livestock grazing systems – rotational and paddock grazing rather than set stocking	
Data input required for the DST	Grass measurements (taken using the tool)	
Use of data from other existing datasets	None	
Data export	Data can be downloaded to a PC (from the electronic HerboMetre)	
Data storage	None	
Benchmarking	None	
Ability of the DST to deliver an impact	The tool is used to measure grass covers and can therefore be used to improve the efficiency of grassland utilization.	
Approach used to generate the outcome from the DST and degree of user interaction	On a (usually weekly) basis the farmer/advisor measures the grass covers on his grazing platform and inputs the data onto software. This can either be done through a smart phone or on the computer. The farmer also enters current livestock numbers and expected grass and supplementary / conserved feed intakes. From this the application produces a grazing wedge and a demand line which allows the farmers	

	to assess grass supply against demand over the next couple of weeks and take appropriate action. The user can use the tool to look at the stock available, inform a cutting decision or open new paddocks.
Additional comments	None




DST 7 Herdetect SUPER-G partner: France Chambre Regionale D'agriculture De Normandie		
DST provider	Research project to develop DST	
Funder	CASDAR national subsidies of agricultural ministry	
Brief description	Herdetect is a research project which aims to develop a DST to estimate grass production using satellite data. The objectives are: <ul style="list-style-type: none"> • Develop an innovative and operational grazing management service, automated and in near real time • Analyze the joint use of several remote sensing and ground observation methods and techniques to respond reliably to farmers' needs • Analyze the potentialities and limitations of multi-spectral UAV technology, and those of Sentinel 2A and 2B satellites to restore pasture biomass • Test and evaluate with farmers the advances made possible by these new technologies 	
Links and references	Herdetect project leaflet (in French)	
Date of first release	DST in development	
Last update	DST in development	
Main purpose (ecosystem services)	6. Grass for livestock, biomass (bioenergy) and other products <ul style="list-style-type: none"> • Grass measurement & short term budgeting 	
Main purpose	Measure grassland and estimate biomass by GPS data It is a Casdar project from 2017 to 2020	
Target audience	Farmers Advisors	
Format	<ul style="list-style-type: none"> • Software – mobile application 'app' Note: use of satellite data in a mobile application	
Cost/availability	Unknown (tool in development)	
Number of users	None (tool in development)	
Country of origin	France	
Is it country or region specific?	Specific to France	
Language	French	
Is the tool specifically targeted to permanent grassland?	All grassland types	
Grassland and livestock management	Not specific to a particular management system or livestock type.	
Data input required for the DST	Surface of paddock, number of animals	
Use of data from other existing datasets	No	
Data export	No	

Data storage	Unknown (tool in development)
Benchmarking	No
Ability of the DST to deliver an impact	Improve decision for farmers with a precise estimation of biomass
Approach used to generate the outcome from the DST and degree of user interaction	Use of satellite data to estimate grass biomass (tool in development)
Additional comments	None

DST 8 Pature plan SUPER-G partner: France Chambre Regionale D'agriculture De Normandie		
DST provider	Elvup	
Funder	Elvup and Inra	
Brief description	Software to evaluate quantity of grass available, data input are grass growth, number of animals, gradient of grazing and density; the objective of this tool is to estimate grazing days in future weeks.	
Links and references	Pature plan	
Date of first release	2014	
Last update	2018	
Main purpose (ecosystem service)	6. Grass for livestock, biomass (bioenergy) and other products <ul style="list-style-type: none"> • Grass measurement & short term budgeting • Whole season/long term modelling or forecasting 	
Main purpose	DST to help farmers estimate grass growth and manage their grazing.	
Target audience	Farmers Advisors	
Format	Software – desk based	
Cost/availability	Charged for license 50€/ year and 100 € the first year	
Number of users	Unknown	
Country of origin	France	
Is it country or region specific?	No	
Language	French	
Is the tool specifically targeted to permanent grassland?	All grassland types	
Grassland and livestock management	The tool is targeted for different grazing livestock sectors (e.g. beef, sheep, dairy)	
Data input required for the DST	<ul style="list-style-type: none"> • Type of grassland and plots • Measurements of grassland (height of grass) • Livestock management and number of animals grazing 	
Use of data from other existing datasets	No	
Data export	No	
Data storage	The tool stores data and produces a report with graphs at the end of grazing season.	
Benchmarking	No	
Ability of the DST to deliver an impact	The DST helps farmers to evaluate grass available and calculate grazing requirements for their animals. The farmer is provided with forecasts of grass available for grazing.	
Approach used to generate the outcome from the	Farmer or advisor need to record and input grass height measurements each week in to get graph and estimation of biomass available	


DST and degree of user interaction	
Additional comments	None




DST 9 PaturNet SUPER-G partner: France Chambre Regionale D'agriculture De Normandie		
DST provider	Littoral Normand, Eva Jura	
Funder	Eva Jura	
Brief description	PaturNet is a web and app based grazing calendar, which allows the farmer to record grazing management during the season. The farmer can also record grass measurements to estimate grass production.	
Links and references	PaturNet	
Date of first release	Unknown	
Last update	2019	
Main purpose (ecosystem service)	6. Grass for livestock, biomass (bioenergy) and other products <ul style="list-style-type: none"> • Grass measurement & short term budgeting • Whole season/long term modelling or forecasting 	
Main purpose	Grazing management	
Target audience	Farmers Advisors	
Format	Software – web based Software – mobile application 'app'	
Cost/availability	Charged for software. Cost unknown.	
Number of users	500+ downloads on the GooglePlay store	
Country of origin	France	
Is it country or region specific?	No, but the app is not available to download outside France.	
Language	French	
Is the tool specifically targeted to permanent grassland?	All grassland types	
Grassland and livestock management	Specific to rotational grazing	
Data input required for the DST	Grass height and management of grassland	
Use of data from other existing datasets	No	
Data export	Yes excel files	
Data storage	Yes different grazing season and quantity harvested	
Benchmarking	No	
Ability of the DST to deliver an impact	Improved efficiency of grass growth and grazing	
Approach used to generate the outcome from the DST and degree of user interaction	Farmer enters details of grazing management and grass measurements. The tool helps the farmer plan their grass utilization.	


Additional comments	The tool was first tested in the Alpes territory.
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DST 10 Smart Grazing SUPER-G partner: France Chambre Regionale D'agriculture De Normandie		
DST provider	Applifarm	
Funder	Commercial tool developed by Applifarm and partners including DigitAnimal, the Institute of Livestock, Sigfox and Office Veritas.	
Brief description	Applifarm, a start-up specializing in agricultural big-data, has developed Smart Grazing, an add-on to its platform to show in real time, with GPS data of a connected collar, the position of the herd. This tool geolocates animals via GPS data processing to simplify grazing time management for breeders, cooperatives and processors. An algorithm calculates the grazing time of the herd. Using the number of grazing days, location of grasslands or paddocks, and the associated areas the breeder automatically constitutes a digitized pasture book.	
Links and references	Applifarm website	
Date of first release	2019	
Last update	2019	
Main purpose (ecosystem service)	6. Grass for livestock, biomass (bioenergy) and other products	
Main purpose	Calculates grazing time	
Target audience	Farmers Advisors	
Format	Software – mobile application ‘app’	
Cost/availability	Unknown	
Number of users	Unknown	
Country of origin	France	
Is it country or region specific?	Not specific to a particular country. Developed and manufactured in France.	
Language	French	
Is the tool specifically targeted to permanent grassland?	All grassland types.	
Grassland and livestock management	Grazing cattle	
Data input required for the DST	A GPS collar sensor records grazing time and location.	
Use of data from other existing datasets	Data from GPS collar	
Data export	Unknown	
Data storage	Unknown	
Benchmarking	No	
Ability of the DST to deliver an impact	Tool helps farmers to provide information on grazing time which is required for various quality labels.	

<p>Approach used to generate the outcome from the DST and degree of user interaction</p>	<p>Data from GPS collar is used to calculate grazing time.</p>
<p>Additional comments</p>	<p>A number of processors (dairies, slaughterhouses etc.) now specify a minimum time for cattle spent at pasture/grazing. Most farmers keep a paper pasture book to record this information. This tool is a digital solution which records this information and removes the need for a paper record – bringing advantages to both the farmer and processors. For the operators of the sector, this solution offers a guarantee of pasture time, which can be used for the labeling of milk (local pasture, hay milk, compliance with regulations, collection areas).</p>


DST 11 Agro weatherapp SUPER-G partner: WUR		
DST provider	OCI Agro	
Funder	OCI Agro	
Brief description	A weather app that uses weather data to determine the best time to carry out tasks on the land so that the optimal time to spread, spray and silage can be achieved.	
Links and references	Agro weatherapp webpage with download link	
Date of first release	2016	
Last update	2020	
Main purpose (ecosystem service)	6. Grass for livestock, biomass (bioenergy) and other products	
Main purpose	To optimize on farm operations according to weather	
Target audience	Farmers	
Format	Software – mobile application ‘app’	
Cost/availability	Free	
Number of users	Unknown	
Country of origin	The Netherlands	
Is it country or region specific?	App uses weather data which is specific to the Netherlands	
Language	Selectable (German, English, French, Dutch)	
Is the tool specifically targeted to permanent grassland?	All crops including grassland	
Grassland and livestock management	Not specific to a management system or livestock type	
Data input required for the DST	Location	
Use of data from other existing datasets	Pulls and presents weather data	
Data export	No	
Data storage	No	
Benchmarking	No	
Ability of the DST to deliver an impact	By working with optimal weather conditions farmers may be able to reduce waste in sub-optimal conditions such as the rain or wind. They can apply products when they will reduce environmental impact and when they will be most effective, thus reducing unnecessary use and associated costs.	
Approach used to generate the outcome from the DST and degree of user interaction	Users enters their location and the app draws on local weather data and forecasts. User data input is minimal.	
Additional comments	None	

DST 12 AgroMineraal SUPER-G partner: WUR		 AgroMineraal
DST provider	AgroVision	
Funder	AgroVision	
Brief description	AgroMineral is a mineral accounting software which summarizes all aspects of the farm gate nutrient balance and nutrient flows of the crops, soils and livestock on the farms. The tool navigates and provides advice to farmers helping them to manage their on farm nutrient flows within the legal limits.	
Links and references	AgroMineraal website	
Date of first release	Unknown	
Last update	2019	
Main purpose	6. Grass for livestock, biomass (bioenergy) and other products <ul style="list-style-type: none"> • Nutrient management (including fertilisers and organic manures) • Whole season/long term modelling or forecasting 	
Main purpose	Farm gate nutrient balance	
Target audience	Farmers Advisors	
Format	Software – desk based	
Cost/availability	Charged €163/year	
Number of users	Unknown	
Country of origin	The Netherlands	
Is it country or region specific?	AgroMineraal is specific for the Netherlands only	
Language	Dutch	
Is the tool specifically targeted to permanent grassland?	All crops	
Grassland and livestock management	Grassland and dairy livestock	
Data input required for the DST	Data can be quickly loaded from existing databases such as RVO and Eurofins, for example field data (number of hectares, soil type). Herd data can be loaded from Agrovision Cowmanager software (number of herd, milk production, milk solids etc.). Manure analysis data can be imported from Eurofins, (e.g. Nitrogen content in manure).	
Use of data from other existing datasets	The tool draws on data from ALNN, Eurofins, RVO and ANCA and is designed to demonstrate compliance with Dutch legislation.	
Data export	Data can be exported to the Fertilisation Planner (DST 18).	
Data storage	Yes	
Benchmarking	The tool is not designed to provide benchmarking, however the datasets entered into the tool could be used to provide benchmarking.	
Ability of the DST to deliver an impact	The tool helps farmers to plan their nutrient use within the Dutch limits (nutrient management and compliance tool).	

Approach used to generate the outcome from the DST and degree of user interaction	Data is imported from other tools like RVO (data source from the government), Eurofins (laboratory for measuring silage, manure and soil samples), and Cowmanager. Then data is updated throughout the year used to calculate the farm gate nutrient balance.
Additional comments	None


DST 13 Akkerweb SUPER-G partner: WUR		
DST provider	Akkerweb	
Funder	Akkerweb	
Brief description	<p>Akkerweb is a web-based portal which allows the storage and sharing of farm data to facilitate precision agriculture. Akkerweb provides access to external data sources such as weather, field boundaries, satellite imagery as well as allowing farmers to upload and store their own geo-referenced data including soil maps, drone imagery and the output of tractor mounted sensors. Data sources are combined and processed in 'apps' which can then generate task maps and recommendations to achieve a specific goal. A Farmer can add whichever app is relevant to their operation to their akkerweb. Apps available are mainly in Dutch. Apps can be developed independently and are released for use on Akkerweb once approved by the consortium.</p>	
Links and references	Akkerweb website	
Date of first release	Unknown	
Last update	Unknown	
Main purpose (ecosystem service)	6. Grass for livestock, biomass (bioenergy) and other products	
Main purpose	Promoting the uptake of precision farming by centrally collating relevant data	
Target audience	Farmers Advisors	
Format	Software – web based	
Cost/availability	Free	
Number of users	4000+	
Country of origin	The Netherlands	
Is it country or region specific?	Specific to The Netherlands because it draws on field boundary data in the national database (Land Parcel Information System) and satellite images purchased by the Dutch government.	
Language	Dutch	
Is the tool specifically targeted to permanent grassland?	All crops including grassland	
Grassland and livestock management	Not specific to a particular management system or livestock type	
Data input required for the DST	Farm, field and crop details (data recording platform)	
Use of data from other existing datasets	Weather, field boundaries, satellite images, farm management data stored in commercial Farm Management Information Systems, Netherlands Enterprise Agency (RVO), and sensors.	
Data export	Data is used with whichever other 'apps' the user uses	
Data storage	Yes	
Benchmarking	None	

Ability of the DST to deliver an impact	Farm data management platform – helps farmers maximise the value of their farm data.
Approach used to generate the outcome from the DST and degree of user interaction	Data is entered to the online Akkerweb platform and shared with 'apps' downloaded by the users. Farm data management platform.
Additional comments	Akkerweb (www.akerweb.eu) is a web-based portal for precision agriculture. It is the product of a consortium consisting of Agrifirm, the largest farmer's cooperative in The Netherlands, and Wageningen University & Research (WUR), the leading agricultural research center in The Netherlands. Akkerweb has evolved from NemaDecide, a decision-support system for control of plant parasitic nematodes


DST 14 Barenbrug Graslandapp SUPER-G partner: WUR		
DST provider	Barenbrug	
Funder	Barenbrug	
Brief description	Website with information on grassland management. Users follow an electronic flow charts related to aspects of pasture assessment, management or seed mixture. By answering questions about observations and conditions of their own field different advice is provided based on their answers. This can include advice for weed control, turf management and reseeding.	
Links and references	GraslandApp website	
Date of first release	Unknown	
Last update	Unknown	
Main purpose (ecosystem service)	6. Grass for livestock, biomass (bioenergy) and other products <ul style="list-style-type: none"> • Grass measurement & short term budgeting • Grass variety selection 	
Main purpose	General grassland management	
Target audience	Farmers	
Format	Software – web based Software – mobile application ‘app’	
Cost/availability	Free	
Number of users	Unknown	
Country of origin	The Netherlands	
Is it country or region specific?	The tool is targeted at farmers in the Netherlands (provided in Dutch), but information may be relevant to farmers in other areas.	
Language	Dutch	
Is the tool specifically targeted to permanent grassland?	All grassland types	
Grassland and livestock management	Not specific to a particular management system or livestock type, although mainly used by dairy farmers	
Data input required for the DST	Rough knowledge of % cover, soil type, grazing and mowing practices, plant species present. Input required will depend on the user’s needs and the flow chart the user follows	
Use of data from other existing datasets	None	
Data export	None	
Data storage	None	
Benchmarking	None	
Ability of the DST to deliver an impact	Targeted grassland management advice based on the user’s own observed conditions can help manage and improve grassland	

Approach used to generate the outcome from the DST and degree of user interaction	Minimal input required. User clicks the option that best applies to their situation as they work through the decision tree to access relevant advice.
Additional comments	None



DST 15 BedrijfsWaterWijzer SUPER-G partner: WUR		
DST provider	WUR with farmers input/ input from the water board. The tool is accessible through the Akkerweb environment (DST 13).	
Funder	Koeien & Kansen (Cows & Opportunities), Ministry of Agriculture, Nature and Fishery. ZuivelNL (DairyNL)	
Brief description	The BedrijfsWaterWijzer examines various aspects that relate to both the quality and quantity of water on a dairy farm. This involves looking at the property, drought, flooding, leaching to groundwater, rinsing to surface water, livestock drinking water quality and ecological ditch management. The tool focuses on risk of leaching losses from fields and risk of pollution from farmyards from runoff or rinsing machinery (farm sprayers). Data from the KringloopWijzer DST can be imported into the tool. The BWW enables farmers to see at a glance where the farm stands when it comes to water management.	
Links and references	BedrijfsWaterWijzer website BedrijfsWaterWijzer news article (in Dutch)	
Date of first release	Unknown	
Last update	Continuous (It is more or less still in development)	
Main purpose (ecosystem service)	4. Water quality	
Main purpose	Water management on the farm	
Target audience	Farmers Policy makers	
Format	<ul style="list-style-type: none"> • Software – web based 	
Cost/availability	It will be freely available on Akkerweb to all farms. A test version is now available to Koeien & Kansen participants on Akkerweb.	
Number of users	At the moment the tool is used a bit by Koeien & Kansen participants to help to develop the tool.	
Country of origin	The Netherlands	
Is it country or region specific?	The Netherlands	
Language	Dutch	
Is the tool specifically targeted to permanent grassland?	The tool can be used for all crops, but it is mainly targeted at Dairy farms and grass/maize.	
Grassland and livestock management	Not specific to a particular management system on livestock type but is mainly used by dairy farmers for grass and maize crops and farmyard management.	
Data input required for the DST	Company details, field characteristics (soil, water, land use, fertilizer); information on water bodies (length, width, profile), drainage and water level management.	
Use of data from other existing datasets	Reads data from the KringloopWijzer (DST 26) and can collect location and associated data from Akkerweb (DST 13).	
Data export	None	

Data storage	Yes, information can be stored to simplify future usage,
Benchmarking	None
Ability of the DST to deliver an impact	Identifying high risk areas on the user's farm can reduce wastage and pollution of water courses which can bring monetary and environmental benefits.
Approach used to generate the outcome from the DST and degree of user interaction	Physiological and hydrological data from fields is imported together with laboratory results of soil samples, the positions of drains and the soil water level. This provides a clear overview for the farmer about what is good on the farm, and what needs attention. For example, the farm can get a 9/10 for nutrient leaching losses, but a 2/10 on silage effluent leaching to surface waters because the silage pit is next to a ditch. Together with farm advisors and advisors from the local water board the farmer can make a plan to improve the farm.
Additional comments	None

DST 16 Beregeningssignaal SUPER-G partner: WUR		
DST provider	ZLTO Delphy, Royal HaskoningDHV, Wageningen UR Livestock Research, Prezent Internet and Suiker Unie	
Funder	ZLTO Delphy, Royal HaskoningDHV, Wageningen UR Livestock Research, Prezent Internet and Suiker Unie	
Brief description	Irrigation signal is an online irrigation scheduling tool. The tool uses weather data and information on field size and crop type to provide recommendations on amount and timing of irrigation. The tool calculates a field moisture balance and alerts the user <i>via</i> email if irrigation is recommended and if so, how much.	
Links and references	Beregeningssignaal website	
Date of first release	Unknown	
Last update	Unknown	
Main purpose (ecosystem service)	6. Grass for livestock, biomass (bioenergy) and other products	
Main purpose	Irrigation scheduling	
Target audience	Farmers	
Format	<ul style="list-style-type: none"> • Software – web based 	
Cost/availability	Charged for: you can use the online program for €249 a year. LTO members receive a € 50 member discount and pay €199. Rates apply per year, excluding VAT	
Number of users	Unknown	
Country of origin	The Netherlands	
Is it country or region specific?	Specific to the Netherlands	
Language	Dutch	
Is the tool specifically targeted to permanent grassland?	All crop types including grassland	
Grassland and livestock management	Not specific to a particular management system or livestock type	
Data input required for the DST	Precipitation, groundwater level, irrigation, soil moisture	
Use of data from other existing datasets	Rainfall data	
Data export	Data can be shared via Akkerweb (DST 13).	
Data storage	Yes	
Benchmarking	None	
Ability of the DST to deliver an impact	Accurate irrigation scheduling can help maximise crop (including grassland) production and improve water use efficiency.	
Approach used to generate the outcome from the	Weather, cropping and field information is used to calculate a moisture balance and provide irrigation advice. User can input data from own measurements	


DST and degree of user interaction	
Additional comments	None




DST 17 Boerenbunder SUPER-G partner: WUR	
DST provider	DACOM
Funder	DACOM
Brief description	Borenbunder provides users with information about fields and field history. It can provide information on soil type and historical field boundaries to show if field merging has occurred. Cropping history and percentage cover are also presented. Satellite images determine current crop status, track growth and in the long term even predict yield
Links and references	Boerenbunder website
Date of first release	Unknown
Last update	Unknown
Main purpose (ecosystem service)	6. Grass for livestock, biomass (bioenergy) and other products <ul style="list-style-type: none"> • Whole season/long term modelling or forecasting
Main purpose	Provides historical and contemporary information about the user's field
Target audience	Farmers Advisors Other (Brokers, contractors and governments)
Format	Software – web based
Cost/availability	<ul style="list-style-type: none"> • Free version with limited capabilities • Charged for. Different packages are available (Free, Pro(€150/yr) Premium (€1000/yr))
Number of users	Unknown
Country of origin	The Netherlands
Is it country or region specific?	Specific to the Netherlands (information provided for fields in the Netherlands)
Language	Dutch, Danish, Flemish
Is the tool specifically targeted to permanent grassland?	All crops
Grassland and livestock management	Not specific to a particular livestock or management system
Data input required for the DST	Address
Use of data from other existing datasets	Yes takes data from satellites
Data export	Yes, Can export into a PDF report
Data storage	None
Benchmarking	None
Ability of the DST to deliver an impact	User can identify limited information field history
Approach used to generate the	User need not input any information except the location of the field they're interested in

outcome from the DST and degree of user interaction	
Additional comments	None




DST 18 CowVision Grond&Gewas Fertilization Planner SUPER-G partner: WUR		
DST provider	AgroVision	
Funder	AgroVision	
Brief description	<p>The Fertilizer Planner provides insight into the available manure throughout the year, taking into account disposal, supply production, grazing, cutting and yield potential. This programme extracts data from AgroMineraal (DST 12) and creates a field specific fertilizer plan based on the needs of the soil, the crop and available fertilizers. The tool can be used to plan how much manure must be exported (if needed) and how much fertiliser needs to be purchased and when to be applied. Through the year the plan can be change to stay within the application limitations.</p>	
Links and references	Fertiliser planner webpage	
Date of first release	Unknown	
Last update	Unknown	
Main purpose	6. Grass for livestock, biomass (bioenergy) and other products <ul style="list-style-type: none"> • Nutrient management (including fertilisers and organic manures) • Whole season/long term modelling or forecasting 	
Main purpose	Nutrient management (nitrogen & phosphorus)	
Target audience	Farmers	
Format	Software – desk based	
Cost/availability	Charged for, to be able to use you must have AgroMineraal (DST 12) which costs €163/year so an indirect cost is necessary for use.	
Number of users	Unknown	
Country of origin	The Netherlands	
Is it country or region specific?	Specific to the Netherlands. It uses data from AgroMineraal (DST 12) which is specific to the Netherlands through the map data and government data that is imported. The tool provides a fertiliser plan in accordance with Dutch nutrient application limits.	
Language	Dutch	
Is the tool specifically targeted to permanent grassland?	All grassland types and maize silage	
Grassland and livestock management	Not specific to a particular management system or livestock type.	
Data input required for the DST	Field information (number/ amount; size; target yield) and input from dairy livestock (the amount of slurry available).	
Use of data from other existing datasets	It is an extension on AgroMineraal (DST12)	
Data export	No	
Data storage	Yes. The tool can store data from previous years and readily display the nutrient application plan in the event of an audit.	
Benchmarking	None	

Ability of the DST to deliver an impact	Nutrient management tool which can help improve nutrient management and crop yields. Good nutrient management can reduce nutrient losses to the environment.
Approach used to generate the outcome from the DST and degree of user interaction	This programme extracts data from AgroMineraal (DST 12) and creates a field specific fertilizer plan based on the needs of the soil, the crop and available fertilizers.
Additional comments	Complementary to AgroMineraal (DST 12).

DST 19 Excretiewijzer SUPER-G partner: WUR		
DST provider	WUR	
Funder	Wageningen UR, Ministry of Agriculture Nature and Fishery, DairyNL	
Brief description	The ExcretieWijzer calculates the manure production of a dairy herd according to the calculation rules of the "Guide for farm-specific excretion". In addition to the excretion of nitrogen and phosphate and the emission of ammonia, the latest version also calculates a company-specific phosphate usage standard. The ExcretieWijzer is also a management tool. For example, to reduce the manure production of livestock, to influence the ammonia emission or to increase the phosphate yield.	
Links and references	ExcretieWijzer webpage and download link	
Date of first release	Unknown	
Last update	2019	
Main purpose (ecosystem service)	6. Grass for livestock, biomass (bioenergy) and other products <ul style="list-style-type: none"> • Nutrient management (including fertilisers and organic manures) 	
Main purpose	Calculates manure production	
Target audience	Farmers	
Format	Software – desk based	
Cost/availability	Free	
Number of users	Unknown	
Country of origin	The Netherlands	
Is it country or region specific?	Calculations in the tool are based on "Guide for farm-specific excretion" which is specific to The Netherlands	
Language	Dutch	
Is the tool specifically targeted to permanent grassland?	All grassland types	
Grassland and livestock management	Targeted at dairy farms	
Data input required for the DST	Livestock, manure type, milk production, grazing, soil nutrient supply, soil type, farm size	
Use of data from other existing datasets	None	
Data export	None	
Data storage	Data entered into the tool can be saved	
Benchmarking	None	
Ability of the DST to deliver an impact	The tool calculates manure production to help farmers assess and demonstrate compliance with limits in Dutch legislation.	
Approach used to generate the outcome from the	User enters their farm details and the tool calculates manure production. This is compared against limits in Dutch legislation.	


DST and degree of user interaction	
Additional comments	None




DST 20 Gras Monitor SUPER-G partner: WUR		
DST provider	Agrifirm	
Funder	Agrifirm	
Brief description	Provides an overview of the progress of grass quality of intensively managed ryegrass grasslands each week during the growing season. Measurements of various field experiments in the country are combined. Data is published online each week of the season providing information on VEM (One Dutch feeding unit for lactating animals (VEM) contains 1.650 kcal or 6.9kJ Net Energy for Lactation) and crude protein. This information is used by farmers and advisors. Farmers can use it to determine the optimum harvest time and to gain insight in the actual grass quality in their pasture.	
Links and references	Gras Monitor website	
Date of first release	Before 2014	
Last update	Nov 2019	
Main purpose (ecosystem service)	6. Grass for livestock, biomass (bioenergy) and other products <ul style="list-style-type: none"> Grass measurement & short term budgeting 	
Main purpose	Information and guidance on grass quality throughout the season	
Target audience	Farmers Advisors	
Format	<ul style="list-style-type: none"> Paper based (only available online as an electronic version) 	
Cost/availability	Free	
Number of users	Unknown	
Country of origin	The Netherlands	
Is it country or region specific?	Only draws on samples and weather data from across The Netherlands so results are only applicable to Dutch farms.	
Language	Dutch	
Is the tool specifically targeted to permanent grassland?	All grassland type, but targeted mainly at intensively managed ryegrass for dairy production and grazing	
Grassland and livestock management	Mainly used by dairy farmers	
Data input required for the DST	No data input (guidance information on grass quality)	
Use of data from other existing datasets	None	
Data export	None	
Data storage	None	
Benchmarking	Benchmarking of grass quality information averaged across The Netherlands	
Ability of the DST to deliver an impact	Provides information on grass quality which can be used by farmers to inform their grass use.	

Approach used to generate the outcome from the DST and degree of user interaction	No user interaction required.
Additional comments	None




DST 21 Grascheck SUPER-G partner: WUR		
DST provider	Barenbrug	
Funder	Barenbrug	
Brief description	User enters details of grass yield, quality, grass consumption and soil type. Grascheck calculates the full potential yield of the grassland and costs/benefits associated with grassland improvement options (weeding, oversowing etc).	
Links and references	Grascheck website	
Date of first release	Unknown	
Last update	Unknown	
Main purpose (ecosystem service)	6. Grass for livestock, biomass (bioenergy) and other products <ul style="list-style-type: none"> • Grass measurement & short term budgeting 	
Main purpose	Maximising grassland production	
Target audience	Farmers	
Format	Software – web based	
Cost/availability	Free	
Number of users	Unknown	
Country of origin	The Netherlands	
Is it country or region specific?	Specific to the Netherlands – tool uses information from Eurofins (BLGG) report which is used by farmers in the Netherlands. Grassland production information is based on data from the Netherlands.	
Language	Dutch	
Is the tool specifically targeted to permanent grassland?	All grassland types	
Grassland and livestock management	Not specific to a particular management system or livestock type	
Data input required for the DST	Grassland area, grass dry matter bought and sold, how much grass is consumed by the herd, crude protein and VEM of grass, soil nitrogen supply.	
Use of data from other existing datasets	No	
Data export	None	
Data storage	None	
Benchmarking	None	
Ability of the DST to deliver an impact	The tool provides guidance on grassland improvement options which can increase dry matter yields and increase income	
Approach used to generate the outcome from the DST and degree of user interaction	User inputs data from their own records relating to yield, quality and soil nitrogen supply. Data is sent to grass experts and advice is returned to user via email.	
Additional comments	None	


DST 22 Grasland APK SUPER-G partner: WUR		
DST provider	Innoseeds/ DLF	
Funder	Innoseeds/ DLF	
Brief description	This mobile application gives farmers and advisors the tools needed to quickly assess grassland quality. This is achieved by answering simple questions about the % cover and presence of weeds. Subsequent advice is provided with the aim of restoring yield and quality of the grassland.	
Links and references	Download link	
Date of first release	2017	
Last update	2017	
Main purpose (ecosystem service)	6. Grass for livestock, biomass (bioenergy) and other products <ul style="list-style-type: none"> • Grass variety selection 	
Main purpose	Pasture assessment and advice on optimizing the production and quality	
Target audience	Farmers Advisors	
Format	Software – mobile application ‘app’	
Cost/availability	Free	
Number of users	Unknown	
Country of origin	The Netherlands	
Is it country or region specific?	Developed for farmers in the Netherlands (in Dutch), however the tool may be relevant for farmers in other countries.	
Language	Dutch	
Is the tool specifically targeted to permanent grassland?	All grassland types	
Grassland and livestock management	Not specific to a particular management system or livestock type	
Data input required for the DST	No data input, the user follows a decision tree by answering questions to access relevant guidance.	
Use of data from other existing datasets	None	
Data export	None	
Data storage	None	
Benchmarking	None	
Ability of the DST to deliver an impact	By helping farmers easily assess their grassland and providing advice on how to improve, yield can be increased which may reduce costs or improve profits.	
Approach used to generate the outcome from the	The app takes the user through a series of questions and provides advice based on the output.	

DST and degree of user interaction	
Additional comments	None

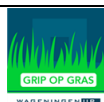


DST 23 GraslandGebruiksWijzer SUPER-G partner: WUR		
DST provider	Wageningen Livestock Research	
Funder	Wageningen Livestock Research	
Brief description	<p>The GraslandGebruiksWijzer (GGW) draws up a plan for grazing, feed extraction and fertilization of grassland. GGW calculates grassland production, the quality of grass and silage and the losses during grazing, mowing and silage. GGW makes suggestions for plots where cattle can graze best. Mowing is possible on plots that are not needed for grazing. The grassland use is displayed on a calendar. When there is a shortage of meadow grass, GGW gives timely advice to increase the supplementary feed. The animals can be stored in the event of a shortage of grass. When there is enough grass again, they go outside again. For fertilisation purposes GGW uses the calculation rules of the N-Advice program, which have been established by the Grassland and Fodder Fertilization Committee.</p>	
Links and references	<ul style="list-style-type: none"> • GraslandGebruiksWijzer webpage on verantwoordeveehouderij webiste • GraslandGebruiksWijzer webpage on WUR website 	
Date of first release	2000	
Last update	Unknown	
Main purpose (ecosystem service)	6. Grass for livestock, biomass (bioenergy) and other products <ul style="list-style-type: none"> • Nutrient management (including fertilisers and organic manures) • Grass measurement & short term budgeting 	
Main purpose	Grass budgeting and fertilisation	
Target audience	Farmers	
Format	Software – desk based	
Cost/availability	Free	
Number of users	Unknown	
Country of origin	The Netherlands	
Is it country or region specific?	Input requires choice of province, therefore limited to The Netherlands only.	
Language	Dutch	
Is the tool specifically targeted to permanent grassland?	All grassland types	
Grassland and livestock management	Not specific to a particular management system or livestock type.	
Data input required for the DST	Detailed information on farm livestock, grazing management and field information.	
Use of data from other existing datasets	None	
Data export	Unknown	
Data storage	Can save input data and the generated schedule	

Benchmarking	None
Ability of the DST to deliver an impact	The tool provides information on grassland production and fertiliser recommendations. The information can be used to improve grass management and production
Approach used to generate the outcome from the DST and degree of user interaction	The user enters farm, grassland management and livestock information. The tool calculates grassland production and provides a recommendation for fertilisation.
Additional comments	None


DST 24 Graslandkompas SUPER-G partner: ADAS		
DST provider	Aeres University of Applied Sciences & Van Hall Larenstein University of Applied Sciences, the Netherlands	
Funder	ABZ-Diervoeding, Agrifirm, CONO, De Heus, DLF, DMS, FOrFarmers, T. Hof, R. Hooch Antink, CoE Agrodier.	
Brief description	<p><i>Graslandkompas</i> is a prototype tool for Dutch dairy farmers and advisers that aims to improve grassland production and utilization through the use of a number of metrics or “performance indicators” (PIs) across six ‘areas of influence’ (or ‘wind directions’): soil, sward, manuring, grazing, silage making and conservation. Each ‘wind direction’ consists of 3 to 6 measurable key performance indicators (KPIs) and each KPI consists of 1 to 15 PIs. Each PI is scored from 1 (poor) to 5 (good). KPIs are calculated as the weighted average of PIs; and wind directions are calculated as the weighted average of the KPIs. The arithmetic mean of the six ‘wind directions’ leads to the final GC score (1-5 with intervals of 0.5).</p>	
Links and references	<ul style="list-style-type: none"> • Graslandkompas website (in Dutch) • De Haas et al. (2019). ‘Grassland Compass’: a practical tool to improve grass production and grass utilization on Dutch dairy farms. <i>Grassland Science in Europe</i>, 24, 494-496. 	
Date of first release	Not released: “further validation is necessary”	
Last update	Not applicable	
Main purpose (ecosystem service)	6. Grass for livestock, biomass (bioenergy) and other products (1 st) <ul style="list-style-type: none"> • Nutrient management (including fertilisers and organic manures) • Grass measurement & short term budgeting • Soil management 	
Main purpose	To improve grass production and utilization.	
Target audience	Farmers Advisors	
Format	Paper based – but not released so could be in any format	
Cost/availability	Unknown (Not released)	
Number of users	Not released	
Country of origin	The Netherlands	
Is it country or region specific?	Designed for Dutch dairy farms, but probably applicable to any high output livestock grazing system.	
Language	Dutch (not released yet, so not known if it will also be available in other languages)	
Is the tool specifically targeted to permanent grassland?	All grassland types.	
Grassland and livestock management	Targeted at dairy grazing and cutting systems, but could be applicable to beef and sheep systems.	
Data input required for the DST	Unknown, but include results from existing farm tools, e.g. Kringloopwijzer (Annual Nutrient Cycling Assessment) (DST26) and:	

	<ul style="list-style-type: none"> • Soil – soil analysis results, visual evaluation of soil structure (VESS) • Sward – sward quality, rooting depth • Manuring – N and P surpluses • Grazing - unknown • Silage making – ‘drying period’, ‘cutting height’ and ‘chop length’ • Conservation - silage analysis results
Use of data from other existing datasets	Uses data from existing farm tools, e.g. Kringloopwijzer (Annual Nutrient Cycling Assessment) (DST26).
Data export	Unknown
Data storage	Unknown
Benchmarking	Potentially, yes.
Ability of the DST to deliver an impact	The on-farm test of Grassland Compass initiates discussions between farmer and advisor on improvements of grassland production and utilization, as the measures are farm specific.
Approach used to generate the outcome from the DST and degree of user interaction	The tool requires users to score their grassland management against a range of performance indicators; and produces scores for each indicator and ‘wind direction’ (theme) that can be compared with other farms, pre-test evaluations and previous assessments.
Additional comments	Prototype – under development


DST 25 Grip op Gras SUPER-G partner: WUR		
DST provider	Ontwikkeld door Wageningen University & Research in opdracht van Amazing Grazing 2.0 en toegankelijk via Akkerweb	
Funder	The tool was the outcome of the 'Amazing Grazing' project which was funded by ZuivelNL and the Dutch Ministry of Economic Affairs.	
Brief description	In field measurements of grass can be immediately logged on the app and are associated with the field via GPS. Dry matter yields can then be displayed against the corresponding field. This information helps the grower plan cutting date and predict shortages or surpluses of grass	
Links and references	Grip op Gras webpage	
Date of first release	Unknown	
Last update	Unknown	
Main purpose (ecosystem service)	6. Grass for livestock, biomass (bioenergy) and other products <ul style="list-style-type: none"> • Grass measurement & short term budgeting 	
Main purpose	Estimating grass yields	
Target audience	Farmers Advisors	
Format	<ul style="list-style-type: none"> • Software – web based • Software – mobile application 'app' 	
Cost/availability	Free	
Number of users	Unknown	
Country of origin	The Netherlands	
Is it country or region specific?	Specific to the Netherlands. The gras growth model used is a Dutch model fed with data from Dutch grassland experiments and calibrated with Dutch farm data.	
Language	Dutch	
Is the tool specifically targeted to permanent grassland?	All grassland types	
Grassland and livestock management	Not targeted at a particular management system or livestock type	
Data input required for the DST	Grass height, GPS	
Use of data from other existing datasets	As an 'app' for akkerweb (DST 13) Grip on Gras can draw on the location and associated data from there	
Data export	Shares data with other connected users via akkerweb (DST 13)	
Data storage	Stores user inputted data	
Benchmarking	None	
Ability of the DST to deliver an impact	Provides information on grass production which can be used to improve grassland utilisation.	
Approach used to generate the outcome from the	User enters grass measurement data (height) and the tool calculates grass production, which can be used to plan grassland management (cutting or grazing)	

DST and degree of user interaction	
Additional comments	None




DST 26 Kringloopwijzer – annual nutrient cycling assessment (ANCA) SUPER-G partner: WUR		 <p>KRINGLOOP WIJZER</p>
DST provider	Wageningen University and Research produced the tool, nowadays it is a joint effort between <ul style="list-style-type: none"> • Research Wageningen UR • Government: ministries agriculture, environment • Dairy sector: farmers unions, dairy industry 	
Funder	<ul style="list-style-type: none"> • Government: ministries agriculture, environment • Dairy sector: farmers unions, dairy industry 	
Brief description	<p>If farmers want to deliver milk to the dairy processing firms they are obliged to complete their annual nutrient cycling assessment. This information is required to calculate the efficiency of the utilisation of nutrients of feed, fertilisers, land and cattle. These calculations provide insight on the levels of nutrient losses from farm to environment. It allows for comparisons with values of colleagues and normative values.</p> <p>The ANCA tool provides an overview of</p> <ul style="list-style-type: none"> • Feed consumption and efficiency • Excretion of N and P • Ammonia losses • Crop yields • Fertiliser applications and efficiency of turn over into crops • Surpluses of N and P on farm and soil balance • Nitrate content groundwater • Input of effective organic matter • Greenhouse gas emissions 	
Links and references	<ul style="list-style-type: none"> • KringloopWijzer webpage on verantwoordeveehouderij • KringloopWijzer website • Impact story on WUR website (in English) 	
Date of first release	2013	
Last update	2019	
Main purpose (ecosystem services)	2. Carbon storage and GHG 4. Water quality 6. Grass for livestock, biomass (bioenergy) and other products <ul style="list-style-type: none"> • Nutrient management (including fertilisers and organic manures) • Whole season/long term modelling or forecasting 	
Main purpose	Nutrient cycling assessment	
Target audience	Farmers Advisors	
Format	Software – desk based Software – web based	
Cost/availability	Free	
Number of users	Unknown	
Country of origin	The Netherlands	
Is it country or region specific?	Specific to the Netherlands.	

Language	Dutch
Is the tool specifically targeted to permanent grassland?	All grassland types – the tool distinguishes between production grassland and extensively managed grassland
Grassland and livestock management	Not specific to a particular management system or livestock type.
Data input required for the DST	Information on the farm, the input and export of the farm <ul style="list-style-type: none"> • Year • Animals (number/breed) • Milk production • Grazing hours/yr • Farmland, land use (ha) • P status soil • Feed stocks: harvest and import • Contents of feed stocks (Energy/N/P/Ash) • Feed stocks storage changes • Export of farm feeds • Soil type • Cropping plan, Legumes • Farm organic/artificial manure (input/output) • Type of housing
Use of data from other existing datasets	None
Data export	Data can be exported from the central database in pdf format. A benchmark given as comparison.
Data storage	Yes – data entered into the tool is saved.
Benchmarking	Dutch excretion regulations based on standards Deviation from standards observed Indicators (with targets): <ul style="list-style-type: none"> • N surplus soil surface balance (kg N/ha) • Ammonia losses (kg/ha and kg/LSU) • Home grown protein production (protein production / protein use; %) • Permanent grassland (%) • Carbon food print (gr CO₂-eq / kg FPCM)
Ability of the DST to deliver an impact	The tool provides nutrient management information which can be used to demonstration compliance with Dutch regulations.
Approach used to generate the outcome from the DST and degree of user interaction	Users enter farm and field information. The tool calculates the efficiency of the utilisation of nutrients of feed, fertilisers, land and cattle
Additional comments	In 1992 they started with the development of a farm gate balance for the Research Farm the Marke. In 1999 a network of 19 farmers “cows and opportunities” started to work with the farm gate balance. Since then the tool was improved and extended.

DST 27 Mestverdelingswijzer SUPER-G partner: WUR		
DST provider	Wageningen Livestock Research on behalf of the Grassland and Fodder Fertilization Commission	
Funder	ZuivelNL	
Brief description	With the Mestverdelingswijzer (Manure Distribution Guide), users can roughly check how the available slurry on the farm can best be divided between the grassland plots and maize land plots. The tool takes into account an optimal distribution of phosphate.	
Links and references	Mestverdelingswijzer webpage on WUR website with download link	
Date of first release	Unknown	
Last update	Unknown	
Main purpose (ecosystem service)	6. Grass for livestock, biomass (bioenergy) and other products <ul style="list-style-type: none"> • Nutrient management (including fertilisers and organic manures) 	
Main purpose	Manure management	
Target audience	Farmers	
Format	Software – desk based	
Cost/availability	Free	
Number of users	Unknown	
Country of origin	The Netherlands	
Is it country or region specific?	The tool works with Dutch nutrient application limits. Data flows are based on Dutch data. The tool is therefore applicable to the Netherlands only.	
Language	Dutch	
Is the tool specifically targeted to permanent grassland?	All grassland and maize	
Grassland and livestock management	Not specific to a particular management system or livestock type	
Data input required for the DST	Quantity of manure and manure type. Area of land and crop type.	
Use of data from other existing datasets	None	
Data export	None	
Data storage	Data entered into the tool can be saved.	
Benchmarking	None	
Ability of the DST to deliver an impact	Tool provides guidance on manure application which can help farmers improve manure nutrient use efficiency and minimise the risk of diffuse pollution.	
Approach used to generate the	User enters manure and crop details and the tool provides guidance on where and how much manure to apply.	

outcome from the DST and degree of user interaction	
Additional comments	None



DST 28 Milieumeetlat SUPER-G partner: WUR		
DST provider	CLM yardstick environment	
Funder	CLM yardstick environment	
Brief description	The Environmental Yardstick for Pesticides provides an overview of the environmental pressures generated by all crop protection agents permitted on the Dutch market. It enables the user to compare these agents and chooses the least harmful crop protection strategy.	
Links and references	Clm yardstick website	
Date of first release	Unknown	
Last update	Unknown	
Main purpose (ecosystem service)	6. Grass for livestock, biomass (bioenergy) and other products	
Main purpose	Allows growers to identify pesticides with low environmental pressures	
Target audience	Farmers Other (NGOs, educational institutes and commercial enterprises.)	
Format	Software – web based Software – mobile application ‘app’	
Cost/availability	<ul style="list-style-type: none"> • Free to compare up to three crop protection agents • Charged for - Subscribers can compare an unlimited number of crop protection agents and export their data to excel amongst other features. (€50/year for an individual farmer, €2250 per year for commercial use) 	
Number of users	Unknown	
Country of origin	The Netherlands	
Is it country or region specific?	Only compares crop protection agents permitted on the Dutch market	
Language	Dutch, English	
Is the tool specifically targeted to permanent grassland?	All crops including grassland	
Grassland and livestock management	Not specific to a particular management system or livestock type	
Data input required for the DST	Soil type, season and pesticide choice	
Use of data from other existing datasets	Draws environmental impact data from all pesticides on the Dutch market	
Data export	Can be exported to excel format	
Data storage	The free tool available in the website does not save data. Subscribed version allows data storage.	
Benchmarking	None	
Ability of the DST to deliver an impact	Will help farmers identify the most ‘environmentally friendly’ crop protection agents available to them.	

Approach used to generate the outcome from the DST and degree of user interaction	User inputs only their soil type and season and chooses the pesticides they wish to compare.
Additional comments	None



DST 29 Perceelverdeler SUPER-G partner: WUR	
DST provider	Koeien & Kansen (Cows and opportunities)
Funder	Koeien & Kansen (Cows and opportunities), Ministry of Agriculture, Nature and Fishery, ZuivelNL
Brief description	In the Netherlands farmers must provide a farm gate nutrient balance if they use manures. Perceelverdeler provides advice on the optimum distribution of organic manures on dairy farms within N and P distribution allowance. The tool helps to organize the manure application for grass and maize to maximize forage production for quantity and quality.
Links and references	<ul style="list-style-type: none"> • Perceelverdeler news article containing download link • Example report (In Dutch)
Date of first release	2015
Last update	2019
Main purpose (ecosystem service)	6. Grass for livestock, biomass (bioenergy) and other products <ul style="list-style-type: none"> • Nutrient management (including fertilisers and organic manures)
Main purpose	Manure management
Target audience	Farmers Advisors
Format	<ul style="list-style-type: none"> • Software – desk based
Cost/availability	<ul style="list-style-type: none"> • Free
Number of users	Unknown
Country of origin	The Netherlands
Is it country or region specific?	Yes, specific to the Netherlands
Language	Dutch
Is the tool specifically targeted to permanent grassland?	Targeted at all grassland types and maize
Grassland and livestock management	Dairy
Data input required for the DST	Past crop yields obtained from the ANCA tool; past crop NPK offtakes; cropping history and crop rotation; manure volume and the N, P ₂ O ₅ and K ₂ O concentrations; Clover-coverage (%); Grazing intensity; Organic content of soil (%) – required for maize plots and used for potash fertilizer; CEC, crop available NPK in soil; growing of a catch crop; fertilizer use on maize land; information on soil fertility.
Use of data from other existing datasets	ANCA tool
Data export	None
Data storage	Yes, the tool stores yearly input
Benchmarking	None

Ability of the DST to deliver an impact	Optimizes organic manure distribution per field within the farm nutrient allowance. Optimized nutrient distribution reduces losses to the environment and allows for improved grass and maize production
Approach used to generate the outcome from the DST and degree of user interaction	This is an extension of the ANCA tool, a farm gate balance. With additional data of soil and crops the manure distribution can be planned on field level. This tool helps with planning of farm activities. High amount of user interaction, inputting records and data
Additional comments	None

DST 30 Weidevoerkompass SUPER-G partner: WUR	
DST provider	ZuivINL, WUR, PPP-Agro Advies
Funder	ZuivINL, Veenweiden Innovatie Centrum Zegveld, KTC Zegveld PPP-Agro Advies, Wageningen Livestock Research
Brief description	The Weidevoerkompass provides advice on adjustments to the supplementary feed of the dairy cattle based on quality and quantity of the pasture grass the cows have access to. This way nutrient supply can be finely tuned to be highly efficient to reduce excess excretion and cost.
Links and references	Weidevoerkompass webpage and download link
Date of first release	Unknown
Last update	Unknown
Main purpose (ecosystem service)	6. Grass for livestock, biomass (bioenergy) and other products <ul style="list-style-type: none"> • Whole season/long term modelling or forecasting
Main purpose	Grass budgeting tool
Target audience	Farmers
Format	Spreadsheet
Cost/availability	Free
Number of users	Unknown
Country of origin	The Netherlands
Is it country or region specific?	Developed for farmers in the Netherlands and is only applicable here
Language	Dutch
Is the tool specifically targeted to permanent grassland?	All grassland types
Grassland and livestock management	Dairy, grazing
Data input required for the DST	Supplementary feed information, grass values, average number of cows and milk production, grazing information.
Use of data from other existing datasets	None
Data export	Data is saved in an excel spreadsheet
Data storage	Data can be saved in the spreadsheet
Benchmarking	None
Ability of the DST to deliver an impact	Use of the tool will reduce excess nutrient excretion and help maximize on farm feed resources potentially reducing costs incurred by purchase of supplementary feed.
Approach used to generate the outcome from the	Users input quite a lot of data into the spreadsheet which auto-generates values and figures

DST and degree of user interaction	
Additional comments	None





DST 31 Yara Grass N SUPER-G partner: WUR	
DST provider	Yara
Funder	Nutrient Management Institute (NMI)
Brief description	Yara GrassN provides advice on optimum rate and timing of fertilizer application based on the weather and circumstances at the user's company. It focuses on optimal use of nitrogen and therefore high crude protein content. The GrassN app also provides sulphur and potassium recommendations for later cuts.
Links and references	Yara Grass N webpage
Date of first release	Unknown
Last update	Unknown
Main purpose (ecosystem service)	6. Grass for livestock, biomass (bioenergy) and other products <ul style="list-style-type: none"> • Nutrient management (including fertilisers and organic manures)
Main purpose	Grassland fertiliser recommendations
Target audience	Farmers Advisors
Format	<ul style="list-style-type: none"> • Software – mobile application 'app'
Cost/availability	Free
Number of users	Unknown
Country of origin	The Netherlands
Is it country or region specific?	Specific to the Netherlands - recommendations are based on weather of the past weeks and soil types derived from user's local weather station in the Netherlands
Language	Dutch
Is the tool specifically targeted to permanent grassland?	All grassland types
Grassland and livestock management	Not specific to a particular management system or livestock type
Data input required for the DST	Scheduled fertilizer dose. User can input own soil analysis data otherwise it is inferred from nearby results.
Use of data from other existing datasets	Weather of the past weeks, 10-day weather forecast, ground type, soil fertility, and target values for grass production and crude protein.
Data export	None
Data storage	None
Benchmarking	None
Ability of the DST to deliver an impact	The tool provides fertiliser recommendations, which will help growers maximize grassland production.
Approach used to generate the outcome from the	Information on weather and soil type is used to generate a fertiliser recommendation.




DST and degree of user interaction	
Additional comments	None




DST 32	
AgLime Lime calculator	
SUPER-G partner: ADAS	
DST provider	Agricultural Lime Association and the University of Hertfordshire
Funder	Agricultural Lime Association
Brief description	The Lime Calculator allows users to calculate a recommended liming rate (t/ha) based on the cropping (arable or grass), measured soil pH, soil type and liming material to be applied. The system uses Agricultural Lime Association (ALA) recommendations and was developed by the ALA in partnership with The University of Hertfordshire; Agriculture and the Environment Research Unit (AERU).
Links and references	Lime calculator
Date of first release	Unknown
Last update	Unknown
Main purpose (ecosystem service)	<ul style="list-style-type: none"> Grass for livestock, biomass (bioenergy) and other products Nutrient management (including fertilisers and organic manures)
Main purpose	Lime recommendations
Target audience	Farmers Advisors
Format	Software – web based
Cost/availability	Free
Number of users	Unknown
Country of origin	UK
Is it country or region specific?	The tool provides ALA lime recommendations which have been developed for the UK
Language	English
Is the tool specifically targeted to permanent grassland?	All crops including grassland
Grassland and livestock management	Not specific to a particular management system or livestock type.
Data input required for the DST	Crop type (arable or grassland), soil pH and soil type.
Use of data from other existing datasets	None
Data export	None
Data storage	None
Benchmarking	None
Ability of the DST to deliver an impact	The tool provides lime recommendations; applying lime to correct low soil pH will help improve grassland productivity.
Approach used to generate the outcome from the DST and degree of user interaction	User enters soil type and soil pH and the tool provides a lime recommendation. The tool provides a quick and easy method of accessing lime recommendations.

Additional comments	None.
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DST 33 AHDB Better Returns Programme SUPER-G partner: ADAS		
DST provider	AHDB	
Funder	AHDB	
Brief description	<p>The AHDB Beef & Lamb Better Returns Programme (BRP) encourages English beef and sheep producers to evaluate their businesses to identify where improvements can be made in terms of cost reduction, environmental impact and animal performance. BRP skills and knowledge transfer work is carried out through a programme of direct communication with livestock producers combined with practical, free events across England, backed up by a range of informative literature and other resources. The programme focuses on the following key areas: breeding, selection for slaughter, health and fertility, nutrition and forage, and systems and costings. The nutrition and forage area is relevant to grassland management and includes the following BRP guidance manuals:</p> <ul style="list-style-type: none"> • Manual 1 – Improving pasture for better returns • Manual 3 – Improving soils for better returns • Manual 4 – Managing clover for better returns • Manual 5 – Making grass silage for better returns • Manual 7 – Managing nutrients for better returns • Manual 8 – Planning grazing strategies for better returns • Grassland reseedling guide <p>In addition, BRP bulletins are published annually.</p>	
Links and references	AHDB Better Returns Programme	
Date of first release	2012	
Last update	Continuous (last BRP update spring 2019)	
Main purpose (ecosystem service)	6. Grass for livestock, biomass (bioenergy) and other products <ul style="list-style-type: none"> • Nutrient management (including fertilisers and organic manures) • Grass measurement & short term budgeting • Whole season/long term modelling or forecasting • Soil management • Grass variety selection 	
Main purpose	General guidance on all aspects of beef & sheep farm management	
Target audience	Farmers Advisors	
Format	Paper based (available in hard copy or electronic download)	
Cost/availability	Free	
Number of users	25,000 people subscribed to the Better Returns bulletin	
Country of origin	England	
Is it country or region specific?	Guidance produced by AHDB Beef & Lamb for beef & sheep farmers in England, however some of the guidance may be applicable elsewhere	
Language	English	
Is the tool specifically targeted	All grassland	

to permanent grassland?	
Grassland and livestock management	All grassland systems (permanent, temporary, cut and grazed). Targeted mainly at beef and sheep farmers, but some of the guidance is also applicable to dairy farmers.
Data input required for the DST	None – paper-based guidance
Use of data from other existing datasets	None
Data export	None
Data storage	None
Benchmarking	None
Ability of the DST to deliver an impact	The BRP programme provides farmers with guidance on different aspects of grassland management. This good practice guidance may help farmers improve their overall grassland management, therefore improving productivity and profitability.
Approach used to generate the outcome from the DST and degree of user interaction	Good practice guidance on aspects of grassland management.
Additional comments	None


DST 34 AHDB Environmental and Agricultural Resource Efficiency Tool (EAgRET) SUPER-G partner: ADAS		
DST provider	ADAS / Agricultural and Horticultural Development Board (AHDB)	
Funder	Agricultural and Horticultural Development Board (AHDB)	
Brief Description	<p>The primary design focus, and hence use, of EAgRET is to examine the direction of change of emissions of a farm business over a period of time or to examine the potential impact of different management scenarios for a farm business. Whilst EAgRET can be used to provide “one-off” assessments of a farm business, this is not what it was designed for and use in this way could provide a misleading assessment of emissions from a farm business.</p> <p>The tool uses a hierarchical structure to define farm businesses, consisting of farm business, farm enterprise and farm activities, where a farm activity is considered to be the lowest unit at which a farm is managed (e.g. a crop within an arable system or a herd type within a livestock system). This hierarchical structure means that EAgRET is able to represent a wide range of farm business structures and allows EAgRET to define and assess the impacts of transfer of resources between farm activities within a farm business. EAgRET contains a library of default farm activities, farm enterprise and farm business that can be used as the starting point for the development of scenarios of agricultural change or farm business structure change. The default data represents the average UK case for a number of crop and livestock systems.</p> <p>EAgRET uses current best practice for calculation of metrics, with IPCC Tier 1 and Tier 2 calculations used for greenhouse gas emissions, the Defra/ADAS soil surface nutrient balance methodology used to provide nutrient balances, and life cycle analysis methodology and emission factors used to represent other key environmental impacts. EAgRET splits emissions into three categories: embedded emissions from purchased resources, embedded emissions from transferred resources and emissions resulting from farm management processes. This allows greater interpretation of the results, particularly in relation to determining which components of the farm business have the greatest impact on the overall emissions. EAgRET is the first tool that we are aware of that provides this split in the emissions. EAgRET uses an economic basis for assigning metrics to products (and for calculating emissions associated with transferred resources). This is the most common methodology used for assignment of metrics. The metrics calculated using EAgRET are:</p> <ul style="list-style-type: none"> • Crop Protection and veterinary medicines • Primary energy use • Carbon Footprint and Global Warming Potential (CO₂eq) • Abiotic resources • Water usage • Land use • Acidification and Eutrophication 	

	<ul style="list-style-type: none"> • N and P budgets <p>In addition, EAgRET reports the cost of inputs and the value of outputs.</p> <p>Results can be provided at the following scales:</p> <ul style="list-style-type: none"> • Whole Farm Business • Farm Enterprise • Farm Activity (e.g. individual field) • Product
Links and references	<ul style="list-style-type: none"> • Skirvin, D. et al. (2015) AHDB Environmental and Agricultural Resource Efficiency Tool (EAgRET). AHDB Project Report No.74325 • EAgRET webpage and download link
Date of first release	2015
Last update	2015
Main purpose (ecosystem service)	1. Carbon storage and GHG 4. Water quality
Main purpose	Assessment of impact of changing farm structure and/or activity on emissions and resource efficiency.
Target audience	Other (AHDB policy officers)
Format	Desktop tool
Cost/availability	For internal use by AHDB or ADAS only
Number of users	6
Country of origin	UK
Is it country or region specific?	UK specific (but does not include poultry sector)
Language	English
Is the tool specifically targeted to permanent grassland?	No – all farm types
Grassland and livestock management	Not specific to a particular management or livestock type.
Data input required for the DST	Farm resource use data (fertilisers, fuel, feed, forage), farm structure (defined within tool), animal numbers, purchases and sales. Manure management system use.
Use of data from other existing datasets	Default farms based on data provided for UK by AHDB and Scottish Crops Research Institute (SCRI) for key livestock and arable farm types in the UK.
Data export	Custom report as PDF or results as CSV
Data storage	Core data lookup tables stored as CSV. Default farm data stored as XML files. User can save modified farm data files.
Benchmarking	Could be used for benchmarking if data modified over time and tool re-run to get revised outputs, but not designed as benchmarking tool.
Ability of the DST to deliver an impact	Has the potential to allow user to assess scenarios for changing farm structure and inputs and to see impact this would have on costs alongside effect on resource efficiency metrics, including GHG emissions.


Approach used to generate the outcome from the DST and degree of user interaction	Scenario to be examined defined in advance in terms of changes to inputs and farm structure. User modifies default farms to match the scenario information. Tool is run and then output can be exported.
Additional comments	The IP for the tool is shared between ADAS and AHDB. ADAS is able to use the tool, with express permission from AHDB. The tool is not available to users outside of ADAS or AHDB.

DST 35 AHDB feed budget planner SUPER-G partner: ADAS		
DST provider	AHDB	
Funder	AHDB	
Brief description	The feed budget planner is an excel based tool used to help producers forecast how much grass is going to be available at certain times of the year, and helps to plan when supplementation is required. The user enters initial pasture cover (from plate meter measurement), grazing area, grazing days, grass growth, % grass utilization and animal intake. The spreadsheet calculates grass availability compared to animal intake. Guidance is given on appropriate figures for grass growth and animal intake.	
Links and references	Feed budget planner	
Date of first release	2012	
Last update	2018	
Main purpose (ecosystem service)	6. Grass for livestock, biomass (bioenergy) and other products <ul style="list-style-type: none"> • Grass measurement & short-term budgeting • Whole season/long term modelling or forecasting 	
Main purpose	Comparing grass production with livestock demand.	
Target audience	Farmers Advisors	
Format	Spreadsheet (downloadable excel spreadsheet)	
Cost/availability	Free	
Number of users	823 page views from Jan – Dec 2019	
Country of origin	England	
Is it country or region specific?	Guidance produced by AHDB Beef & Lamb for beef & sheep farmers in England, however the calculations are applicable elsewhere.	
Language	English	
Is the tool specifically targeted to permanent grassland?	All grassland types	
Grassland and livestock management	All grassland systems (permanent, temporary, cut and grazed). Targeted at beef and sheep farmers – example livestock intake values given for beef & sheep livestock categories.	
Data input required for the DST	Pasture cover, grazing area, grazing days, grass growth prediction, % grass utilization, animal intake, and supplementation.	
Use of data from other existing datasets	None	
Data export	None	
Data storage	Yes – data can be saved in excel spreadsheet.	
Benchmarking	None	
Ability of the DST to deliver an impact	Tool helps farmers forecast grass growth compared to livestock demand enabling them to plan for periods when grass growth exceeds or is below demand. In this way, then tool helps farmers improve their grass management.	

Approach used to generate the outcome from the DST and degree of user interaction	User enters information to calculate grass production and livestock demand – the two values are compared to highlight over/under production of grass to meet livestock requirements.
Additional comments	None

DST 36 AHDB Nutrient Management Guide (RB209) SUPER-G partner: ADAS		
DST provider	AHDB	
Funder	Current edition funded by AHDB; previous editions funded by Defra	
Brief description	<p>The Nutrient Management Guide (RB209) provides fertiliser recommendations and nutrient management advice for England, Wales and Northern Ireland. RB209 was first published by the UK Ministry of Agriculture (MAFF) in 1973 and has been periodically updated to incorporate the results of new research. The current 9th Edition was published by AHDB (UK Levy board) in 2016. RB209 provides ‘industry standard’ economic optimum fertiliser recommendations for arable, grassland and field grown horticultural crops. In addition, RB209 provides good practice soil and nutrient management advice. The Guide is published as seven sections and sections 1-3 to relevant to grassland management:</p> <ul style="list-style-type: none"> • Section 1: Principles of nutrient management • Section 2: Organic materials • Section 3: Grass and forage crops 	
Links and references	Nutrient Management Guide (RB209)	
Date of first release	1 st edition published in 1973	
Last update	Current 9 th edition published in 2016 and last updated Jan 2019	
Main purpose (ecosystem service)	6. Grass for livestock, biomass (bioenergy) and other products <ul style="list-style-type: none"> • Nutrient management (including fertilisers and organic manures) • Soil management 	
Main purpose	Fertiliser recommendations and nutrient management advice	
Target audience	Farmers Advisors Policy makers	
Format	Paper based (hard copy and electronic download) Software – mobile application ‘app’ (all sections of RB209 also available in an app)	
Cost/availability	Free	
Number of users	Unknown – but likely to be high as industry standard fertiliser recommendations.	
Country of origin	UK (excluding Scotland)	
Is it country or region specific?	Fertiliser recommendations are specific to England, Wales and Northern Ireland.	
Language	English	
Is the tool specifically targeted to permanent grassland?	All crops including grassland	
Grassland and livestock management	Not specific to a particular management system or livestock type. RB209 provides fertiliser recommendations for both cut and grazed grass for dairy, beef and sheep livestock systems.	
Data input required for the DST	No specific data entry (guidance document). User needs certain farm and field details including annual rainfall, soil type, past cropping, soil	


	analysis, planned cropping and planned manure use in order to select the correct recommendations.
Use of data from other existing datasets	None (RB209 is based on the results of a large amount of nutrient management research, but the published guidance does not dynamically use data from other datasets)
Data export	No
Data storage	No
Benchmarking	No
Ability of the DST to deliver an impact	RB209 provides guidance for farmers to improve their farm nutrient management. This has the potential to improve crop growth, farm profitability and reduce diffuse pollution (by maximizing nutrient use efficiency).
Approach used to generate the outcome from the DST and degree of user interaction	User needs basic farm and field details to select the appropriate value from tables of fertiliser recommendations.
Additional comments	RB209 fertiliser recommendations are the industry standard fertiliser recommendations and are the basis for fertiliser recommendations provided in the majority of other nutrient management DST in England and Wales, including PLANET and commercial tools such as GateKeeper (Farmplan), Greenlight grower management/Crop Walker (Muddyboots) and Pear Agrii software. RB209 fertiliser recommendations are applicable in England, Wales and Northern Ireland, but not Scotland (Scottish recommendations are given in SRUC Technical Notes).

DST 37 Cool Farm Tool (CFT) SUPER-G partner: University of Aberdeen, UK		
DST provider	The Cool Farm Alliance	
Funder	Funded by research projects from >40 Industry partners (see https://coolfarmtool.org/) and also from NERC (through two Knowledge Exchange fellowships)	
Brief description	<p>The Cool Farm Tool is a farm-level greenhouse gas calculator for estimating net GHG emissions, biodiversity and water quality from agriculture. While harmonized with other calculators, this tool is characterized by:</p> <ul style="list-style-type: none"> • Its farmer focused, being as management sensitive as possible while requiring only input data a farm manager would typically have • Its uses of site sensitive empirical models built from hundreds of peer-reviewed studies. <p>This calculator takes the estimates of technical potential to the farm and uncovers what is practical and pragmatic from a farmer and field perspective. The Cool Farm Tool sits between calculators using simple emission factor approaches (IPCC Tier 1) and Process-Based models that require a greater level of data input and training to interpret (IPCC Tier 3).</p>	
Links and references	<ul style="list-style-type: none"> • CFT webpage on Cool Farm Alliance website • Hillier, J., Walter, C., Malin, D., Garcia-Suarez, T., Mila-i-Canals, L., Smith, P., 2011. A farm-focused calculator for emissions from crop and livestock production. <i>Environmental Modelling & Software</i> 9, 1070–1078. • Hillier, J., Smith, P., Bandel, T., Daniels, S., Malin, D., Hamilton, H. & Walter, C. 2012. Farm-scale greenhouse gas emissions using the cool farm tool: Application of a generic farming emissions calculator in developing countries. In: <i>Climate Change Mitigation and Agriculture</i> (ed. Wollenberg, E., Nihart, A., Tapio-Biström, M. & Grieg-Gran, M.), Earthscan, London. pp. 217-226. • Hillier, J & Smith, P. 2016. The Cool Farm Tool. <i>Food Science and Technology</i> 30, 21-23. • Vetter, S.H., Malin, D, Smith, P. & Hillier, J. 2018. Reducing GHG emissions in egg production by using the Cool Farm Tool. <i>Journal of Cleaner Production</i> 202, 1068-1076. doi: 10.1016/j.jclepro.2018.08.199. 	
Date of first release	The Cool Farm Tool released for the first time in 2011; see Hillier <i>et al.</i> (2011).	
Last update	CFT version 2.0 was released in April 2019.	
Main purpose (ecosystem service)	<ol style="list-style-type: none"> 1. Biodiversity and pollination (3rd) 2. Carbon storage and GHG (1st) 4. Water quality (2nd) 	
Main purpose	Carbon/ GHG/Biodiversity/Water	
Target audience	Farmers Advisors Other: Food chain actors (agri food industry)	

Format	Software – desk based Software – web based
Cost/availability	Free; license
Number of users	Used by 6529 farms in 46 countries
Country of origin	The UK – but applicable all over the world
Is it country or region specific?	The CFT can be applied in any country or region globally.
Language	English
Is the tool specifically targeted to permanent grassland?	The CFT can be used for all crops including grassland, except those grown in non-soil media (e.g. greenhouses or hydroponically)
Grassland and livestock management	Not specific to a particular management system or livestock type
Data input required for the DST	Main data required are: meteorological data, soil and site characteristics, and farm management data (e.g. fertilizer type, amount, timing, farm operations, tillage, irrigation, animal feeds etc.).
Use of data from other existing datasets	The CFT uses climate and soils data which are taken from global databases using farm location – but characteristics can also be input by the user
Data export	The tool's output data can be shared with other tools by via CSV output files (from CFT) that can be used by other tools.
Data storage	Some of the input data can be saved within the tool. However, the output data needs to be saved outside the tool otherwise they are overwritten by output data from the next run.
Benchmarking	The tool's output can be used for comparisons – the tool can be used on multiple farms and the farms compared (see Vetter <i>et al.</i> , 2018).
Ability of the DST to deliver an impact	The CFT gives an estimation for GHG under different farm management systems and grass yields. This information can be used by farmers to improve their management systems and reduce GHG emissions.
Approach used to generate the outcome from the DST and degree of user interaction	The tool is very simple and can be easily used by the farmer. It typically takes 1 hour to input all data and run the model. The user enters all the input data then runs the tool to get the output.
Additional comments	None

DST 38 Corteva Grassland App SUPER-G partner: ADAS	
DST provider	Corteva
Funder	Corteva
Brief description	The Corteva grassland app can be used to help identify weeds in grassland and select appropriate herbicides. Users can select up to three of the most prominent weeds in their grassland and based on this the tool will give a herbicide recommendation. The app includes a photo library of weeds to help identification. In addition, the user can select weed type and % weed cover and the app will estimate the grass yield and financial cost of the weeds. All product recommendations are for Corteva products. Product information is included in the app. The app is available on iphone or android and as a web-based calculator.
Links and references	Corteva Grassland App
Date of first release	2015
Last update	2019
Main purpose (ecosystem service)	6. Grass for livestock, biomass (bioenergy) and other products
Main purpose	Grassland weed management
Target audience	Farmers Advisors
Format	Software – web based Software – mobile application ‘app’
Cost/availability	Free
Number of users	Unknown
Country of origin	UK
Is it country or region specific?	Developed for the UK market, but guidance on grassland weed management could be used elsewhere
Language	English
Is the tool specifically targeted to permanent grassland?	All grassland types
Grassland and livestock management	Not specific to a particular management system or livestock type.
Data input required for the DST	Weed type, % weed cover, age of grass, weed size, spray application method and grass use (cut/grazed and livestock type)
Use of data from other existing datasets	None
Data export	None
Data storage	None
Benchmarking	None
Ability of the DST to deliver an impact	The tool provides guidance on weed identification and treatment. Effective weed treatment will improve grassland productivity and farm profitability.

Approach used to generate the outcome from the DST and degree of user interaction	The user enters details on weeds present in grassland and the app provides herbicide recommendations. The app is produced by Corteva and all product recommendations are for Corteva products.
Additional comments	None

DST 39 Crop Nutrient Recommendation Calculator SUPER-G partner: AgriSearch		 Department of Agriculture and Rural Development <small>www.dardni.gov.uk</small>
DST provider	Developed for Department of Agriculture, Environment and Rural Affairs (DAERA)	
Funder	DAERA	
Brief description	<p>This tool will help the farm to comply with nutrient limit requirements and draw up a nutrient management plan (NMP) for the farm. This tool is used to determine the nitrogen, phosphate and potash required by crops. When the tool is used for the three main nutrients, it will improve soil fertility, optimise application rates, increase crop yields and help to reduce chemical fertiliser costs.</p> <p>The farmer enters the field information (e.g. soil type and soil sample information; P and K index), the cropping details (crop type) and the levels of organic manure and chemical fertiliser applied. The tool will determine how much of each nutrient is required by the crop based on the information provided and compare this to the nutrients applied and advice of any surpluses or deficits. The tool is also useful for storing information required for record keeping.</p>	
Links and references	<ul style="list-style-type: none"> • Farm nutrient management calculators (online service only available to farm businesses with a Business ID) • Paper based workbook 	
Date of first release	2014	
Last update	2015 (start of last NAP)	
Main purpose (ecosystem service)	4. Water quality (2 nd) 6. Grass for livestock, biomass (bioenergy) and other products <ul style="list-style-type: none"> • Nutrient management (including fertilisers and organic manures) (1st) 	
Main purpose	Fertiliser recommendations	
Target audience	Farmers Advisors	
Format	Software - Web based Paper-based worksheet (MSWord document) available to download without registration	
Cost/availability	Free online service for farm businesses with business ID.	
Number of users	Unknown	
Country of origin	Northern Ireland	
Is it country or region specific?	Yes – generates fertiliser recommendations specific to Northern Ireland.	
Language	English	
Is the tool specifically targeted to permanent grassland?	All crops including grassland	
Grassland and livestock management	Not specific to a particular management system or livestock type.	

Data input required for the DST	Land area, type and amount of fertilizer sown and organic manures applied, type of crop (including differing grass systems e.g. grazing, silage etc), cropping history
Use of data from other existing datasets	No
Data export	No
Data storage	Yes
Benchmarking	No
Ability of the DST to deliver an impact	Used mainly for compliance
Approach used to generate the outcome from the DST and degree of user interaction	User enters details of soil analysis, past cropping, planned cropping, and planned fertiliser and organic manures and the tool provides guidance on whether the farm is over or under the nutrient limits.
Additional comments	None

DST 40 ECOSSE model SUPER-G partner: University of Aberdeen, UK		ECOSSE
DST provider	The model was produced by Prof Jo Smith (jo.smith@abdn.ac.uk)	
Funder	Funded by research projects; originally via the Scottish Government, but with applications in various projects funded by UKRI (NERC, BBSRC, EPSRC), the Energy Technologies Institute (ETI), UKERK and the EU under FP7 and H2020.	
Brief description	<p>The ECOSSE (Estimation of Carbon in Organic Soils – Sequestration and Emissions) model simulates soil carbon and nitrogen dynamics in both mineral and organic soils using meteorological, land use, land management and soil data, and simulates changes in soil organic carbon and soil greenhouse-gas emissions. The model is able to function at the field scale or at the national scale (using only the limited data available at this scale).</p> <p>ECOSSE was developed from concepts originally derived for mineral soils in the RothC model and SUNDIAL model, but has been expanded to simulate processes in peatlands and other organic soils. ECOSSE describes soil organic matter using 5 pools: inert organic matter, humus, biomass, resistant plant material and decomposable plant material. All of the major processes of carbon and nitrogen turnover are included in the model, but each process is simulated using only simple equations driven by readily available inputs. This enables ECOSSE to be used for national scale simulations for which only limited input data are available.</p> <p>ECOSSE simulates the soil profile to a depth of up to 3m, dividing the soil into 5 cm layers to facilitate the accurate simulation of processes to depth. Plant carbon and nitrogen inputs are added monthly to the resistant and decomposable plant material pools. During the decomposition process, material is exchanged between the soil organic matter pools according to first-order equations, characterised by a specific decomposition rate for each pool. The decomposition rate of each pool is modified dependent on the temperature, water content, plant cover and pH of the soil. The decomposition process results in gaseous losses of CO₂ and CH₄, with CO₂ losses dominating under aerobic conditions and CH₄ losses under anaerobic conditions. The nitrogen content of the soil follows the decomposition of the soil organic matter, with a stable C:N ratio defined for each soil organic matter pool at a given pH.</p>	
	<ul style="list-style-type: none"> • User Manual (weblink) • Abdalla, M., Hastings, A, Bell, M., Smith, J.U., Richards, M., Nilsson, M.B., Peich, M., Löfvenius, M.O., Lund, M., Helfter, C., Nemitz, E., Sutton, M.A., Aurela, M., Lohila, A., Laurila, T., Dolman, A.J., Beilelli-Marchesini, L., Pogson, M., Jones, E. Drewer, J., Drosler, M. • Smith, P. 2014. Simulation of CO₂ and attribution analysis at six European peatland sites using the ECOSSE model. <i>Water, Air & Soil Pollution</i> 225:2182. doi: 10.1007/s11270-014-2182-8. (14pp.). 	

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- Smith, J.U., Gottschalk, P., Bellarby, J., Chapman, S., Lilly, A., Towers, W., Bell, J., Coleman, K., Nayak, D.R., Richards, M.I., Hillier, J., Flynn, H.C., Wattenbach, M., Aitkenhead, M., Yeluripurti, J.B., Farmer, J., Milne, R., Thomson, A., Evans, C., Whitmore, A.P., Falloon, P. & Smith, P. 2010. Estimating changes in national soil carbon stocks using ECOSSE – a new model that includes upland organic soils. Part I. Model description and uncertainty in national scale simulations of Scotland. *Climate Research* 45, 179-192. doi: 10.3354/cr00899.
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	<p>includes upland organic soils. Part II. Application in Scotland. <i>Climate Research</i> 45, 193-205. doi: 10.3354/cr00902.</p> <ul style="list-style-type: none"> Smith, P., Smith, J.U., Flynn, H., Killham, K., Rangel-Castro, I., Foereid, B., Aitkenhead, M., Chapman, S., Towers, W., Bell, J., Lumsdon, D., Milne, R., Thomson, A., Simmons, I., Skiba, U., Reynolds, B., Evans, C., Frogbrook, Z., Bradley, I., Whitmore, A., Falloon, P. 2007. ECOSSE: Estimating Carbon in Organic Soils - Sequestration and Emissions. Final Report. SEERAD Report. ISBN 978 0 7559 1498 2. 166pp.
Date of first release	The ECOSSE model was released for the first time in 2007 (Smith <i>et al.</i> , 2007)
Last update	The tool was last updated in 2018.
Main purpose (ecosystem service)	2. Carbon storage and GHG
Main purpose	ECOSSE simulates soil carbon and nitrogen dynamics in both mineral and organic soils using meteorological, land use, land management and soil data, and simulates changes in soil organic carbon and soil greenhouse-gas emissions
Target audience	Farmers Policy makers Other: Researchers
Format	Software – desk based
Cost/availability	Free
Number of users	Used mostly in Europe (number of users unavailable)
Country of origin	UK
Is it country or region specific?	The tool can be used worldwide (it is not country or region specific)
Language	English
Is the tool specifically targeted to permanent grassland?	The tool can be used for all crops types (including grassland) and natural ecosystems, including peatlands.
Grassland and livestock management	Via carbon/fertilizer inputs
Data input required for the DST	Climate, site, soil and land use data (arable, grass, forestry, natural/semi-natural), and land management data (e.g. fertilizer type, amount, timing, farm operations, tillage, irrigation, on farms, tree planting and management in forests, water table management on peatlands etc.) .
Use of data from other existing datasets	The tool utilizes data from other sources e.g. weather data, soil data. The spatial version uses global soil data at 1km resolution from the Harmonized World Soils Database, and high-resolution meteorological data (based on past measurements and future projections) from various sources depending on application. The site version can use meteorological data recorded at the site or can access data from the spatial datasets described above.
Data export	The tool's output data could be shared with other tools via output files in ASCII, CSV or NetCDF format.


Data storage	Yes. Some of the input data can be saved within the tool. However, the output data need to be saved outside the tool otherwise, they would be overwritten by output data from the next run.
Benchmarking	The tools does not provide benchmarking, however the tool's output could be used for comparisons.
Ability of the DST to deliver an impact	The ECOSSE model gives an estimation of SOC and GHG emissions for different management systems/scenarios. This information can be used by e.g. farmers/policy makers to select/ improve the management system and thereby, reduce input cost and improve ES delivery
Approach used to generate the outcome from the DST and degree of user interaction	Previous studies showed that the tool is very reliable in estimating SOC and GHG emissions from soils. However, the tool is insensitive to animal grazing and needs to be improved further in this respect. The user enters all of the required climate, site, soil and management input data and run the tool to generate the output.
Additional comments	None



DST 41 Farm crap app SUPER-G partner: ADAS	
DST provider	Dutch College and Rothamsted North Wyke
Funder	Defra via RDPE funding for the SWARM Hub, Rothamsted Research Technology Innovation Programme (TIPs), ERDF through the Agri Tech Cornwall project.
Brief description	<p>The Farm Crap App is a manure management DST designed to raise awareness amongst farmers and growers about the nutritive and economic values of slurries and manures. The tool is available as a mobile application. The mobile app includes the following functions:</p> <ul style="list-style-type: none"> • Calculator that determines the crop available N, P and K supply from applications of organic manures. • Image library which allows farmers to visually assess their manure application rate by comparing with photos. • Record keeping – the user can set up fields and add details of manure application. • RB209 calculator that estimates crop nutrient recommendations to help the user integrate their manure application into a field nutrient management plan.
Links and references	<ul style="list-style-type: none"> • Farm crap app website • Wilson, B., Hodgson, C.J., Reigate, C. and Roderick, S. (2015) Development of a mobile application for manure management – ‘The Farm Crap App’. In Proceedings of 16th International Conference Rural-Urban Symbiosis, RAMIRAN 2015, 8th – 10th September 2015, Hamburg, Germany. pp 40-42
Date of first release	2014
Last update	2019
Main purpose (ecosystem service)	6. Grass for livestock, biomass (bioenergy) and other products <ul style="list-style-type: none"> • Nutrient management (including fertilisers and organic manures)
Main purpose	Nutrient management – organic manures
Target audience	Farmers Advisors
Format	Software – mobile application ‘app’
Cost/availability	Free
Number of users	3500 downloads across iOS and Android versions available
Country of origin	England
Is it country or region specific?	The tool is based on advice and information on organic manures contained in the Nutrient Management Guide (RB209) which is specific to the UK
Language	English
Is the tool specifically targeted to permanent grassland?	All crop types including grassland.
Grassland and livestock management	Not specific to a particular management system or livestock type. The tool can be used for applications of organic materials to any grassland type (or other cropping).



Data input required for the DST	Details of the organic manure application including manure type, season of application, soil type, application rate, method of application and manure analysis if available.
Use of data from other existing datasets	The tool uses Google map data to help farmers map their fields.
Data export	Yes – files can be shared with other users. Data can be exported as a csv data file or within the app to other users who have the app installed.
Data storage	Data entered into the tool can be saved. Multiple 'files' can be saved within the tool.
Benchmarking	None
Ability of the DST to deliver an impact	The DST provides an estimate of crop available nutrient supply from applications of organic material. This information can be used by farmers to improve their nutrient use. This has the potential to improve farm profitability and reducing diffuse pollution (by maximizing nutrient use efficiency)
Approach used to generate the outcome from the DST and degree of user interaction	User enters information on the organic manure application, cropping and soil test results. This input data is used to provide an estimate of crop available nutrient supply (based on information in the Nutrient Management Guide, RB209)
Additional comments	The Farm Crap app performs a similar function to MANNER-NPK (DST 50).


DST 42 farmGRAZE SUPER-G partner: ADAS		
DST provider	Mobile Farm	
Funder	Mobile Farm (an initiative of Aberystwyth University and the Centre of Excellence for UK Farming)	
Brief description	farmGRAZE is a mobile app (for Android) to help farmers measure, record and manage the grazing platform. User enters grass growth information and the app calculates the level of grazing in the field and gives advice on how to manage it. The paid version also plots the grass wedge for the farm, provides a grazing average and export records in spreadsheet format or to other software packages.	
Links and references	FarmGRAZE webpage on Mobile Farm apps	
Date of first release	Unknown	
Last update	2012	
Main purpose (ecosystem service)	6. Grass for livestock, biomass (bioenergy) and other products <ul style="list-style-type: none"> • Grass measurement & short term budgeting 	
Main purpose	Measure and monitor grass growth	
Target audience	Farmers Advisors	
Format	Mobile app (Android)	
Cost/availability	farmGRAZE lite free farmGRAZE paid £5.99	
Number of users	Unknown	
Country of origin	UK	
Is it country or region specific?	Developed for UK market, but could be used elsewhere	
Language	English	
Is the tool specifically targeted to permanent grassland?	Targeted at grazed grass	
Grassland and livestock management	Not specific to a particular management system or livestock type.	
Data input required for the DST	30 sward heights (cm) are input for each field or kg DM/ha can be used where available. The user selects grazing livestock and grazing type.	
Use of data from other existing datasets	None	
Data export	Export to excel (paid version)	
Data storage	Yes	
Benchmarking	None	
Ability of the DST to deliver an impact	The app can be used to help farmers record and track grass growth to help improve efficiency and utilisation of grass.	
Approach used to generate the outcome from the	User enters grass growth information. The app calculates the level of grazing in the field and advice on how to manage it.	

DST and degree of user interaction	
Additional comments	Unsure if app is still actively supported. No response to queries via website or user feedback on App store.




DST 43 Farmscoper SUPER-G partner: ADAS	
DST provider	ADAS
Funder	DEFRA
Brief description	<p>The Farmscoper model is an excel-based decision support tool used to assess diffuse agricultural pollutant loads on a farm and quantify the impacts of farm pollution mitigation options on these. The tool allows for the creation of unique farming systems, based on combinations of livestock, cropping and manure management, and the assessment of the cost and effect of one or more mitigation methods from a library of over 100 methods contained within the tool, many based upon the Mitigation Method User Guide (Newell-Price <i>et al.</i>, 2011). It was originally designed to aid policy analysis, to demonstrate how impacts differ for typical farm systems.</p>
Links and references	<ul style="list-style-type: none"> • Farmscoper webpage • Goody, R. D. et al., 2014. Modelling the cost-effectiveness of mitigation methods for multiple pollutants at farm scale. Science of The Total Environment, Volume 468-469, pp. 1198-1209.
Date of first release	2010
Last update	2017
Main purpose (ecosystem service)	4. Water quality
Main purpose	Farmscoper is a decision support tool that can be used to assess diffuse agricultural pollutant loads on a farm and quantify the impacts of farm mitigation methods on these pollutants.
Target audience	Policy makers
Format	Spreadsheet Software – desk based
Cost/availability	Free
Number of users	Unknown
Country of origin	UK
Is it country or region specific?	Pollutant loss coefficients representative of conditions and management practices for England and Wales.
Language	English
Is the tool specifically targeted to permanent grassland?	All crop types
Grassland and livestock management	Not specific to a particular management system or livestock type.
Data input required for the DST	Crop areas, fertiliser rates, livestock numbers, manure management, uptake of mitigation measures.
Use of data from other existing datasets	No

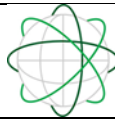
Data export	Pollutant data is in Excel format, so can be copied into other applications.
Data storage	Input and output data can be stored by saving the spreadsheets.
Benchmarking	The tool could potentially be used to compare with results for other farms or regional averages, but is not designed to be accurate for a specific farm, rather indicative of a typical farm comparable to that.
Ability of the DST to deliver an impact	The tool is designed to quantify reduced pollutant emissions associated with the uptake of mitigation measures.
Approach used to generate the outcome from the DST and degree of user interaction	User enters the crop areas, fertiliser rates, livestock numbers, manure management and selects a soil and climate type. The tool then generates 'baseline' pollutant losses, using a set of export coefficients contained within Farmscoper that are derived from more detailed modelling work. The user then enters uptake rates of different mitigation measures and the impacts of these on the 'baseline' pollutant losses are estimated.
Additional comments	None

DST 44 Forage for knowledge SUPER-G partner: ADAS		
DST provider	AHDB	
Funder	AHDB	
Brief description	AHDB newsletter for the Dairy, Beef and Sheep sections containing information on the production and utilization of high-quality forage. The newsletter is produced bi-monthly during the grazing season and contains topical articles on all aspects of forage management including grass measurement, grazing strategies, nutrient management, soil management etc. The newsletter is emailed directly to subscribers and is also available to download from the website.	
Links and references	Forage for knowledge	
Date of first release	2009 (first newsletter)	
Last update	2020 (most recent newsletter)	
Main purpose (ecosystem service)	6. Grass for livestock, biomass (bioenergy) and other products <ul style="list-style-type: none"> • Nutrient management (including fertilisers and organic manures) • Grass measurement & short term budgeting • Whole season/long term modelling or forecasting • Soil management • Grass variety selection 	
Main purpose	Grassland management	
Target audience	Farmers Advisors	
Format	Paper based (email and available to view online)	
Cost/availability	Free	
Number of users	11,000 Recipients	
Country of origin	UK	
Is it country or region specific?	Guidance produced by AHDB for dairy, beef and sheep farmers in the UK, however the guidance may also be applicable elsewhere.	
Language	English	
Is the tool specifically targeted to permanent grassland?	All grassland	
Grassland and livestock management	Not specific to a particular management system or livestock type.	
Data input required for the DST	None (guidance)	
Use of data from other existing datasets	None	
Data export	None (guidance)	
Data storage	None (guidance)	
Benchmarking	None (guidance)	

Ability of the DST to deliver an impact	Newsletters provide topical information to help farmers improve their grassland management.
Approach used to generate the outcome from the DST and degree of user interaction	Newsletters provide topical information to help farmers improve their grassland management. Newsletters are bi-monthly during the grazing season and guidance is adjusted for seasonal factors, i.e. climatic anomalies.
Additional comments	None


DST 45 Gatekeeper SUPER-G partner: ADAS		
DST provider	Farmplan	
Funder	Farmplan	
Brief description	<p>Gatekeeper is a whole farm crop recording software. Users can plan and record field activities including cultivations, sowing and harvesting, fertiliser and Agrochemical use. The nutrient management module generates RB209 fertiliser recommendations. Agrochemical use can be recorded and checked against legislative approvals. Gatekeeper provides a range of mapping options allowing users to mark and measure field areas and boundaries. A precision farming module allows import and storage of spatial data such as yield maps, satellite data and soil analysis data. Users can also create variable rate plans based on their spatial data.</p>	
Links and references	Gatekeeper	
Date of first release	Unknown	
Last update	2019	
Main purpose (ecosystem service)	6. Grass for livestock, biomass (bioenergy) and other products i. Nutrient management (including fertilisers and organic manures)	
Main purpose	Farm management/crop recording software	
Target audience	Farmers Advisors	
Format	Software – desk based Software – web based	
Cost/availability	Charged for (costs unavailable on website)	
Number of users	Unknown	
Country of origin	UK	
Is it country or region specific?	Fertiliser recommendations and agrochemical approvals are specific to the UK	
Language	English	
Is the tool specifically targeted to permanent grassland?	All crops including grassland	
Grassland and livestock management	Not specific to a particular management system or livestock type. The tool will generate RB209 fertiliser recommendations for both cut and grazed grass for dairy, beef and sheep livestock systems.	
Data input required for the DST	Farm, field and crop management details.	
Use of data from other existing datasets	None	
Data export	Reports can be downloaded	
Data storage	Data entered into the tool can be saved and shared with other users (e.g. farmers/agronomists)	
Benchmarking	None	

Ability of the DST to deliver an impact	Crop recording software mainly used for record keeping and compliance checking. User enters cropping information and this can be used to provide fertiliser recommendations and check agrochemical usage meets legislative approvals.
Approach used to generate the outcome from the DST and degree of user interaction	Crop recording software – significant level of user interaction.
Additional comments	None


DST 46 Grass SAT by Rezatec SUPER-G partner: ADAS		 Grass SAT BY REZATEC
DST provider	Rezatec	
Funder	Rezatec	
Brief description	Grass SAT is a pasture management tool which uses satellite remote sensing combined with a grass growth model to forecast a daily grass cover value (kg DM/ha). The grass growth model uses daily weather data. The user enters information on grass management (cutting or grazing) during the season. The tool provides information on the amount of grass available, grass growth per day, number of days to graze each paddock, wedge and non-wedge analysis, average grass cover across the farm and paddock health analysis.	
Links and references	Grass SAT	
Date of first release	2019	
Last update	2020	
Main purpose (ecosystem service)	6. Grass for livestock, biomass (bioenergy) and other products <ul style="list-style-type: none"> • Grass measurement & short-term budgeting • Whole season/long term modelling or forecasting 	
Main purpose	Estimate grass covers	
Target audience	Farmers Advisors	
Format	Software – web based	
Cost/availability	Charged for: £30/month for <100 ha, £45/month for 100-199 ha and £83/month for 200-349 ha.	
Number of users	Unknown	
Country of origin	UK	
Is it country or region specific?	Currently available in the UK to be launched in Europe, Americas and Australasia during 2020.	
Language	English	
Is the tool specifically targeted to permanent grassland?	All grassland types	
Grassland and livestock management	Not specific to a particular management system or livestock type.	
Data input required for the DST	Field/paddock sizes – map directly into Grass SAT system, grass management (cutting/grazing), livestock details	
Use of data from other existing datasets	Yes - Grass SAT uses external data from both satellites and geological datasets which includes weather, soils etc. This data is both current and historic and is fed into the grass growth model.	
Data export	Yes	
Data storage	Yes – the user can save information for their farm	
Benchmarking	None	
Ability of the DST to deliver an impact	The DST provides an estimate of grass covers which can be used to help improve grass utilization.	
Approach used to generate the	Remotely collected data sets including daily weather, soil, Earth observation (from satellites) are fed into an intelligent grass growth	

outcome from the DST and degree of user interaction	model to provide continual estimates of grass cover. The user is also required to update specific activities e.g. cutting and grazing, which can be performed using the Grass SAT mobile app.
Additional comments	Performance management analytics enabling paddock and farm level insights and grass cover forecasting tools will be launched in early 2020.




DST 47 GrassCheck SUPER-G partner: AgriSearch		
DST provider	AgriSearch/AFBI	
Funder	Department of Agriculture (DAERA) and AgriSearch	
Brief Description	<p>GrassCheckNI was set up in 1999 and is operated by AgriSearch and AFBI along with the support from the Department of Agriculture, Environment and Rural Affairs (DAERA), the College of Agriculture, Food and Rural Enterprise (CAFRE) and the Centre for Innovation Excellence in Livestock (CIEL). The project monitors weekly grass growth and quality and provides seven- and 14-day grass growth rate forecasts to support farmers in managing pasture surpluses and deficits throughout the growing season.</p> <p>GrassCheckGB was developed from the successful GrassCheckNI project and launched in 2019. A group of dairy industry sponsors and the three GB levy bodies AHDB, HCC and QMS are working with CIEL and researchers at AFBI and Rothamsted Research to establish a network of up to 50 grass pilot farms across England, Scotland and Wales in 2019</p>	
Reference	GrassCheckNI GrassCheckGB	
Date of first release	1999 (GrassCheckNI) and 2019 (Grasscheck GB)	
Last update	Bulletin issued on a weekly basis throughout growing season. Format of GrasscheckNI bulletin last updated in 2017.	
Main purpose (ecosystem service)	6. Grass for livestock, biomass (bioenergy) and other products <ul style="list-style-type: none"> • Grass measurement & short term budgeting 	
Main purpose	<p>Historically GrassCheck was based on grass plot data. In 2017 farmer co-researchers were recruited to expand the project to bring in grass and quality data from 48 commercial dairy (20), beef (22) and sheep (6) farms across N.I. Each of the farmer co-researchers are equipped with rising plate-meters to measure grass covers. In addition, 24 weather stations were deployed on these pilot farms to record meteorological data from across N.I. This technology is used to provide farmers with up-to-date information of grass growing conditions and grass quality in their locality to help them make the most of this valuable resource.</p>	
Target audience	Farmers Advisors Policy makers	
Format	Web based: Weekly online bulletin Paper guidance: During grazing season, weekly bulletin will feature in the farming press.	
Cost/availability	During the grass growing season, bulletins are free and widely available to anyone <i>via</i> farming press or online on the GrassCheck website or social media.	
Number of users	Estimated 10,000 (GrassCheckNI).	
Country of origin	UK	
Is it country or region specific?	GrassCheckNI specific to Northern Ireland. GrassCheckGB specific to England, Wales and Scotland	

Language	English
Is the tool specifically targeted to permanent grassland?	No, the tool measures all types of grass across a network of commercial dairy, beef and sheep farms.
Grassland management	The tool measures grass growth and quality on farms with all the main grazing livestock sectors in the UK (dairy, beef and sheep). The data is gathered from a mixture of livestock management grazing systems including; set stocking, rotational grazing, non-grazing and zero-grazing/grazing combined.
Data input required for the DST	None
Use of data from other existing datasets	None
Data export	No
Data storage	No
Benchmarking	Against seasonal averages and location
Ability of the DST to deliver an impact	Surveys carried out indicate that farmers find the GrassCheckNI tool useful and do take action based on its recommendations. The data has also been used for policy decisions (e.g. advanced payment of CAP payments)
Approach used to generate the outcome from the DST and degree of user interaction	No user interaction
Additional comments	None


DST 48 Greenlight Grower Management SUPER-G partner: ADAS		
DST provider	MuddyBoots software	
Funder	MuddyBoots software	
Brief description	<p>Greenlight grower management (GGM) is a web-based crop recording software tool. Users can plan and record field activities including cultivations, sowing and harvesting, fertiliser and agrochemical use. The nutrient management module generates RB209 fertiliser recommendations. Agrochemical use can be recorded and checked against legislative approvals. Greenlight Grower Management also provides farm mapping functionality, allowing users to plot field boundaries and record geo-referenced crop details such as pest or disease inspections. The Precision Farming module allows users to manage spatial data such as yield maps, soil nutrient maps and crop performance maps (i.e. satellite NDVI imagery). A mobile 'app' links to the web-based software so that information can be accessed and recorded in the field.</p>	
Links and references	Greenlight Grower Management	
Date of first release	CropWalker (the preceding desk-based tool) was released in 1990's	
Last update	2020 - updated continuously	
Main purpose (ecosystem service)	6. Grass for livestock, biomass (bioenergy) and other products ii. Nutrient management (including fertilisers and organic manures)	
Main purpose	Crop recording software	
Target audience	Farmers Advisors	
Format	Software – web based Software – mobile application 'app' (with offline capability)	
Cost/availability	Charged for – prices range from £255/year for standard version up to £675/year for the premium version	
Number of users	Unknown	
Country of origin	UK	
Is it country or region specific?	<p>Fertiliser recommendations and agrochemical approvals for GGM sold in the UK are specific to the UK. The structure and algorithms in the tool can be used in other countries. GGM is available in Canada and New Zealand. GGM will soon release a German version with German fertiliser recommendations and agrochemical approvals (including grassland). Versions are available in other countries, but without the fertiliser recommendations.</p>	
Language	GGM sold in UK is in English. Other versions available in French Canadian, Romanian, Spanish and German.	
Is the tool specifically targeted to permanent grassland?	All crops including grassland	
Grassland and livestock management	Not specific to a particular management system or livestock type. The tool will generate RB209 fertiliser recommendations for both cut and grazed grass for dairy, beef and sheep livestock systems.	

Data input required for the DST	Farm, field and crop management details.
Use of data from other existing datasets	GGM uses a global dataset of agrochemical approvals. Also uses weather data and Google maps as the base map layer.
Data export	Data can be shared within the platform between individual users or groups of users (so a farmer can share with their agronomist). Data can be exported to excel. GGM uses Tableau for data reporting allowing the user to analysis and report data in any way they want.
Data storage	Data entered into the tool can be saved and shared with other users (e.g. farmers/agronomists)
Benchmarking	None
Ability of the DST to deliver an impact	Crop recording software mainly used for record keeping and compliance checking. User enters cropping information and this can be used to provide fertiliser recommendations and check agrochemical usage meets legislative approvals.
Approach used to generate the outcome from the DST and degree of user interaction	Crop recording software – significant level of user interaction.
Additional comments	MuddyBoots software note that the collaborative nature of GGM has improved the decision making between the farmer and the agronomist. Data is entered and shared in real time, which helps the farmer and agronomist react to events during the growing season (i.e. extreme weather events).

DST 49 Healthy grassland soils SUPER-G partner: ADAS		
DST provider	AHDB	
Funder	AHDB	
Brief description	Guidance booklet including step by step instructions for assessing grassland soils in the field. The guide includes photos and descriptions to help farmers to score their soils. Tables are included at the end of the guide to record the scores. Guidance is given on management options to improve grassland soil structure.	
Links and references	Healthy grassland soils (PDF)	
Date of first release	2015	
Last update	2018	
Main purpose (ecosystem service)	6. Grass for livestock, biomass (bioenergy) and other products <ul style="list-style-type: none"> • Soil management 	
Main purpose	Assessing soil structure	
Target audience	Farmers Advisors	
Format	Paper based (available in hard copy or as an electronic download)	
Cost/availability	Free	
Number of users	Unknown	
Country of origin	UK	
Is it country or region specific?	Developed in the UK, but applicable in other countries.	
Language	English	
Is the tool specifically targeted to permanent grassland?	All grassland types	
Grassland and livestock management	Not specific to a particular management system or livestock type.	
Data input required for the DST	None.	
Use of data from other existing datasets	None	
Data export	None	
Data storage	No – although the guide includes tables for recording soil assessment scores.	
Benchmarking	The guide includes photos of good and bad soil structure which farmers can use to benchmark their own soil structure.	
Ability of the DST to deliver an impact	The guide provides guidance to help farmers to assess soil in the field. This can help farmers to identify and take action to mitigate poor soil structure.	
Approach used to generate the outcome from the	Guidance manual. Farmers use the photographs and descriptions to help them assess soil structure.	


DST and degree of user interaction	
Additional comments	None.




DST 50 MANNER-NPK SUPER-G partner: ADAS		
DST provider	ADAS	
Funder	The last MANNER-NPK update was funded by a consortium including Defra, DARDI, the Scottish Government, Environment Agency, AHDB, Catchment Sensitive Farming, Tried and Tested, Natural England and WRAP.	
Brief description	<p>MANNER-NPK (MANure Nutrient Evaluation Routine) is a practical software tool for use by farmers and their advisers to quantify crop available nutrient supply from applications of organic manures, therefore helping farmers to improve the nutrient use efficiency of organic materials applications.</p> <p>MANNER-NPK estimates the fate of organic manure N following land application, based on the latest research information on the mineralisation of manure organic N, and N losses via ammonia volatilisation, denitrification and nitrate leaching. The total N applied and an estimate of crop available N in the current cropping year and in the year following manure application is given.</p> <p>MANNER-NPK also calculates the amount of total and available P₂O₅ and K₂O applied, and the amount of total SO₃ and MgO applied. The potential financial value of the manure application(s) in £/ha is calculated based on current fertiliser prices (which can be edited). MANNER-NPK generates a 1 page report summarising all input and output information, which can be saved or printed.</p> <p>MANNER-NPK includes NVZ warning messages which highlight potential breaches of the NVZ rules specific to England, Wales, Scotland or Northern Ireland. A library of relevant guidance documents is included.</p>	
Links and references	<ul style="list-style-type: none"> • MANNER-NPK download, MANNER-NPK User Guide and Technical Guide are available from the Help menu within the software tool. • Nicholson, F.A., Bhogal, A., Chadwick, D., Gill, E., Gooday, R.D., Lord, E., Misselbrook, T., Rollett, A.J., Sagoo, E., Smith, K.A., Thorman, R.E., Williams, J.R. and Chambers, B.J. (2013). An enhanced software tool to support better use of manure nutrients: MANNER-NPK. Soil Use and Management 29 (4) 473-484. • Using the new MANNER-NPK software – Webinar hosted by AHDB (Feb 2013). • Introduction to MANNER-NPK – presentation to AHDB Agronomists conference 2012. 	
Date of first release	2000	
Last update	2013	
Main purpose (ecosystem service)	6. Grass for livestock, biomass (bioenergy) and other products <ul style="list-style-type: none"> • Nutrient management 	
Main purpose	Nutrient management – organic materials	
Target audience	Farmers Advisors	

Format	Software – desk based
Cost/availability	Free Available on a CD or to download from the website
Number of users	4,555 (Aug 2019)
Country of origin	UK
Is it country or region specific?	Specific to the UK (England, Wales, Scotland & Northern Ireland). The model has been developed and tested using UK field experimental results. The model uses UK climate data (based on user entered postcode).
Language	English
Is the tool specifically targeted to permanent grassland?	All crop types including grassland.
Grassland and livestock management	Not specific to a particular management system or livestock type. The tool can be used for applications of organic materials to any grassland type (or other cropping).
Data input required for the DST	Farm and field details (location from postcode, crop type and soil type). Details of the organic manure application including manure type, application data, application rate, method of application and manure analysis if available).
Use of data from other existing datasets	DST uses postcode specific long term average (30 year) climate data. This climate data is included within the model.
Data export	Not available (other than via a report)
Data storage	Data entered into the tool can be saved. Multiple 'files' can be saved within the tool. The DST can produce a report which can be saved in PDF format including all input data and results.
Benchmarking	None
Ability of the DST to deliver an impact	The DST provides an estimate of crop available nutrient supply from applications of organic material. This information can be used by farmers to improve their nutrient use. This has the potential to improve farm profitability and reducing diffuse pollution (by maximizing nutrient use efficiency)
Approach used to generate the outcome from the DST and degree of user interaction	User enters basic farm/field information and details of organic manure application in three data input 'tabs' ('Farm & field details', 'Application', and 'Manure analysis'). This input data is used in the model to provide an estimate of crop available nutrients. The results are shown two results tabs ('Results' and '£value'). User has to enter the information in order to generate a result.


<p>Additional comments</p>	<p>In addition to the standalone MANNER-NPK software tool, the MANNER-NPK calculations are available within a number of other written and software tools. MANNER-NPK was used to produce the organic material crop available nitrogen 'look-up tables' in national written nutrient management guidance in the 'AHDB Nutrient Management Guide' Chapter 2 in England and Wales (AHDB 2017) and the SRUC Technical Note on 'Bulky Organic Fertilisers TN650' in Scotland (SRUC, 2013).</p> <p>Estimating the nutrient supply from organic materials is an important component of nutrient planning, and the MANNER-NPK calculation engine (Dynamic Link Library – DLL) has been integrated into the PLANET nutrient management software tool (www.planet4farmers.co.uk, c.18,000 registered users). PLANET provides fertiliser recommendations taking into account crop requirements, soil nutrient supply and the nutrient supply from organic materials (calculated from MANNER-NPK). Development of PLANET was funded by Defra and the Scottish Government, and the PLANET 'calculation engine' is available as a Dynamic Link Library (DLL) free of charge to commercial software companies to integrate into their own tools. The PLANET DLL has been integrated into commercial tools produced in the UK by Farmplan, Muddyboots and Pear Agri. The Defra Farm Practice Survey (2017) showed that 54% of farms with a nutrient management plan used a software tool which integrates the MANNER-NPK calculations (i.e. PLANET, Muddyboots or Farmplan).</p>
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<p>DST 51 N max for grassland calculator SUPER-G partner: AgriSearch</p>		 <p>Department of Agriculture and Rural Development <small>www.dardni.gov.uk</small></p>
DST provider	Developed for Department of Agriculture, Environment and Rural Affairs (DAERA)	
Funder	DAERA	
Brief description	This calculating tool determines the amount of chemical nitrogen and nitrogen from organic manure other than livestock manure, for example sewage sludge, that has been applied to the grassland area of the farm to help the farmer comply with the Nitrates Action Programme (NAP). The tool is available as a web-based calculator and as a paper based workbook.	
Links and references	<ul style="list-style-type: none"> • Farm nutrient management calculators (online service only available to farm businesses with a Business ID) • NAP 2015-2019 (page 40 of booklet is the paper-based version of online service) 	
Date of first release	2010	
Last update	Updated for the 2015-2018 NAP	
Main purpose (ecosystem service)	<p>4. Water quality (2nd)</p> <p>6. Grass for livestock, biomass (bioenergy) and other products (1st)</p> <ul style="list-style-type: none"> • Nutrient management (including fertilisers and organic manures) 	
Main purpose	The farmer enters relevant farm information (e.g. area, farm type) and the amount of chemical N fertiliser and other organic manures applied to grassland. The tool then calculates crop available N applied to the grassland area and checks that N applications to the whole grassland area on the farm to not exceed NAP Nmax limits.	
Target audience	Farmers Advisors	
Format	Paper based (workbook) Software – web based	
Cost/availability	Free online service for farm businesses with business ID.	
Number of users	Unknown	
Country of origin	Northern Ireland	
Is it country or region specific?	Yes specific to Northern Ireland NAP	
Language	English	
Is the tool specifically targeted to permanent grassland?	All grassland types	
Grassland and livestock management	Not specific to a particular management system or livestock type.	
Data input required for the DST	Land area, type and amount of fertiliser N applied (mineral fertiliser and organic materials)	
Use of data from other existing datasets	No	


Data export	No
Data storage	Yes
Benchmarking	No – only benchmarks against permitted levels of fertilizer application
Ability of the DST to deliver an impact	Used mainly to assess and demonstrate compliance with NAP Nmax rules.
Approach used to generate the outcome from the DST and degree of user interaction	Straight forward calculation of available N loading from fertiliser and organic materials during a calendar year averaged over the grassland area on a farm.
Additional comments	None

DST 52 Nitrogen loading calculator SUPER-G partner: AgriSearch		 Department of Agriculture and Rural Development <small>www.dardni.gov.uk</small>
DST provider	Developed for Department of Agriculture, Environment and Rural Affairs (DAERA)	
Funder	DAERA	
Brief Description	This tool helps the farmer to assess and demonstrate compliance with the Nitrates Action Programme (NAP) nutrient limits by estimating the Nitrogen loading for the farm based on the annual livestock numbers, imports/exports of organic manures and the land area. The user enters the total amount of hectares farmed, their livestock numbers and the total amount of manure or slurry imported or exported. A report is produced to give the farmer an indication of the total nitrogen loading each year (kg N/ha/year).	
Links and references	<ul style="list-style-type: none"> • Farm nutrient management calculators (online service only available to farm businesses with a Business ID) • NAP 2015-2019 (page 9-21 of booklet is the paper-based version of online service) 	
Date of first release	2010	
Last update	Updated for the 2015-2018 NAP	
Main purpose (ecosystem service)	4. Water quality (2 nd) 6. Grass for livestock, biomass (bioenergy) and other products (1 st) <ul style="list-style-type: none"> • Nutrient management (including fertilisers and organic manures) 	
Main purpose	Calculates N loading for the farm to assess and demonstrate compliance with the NAP N loading rule.	
Target audience	Farmers Advisors	
Format	Paper based (workbook) Software – web based	
Cost/availability	Free online service for farm businesses with business ID.	
Number of users	Unknown	
Country of origin	Northern Ireland	
Is it country or region specific?	Yes, specific to Northern Ireland	
Language	English	
Is the tool specifically targeted to permanent grassland?	Targeted primarily at grassland farmers but not completely specific to permanent grassland.	
Grassland and livestock management	Not specific to a particular management system or livestock type.	
Data input required for the DST	Land area, type and amount of livestock on farm and imports/exports of organic materials.	
Use of data from other existing datasets	No	
Data export	No	

Data storage	Yes
Benchmarking	No
Ability of the DST to deliver an impact	Used mainly to assess and demonstrate compliance with NAP N loading rules.
Approach used to generate the outcome from the DST and degree of user interaction	Uses preset (statutory) values of nitrogen excretion for animal type / age group and details of imports/exports of organic materials to calculate an organic N loading per hectare for the farmer.
Additional comments	None

DST 53 Phosphate and potash nutrient calculator SUPER-G partner: ADAS		
DST provider	Potash Development Association	
Funder	Potash Development Association	
Brief description	<p>The phosphate and potash calculator can be used to calculate nutrient offtake and nutrient deficiency correction. It enables a quick calculation of the phosphate and potash offtakes by most UK crops (including grassland) at harvest. The user selects crop type and enters yield and the tool calculates offtake based on standard values for crop phosphate and potash content. If the soil phosphate and potash Indices are below target level, the second section of the calculator provides a guide to the quantity of nutrient which is likely to be required to correct the deficiency. This will vary according to the level of deficiency and the soil type. The quantity will usually be more than can reasonably be applied in one season, and the Calculator asks by how much and how quickly you want to correct the deficiency, i.e. over how many years.</p>	
Links and references	Phosphate and potash calculator	
Date of first release	A form of the calculator has been around since the late 90's (as a manual slide-rule) but was released on the website in the early 2000s. It was made into an app in 2018.	
Last update	2019	
Main purpose (ecosystem service)	6. Grass for livestock, biomass (bioenergy) and other products <ul style="list-style-type: none"> • Nutrient management (including fertilisers and organic manures) 	
Main purpose	Phosphate and potash nutrient management	
Target audience	Farmers Advisors	
Format	Software – web based Software – mobile application 'app'	
Cost/availability	Free	
Number of users	470 downloads of app on IOS and Android (Nov 2019)	
Country of origin	UK	
Is it country or region specific?	Specific to England and Wales – crop P and K offtake figures are based on information in Nutrient Management Guide	
Language	English	
Is the tool specifically targeted to permanent grassland?	All crops including grassland	
Grassland and livestock management	Targeted at cut grass – tool provides P and K offtake figures for cut grass & user is required to enter a yield in order to calculate phosphate and potash offtake	
Data input required for the DST	Crop type and yield are required to calculate phosphate and potash offtake. Current soil index, target index and target number of years to change index are required to calculate quantity of phosphate and potash to apply to correct the soil index.	


Use of data from other existing datasets	No
Data export	None
Data storage	None
Benchmarking	None
Ability of the DST to deliver an impact	Nutrient management tool to help farmers improve the P and K management.
Approach used to generate the outcome from the DST and degree of user interaction	User enters some basic information and the tool calculates P and K offtake.
Additional comments	Uses P and K crop nutrient values from Nutrient Management Guide (RB209).

DST 54 Phosphorus balance calculator SUPER-G partner: AgriSearch		 Department of Agriculture and Rural Development <small>www.dardni.gov.uk</small>
DST provider	Developed for Department of Agriculture, Environment and Rural Affairs (DAERA)	
Funder	DAERA	
Brief description	<p>A Phosphorus balance below 10kg/ha/year is required for those operating under derogation (up to 250kg/ha/year). This tool calculates the P balance for the farm and help manage P inputs and outputs to meet the limit.</p> <p>The farmer will enter the area farmed (ha), along with details of how phosphorus is brought into the farm (e.g. chemical fertilizer, feedstuff, organic manure, and livestock numbers) and how phosphorus leaves the farm (e.g. through selling crops, exporting organic manure, and removing livestock from the farm). The tool calculates this information and generates a phosphorus balance report (kg P/ha/year).</p>	
Links and references	<ul style="list-style-type: none"> • Farm nutrient management calculators (online service only available to farm businesses with a Business ID) • NAP 2015-2019 • NAP Derogation Fertilisation Account (paper based worksheet for farmers with a derogation) 	
Date of first release	2010	
Last update	Updated for the 2015-2018 NAP	
Main purpose (ecosystem service.)	4. Water quality (2 nd) 6. Grass for livestock, biomass (bioenergy) and other products (1 st) <ul style="list-style-type: none"> • Nutrient management (including fertilisers and organic manures) 	
Main purpose	Calculates a P balance for the farm to assess and demonstrate compliance with the NAP P loading limit for farms operating under a derogation.	
Target audience	Farmers Advisors	
Format	Software - Web based Paper based (worksheet)	
Cost/availability	Free online service for farm businesses with business ID. Paper based worksheet (MSWord document) available to download without registration	
Number of users	Unknown	
Country of origin	Northern Ireland	
Is it country or region specific?	Yes	
Language	English	
Is the tool specifically targeted to permanent grassland?	Targeted primarily at grassland farmers but not completely specific to permanent grassland.	

Grassland and livestock management	Not specific to a particular management system or livestock type.
Data input required for the DST	Land area, type, amount and type of fertilizer sown, purchased feed, livestock sales and purchases, milk sales, slurry imports / exports
Use of data from other existing datasets	No
Data export	No
Data storage	Yes
Benchmarking	No
Ability of the DST to deliver an impact	Used mainly to assess and demonstrate compliance with NAP N loading rules.
Approach used to generate the outcome from the DST and degree of user interaction	Straight forward calculation of total P Balance; user enters data on farm exports and imports of livestock, fertilizer, meat and milk, straw, feed and manures and land area, and the tool calculates the farm P balance.
Additional comments	None

DST 55	
PLANET	
SUPER-G partner: ADAS	
DST provider	ADAS
Funder	Defra and Scottish Government
Brief description	PLANET (Planning Land Applications of Nutrients for Efficiency and the environment) is a nutrient management decision support tool for use by farmers and advisers in England/Wales and Scotland for field level nutrient planning and for assessing and demonstrating compliance with the Nitrate Vulnerable Zone (NVZ) rules. PLANET gives fertiliser recommendations for all major nutrients and lime based on Defra's "Fertiliser Manual (RB209)" (8 th Edition) in England/Wales and on SRUC "Technical Notes" in Scotland. Fertiliser recommendations take account of the crop nutrient requirement, the soil nitrogen supply, laboratory soil analysis results, and the nutrients supplied from any organic material applications (calculated using the MANNER-NPK (DST 50) 'calculation engine'). A nutrient application plan can be developed and updated during the season. Detailed field records can be kept of cropping, soil analyses, and fertiliser and organic material applications.
Links and references	PLANET website
Date of first release	2005
Last update	2013 (v3.3)
Main purpose (ecosystem service)	6. Grass for livestock, biomass (bioenergy) and other products iii. Nutrient management (including fertilisers and organic manures)
Main purpose	Nutrient management decision support
Target audience	Farmers Advisors
Format	Software – desk based
Cost/availability	Free
Number of users	18,000 (2019)
Country of origin	UK
Is it country or region specific?	Fertiliser recommendations and NVP rules used by PLANET are specific to England, Wales and Scotland.
Language	English
Is the tool specifically targeted to permanent grassland?	All crop types including grassland
Grassland and livestock management	Not specific to a particular management system or livestock type. The tool will generate fertiliser recommendations for both cut and grazed grass for dairy, beef and sheep livestock systems.
Data input required for the DST	Farm and field details including location (postcode to retrieve location specific rainfall data), soil type, past cropping, soil analysis, planned cropping and planned manure use. NVZ N loading module requires data on farm area, livestock type and numbers and imports/exports of organic manures. NVZ Organic manures inventory requires entry of


	livestock type and numbers, manure system (solid or liquid) and when the livestock are housed.
Use of data from other existing datasets	DST uses postcode specific long term average (30 year) climate data.
Data export	Data can be exported in excel format.
Data storage	Data entered into the tool can be saved. Multiple 'files' can be saved within the tool. The DST can generate reports which can be saved in PDF format.
Benchmarking	The 'Farmgate nutrient balance' module provides limited benchmarking of farm N, P and K balance compared to similar farms.
Ability of the DST to deliver an impact	PLANET DST can be used by farmers to improve their farm nutrient management. This has the potential to improve crop growth, farm profitability and reduce diffuse pollution (by maximizing nutrient use efficiency).
Approach used to generate the outcome from the DST and degree of user interaction	User enters farm and field level details into the tool and this information is used to provide fertiliser recommendations and to check compliance with the NVZ rules. User must input information in order to generate a result.
Additional comments	The PLANET 'calculation engine' is available as a Dynamic Link Library (DLL) free of charge to commercial software companies to integrate into their own tools. The PLANET DLL has been integrated into commercial tools produced in the UK by Farmplan, Muddyboots and Pear Agri. The Defra Farm Practice Survey (2017) showed that 54% of farms with a nutrient management plan used a software tool which integrates the PLANET calculation engine (i.e. PLANET, Muddyboots or Farmplan).

DST 56 Recommended grass & clover lists for England and Wales SUPER-G partner: ADAS		
DST provider	British Grassland Society	
Funder	Variety testing is funded by plant breeders through the British Society of Plant Breeders and the ruminant levy boards AHDB and Hybu Cig Cymru	
Brief description	Handbook of recommended grass and clover varieties for use in England and Wales. The lists are drawn up after rigorous testing for attributes such as yield, persistency, quality and disease resistance. The data come from trials carried out by the NIAB-TAG, Barenbrug, IBERS, DLF Seeds, DSV, AFBI and SRUC, and are evaluated by a panel of experts. Recommendations are given based on the use of the grassland (cut or grazed), desired length of ley and other characteristics such as maturity, production characteristics and disease resistance. Information is provided in a handbook, interactive spreadsheet and online database.	
Links and references	Recommended grass & clover lists	
Date of first release	Unknown	
Last update	2019 (updated annually for each new season)	
Main purpose (ecosystem service)	6. Grass for livestock, biomass (bioenergy) and other products <ul style="list-style-type: none"> • Grass variety selection 	
Main purpose	Guidance on selecting grassland varieties	
Target audience	Farmers Advisors	
Format	Paper based (hard copy and as electronic download) Interactive spreadsheet Web-based (online database)	
Cost/availability	Free	
Number of users	Unknown	
Country of origin	England and Wales	
Is it country or region specific?	Specific to England and Wales (based on trials in England and Wales)	
Language	English	
Is the tool specifically targeted to permanent grassland?	Mainly targeted at temporary grassland – contains recommendations for short, medium- and longer-term leys, but also includes guidance/recommendations on over sowing older grassland.	
Grassland and livestock management	Not specific to a particular management system or livestock type. Provides recommendations for cut and grazed grassland.	
Data input required for the DST	Information on the use of the grassland (cut or grazed), desired length of ley and other characteristics such as maturity, production characteristics and disease resistance. This information can be entered into the online database, or used to select varieties from appropriate tables from the handbook or spreadsheet version.	
Use of data from other existing datasets	No	


Data export	No
Data storage	No
Benchmarking	The tool compares characteristics of different grassland varieties (e.g yield, D-value, disease resistance)
Ability of the DST to deliver an impact	Selecting high performing grassland varieties appropriate for the target end use (grazing/cutting) can increase yield and overall performance of the grassland.
Approach used to generate the outcome from the DST and degree of user interaction	User needs some basic information on what they require from grass varieties (cut or grazed, length of ley, desired production characteristics and disease resistance) and this is used to identify recommended varieties.
Additional comments	None

DST 57 SRUC Technical Notes SUPER-G partner: ADAS	
DST provider	SRUC
Funder	Scottish Government
Brief description	<p>The SRUC Technical Notes are a series of short practical field guides covering a range of topics including soil management, fertiliser recommendations and general crop husbandry. SRUC Technical notes specific to grassland management include</p> <ul style="list-style-type: none"> • TN652 Fertiliser recommendations for grassland • TN719 Recommended grass and clover varieties 2018-19 (updated annually) • TN643 Weed management in grassland • TN629 Management of species rich grasslands • TN661 Practical guidelines for recognizing general signs of Overgrazing and Undergrazing within semi natural habitats • TN659 Moorland grazing – guidance for upland grazing management • TN664 Management of cobalt in grassland soils • TN586 Conservation grazing of semi natural habitats • In addition, the following Technical Notes are relevant to all crops including grassland: <ul style="list-style-type: none"> • TN650 Optimizing the application of bulky organic fertiliser • TN656 Soils information, texture and liming recommendations • TN714 Liming materials and recommendations
Links and references	SRUC Technical Notes
Date of first release	Various
Last update	Various
Main purpose (ecosystem service)	<ol style="list-style-type: none"> 1. Biodiversity and pollination (=1st) 6. Grass for livestock, biomass (bioenergy) and other products (=1st) <ul style="list-style-type: none"> • Nutrient management (including fertiliser and organic manures) • Soil management • Grass variety selection
Main purpose	Guidance documents covering a range of topics relevant to grassland management
Target audience	Farmers Advisors
Format	Paper based (hard copy and electronic download)
Cost/availability	Free
Number of users	Unknown
Country of origin	Scotland
Is it country or region specific?	Guidance aimed at Scottish farmers and based on results of Scottish research, however some Technical Notes may also be applicable in other areas.
Language	English
Is the tool specifically targeted	Technical Notes cover all crops. TN629, TN661, TN659 and TN586 are targeted specifically at permanent grassland

to permanent grassland?	
Grassland and livestock management	TN629, TN661, TN659 and TN586 are targeted at grazing permanent grassland. TN719 is targeted mainly at temporary grassland (variety selection). Other technical notes are not targeted at a specific grassland management system or livestock type.
Data input required for the DST	No specific data entry (guidance document). User needs certain farm and field details to identify correct recommendations/guidance for their farm.
Use of data from other existing datasets	None (the Technical Notes are based on the results of a large amount of research, but the published guidance does not dynamically use data from other datasets)
Data export	No
Data storage	No
Benchmarking	No
Ability of the DST to deliver an impact	Technical Notes provide guidance to farmers on a range of topics related to grassland management.
Approach used to generate the outcome from the DST and degree of user interaction	User needs basic grassland management information to select appropriate guidance in some Technical Notes (i.e. soil analysis and cropping information for fertilizer recommendations)
Additional comments	None

DST 58 Think Soils SUPER-G partner: ADAS		
DST provider	Environment Agency	
Funder	Environment Agency	
Brief description	The 'think soils' manual is a practical guide to soil assessment. It aims to help farmers, land managers, government and non-government advisers to recognise problems with erosion and runoff from agricultural land. Specific guidance is given on how to examine soil in the field. Good and poor soil structure is illustrated and described on a range of soils.	
Links and references	Think Soils	
Date of first release	2008	
Last update	2008	
Main purpose (ecosystem service)	<ol style="list-style-type: none"> 3. Flood and erosion control (2nd) 4. Water quality (3rd) 6. Grass for livestock, biomass (bioenergy) and other products (1st) <ul style="list-style-type: none"> • Soil management 	
Main purpose	Soil assessment and soil management	
Target audience	Farmers Advisors Policy makers	
Format	Paper based (hard copy and electronic download)	
Cost/availability	Free	
Number of users	Unknown	
Country of origin	England	
Is it country or region specific?	Covers agricultural soils in England and Wales	
Language	English	
Is the tool specifically targeted to permanent grassland?	All crops including grassland	
Grassland and livestock management	Not specific to a particular management system or livestock type.	
Data input required for the DST	No data input.	
Use of data from other existing datasets	None	
Data export	None	
Data storage	None	
Benchmarking	The Think Soils manual includes photos of good and bad soil structure which farmers can use to benchmark their own soil structure.	
Ability of the DST to deliver an impact	The Think Soils manual provides guidance to help farmers to assess soil in the field. This can help farmers to identify and take action to mitigate poor soil structure and soil erosion.	

Approach used to generate the outcome from the DST and degree of user interaction	Guidance manual. Farmers use the photographs and descriptions to help them assess soil structure.
Additional comments	None

DST 59 Tried and tested SUPER-G partner: ADAS		
DST provider	Professional Nutrient Management Group (PNMG) – a partnership initiative of the National Farmers Union (NFU), Country Land and Business Association (CLA), Agricultural Industries Confederation (AIC), British Grassland Society (BGS), Linking Environment and Farming (LEAF) and Catchment Sensitive Farming (CSF)	
Funder	Initial funding from Defra. Current funding from PNMG partners.	
Brief description	<p>Tried and tested is an industry initiative established to help farmers in the UK improve nutrient management planning. Tried and tested produces nutrient management tools available in printed form and via the website, including:</p> <ul style="list-style-type: none"> • The Tried and tested nutrient management plan • New to Nutrient Management guide; • Nutrient Management Plan Field Record Sheets; • ThinkManures; • Feed plan for cattle and sheep; • Soil Nutrient Supply (SNS) calculator; • Value of Manures postcards • Guidance on soil analysis • Cab cards on fertiliser use, manure use and soil management • USB sticks with all these resources plus The Nutrient Management Guide (RB209) <p>The aim of the initiative was to provide a simple paper based nutrient management plan aimed primarily at livestock farmers in response to nutrient management planning becoming increasingly complex. The Tried and tested paper based nutrient management plan provides record sheets for nutrient management planning available as paper pads or electronically in PDF or excel format. Additional related guidance documents and case studies are available from the website.</p>	
Links and references	Tried and tested website	
Date of first release	2008	
Last update	2019 (updated to include revised RB209)	
Main purpose (ecosystem service)	6. Grass for livestock, biomass (bioenergy) and other products <ul style="list-style-type: none"> • Nutrient management (including fertilisers and organic manures) • Soil management 	
Main purpose	Nutrient management	
Target audience	Farmers Advisors	
Format	Paper based (available as hard copy or electronic download) Spreadsheet (excel)	
Cost/availability	Free	
Number of users	Unknown	
Country of origin	UK	
Is it country or region specific?	Specific to the UK – aimed at UK farmers and includes UK guidance documents (e.g. RB209).	
Language	English	


Is the tool specifically targeted to permanent grassland?	All crops including grassland.
Grassland and livestock management	Not specific to a particular management system or livestock type.
Data input required for the DST	Information for nutrient management planning can be recorded in the template forms or spreadsheet – including information on soil analysis, cropping, manure and fertiliser use.
Use of data from other existing datasets	None
Data export	Data is recorded and stored. No need for an additional data export function.
Data storage	Data is recorded and stored in paper forms or electronic sheets.
Benchmarking	None
Ability of the DST to deliver an impact	The Tried and Tested paper based nutrient management plan help farmers get started with nutrient management planning and improve their nutrient use. This has the potential to improve farm profitability and reducing diffuse pollution (by maximizing nutrient use efficiency)
Approach used to generate the outcome from the DST and degree of user interaction	Record keeping tool only.
Additional comments	Tried and tested also includes information on and links to Nutrient Management Guide, MANNER-NPK and PLANET

DST 60 Visual examination of soil structure (VESS) SUPER-G partner: ADAS	
DST provider	SRUC, University of Maringa, Tom Batey (Independent consultant), University of Aarhus
Funder	Scottish Government
Brief description	Visual examination of soil structure (VESS) is a method of visual soil evaluation performed in the field: a 20 cm block of soil is removed, assessed and scored. The VESS scorecard is a two-page colour chart of differing soil structure and associated description. The soil is scored by matching what the user sees in the field with the descriptions and photos on the scorecard.
Links and references	<ul style="list-style-type: none"> • Visual evaluation of soil structure • Ball, B.C., Batey, T., Munkholm, L.J., (2007). Field assessment of soil structural quality—a development of the Peerlkamp test. Soil Use and Management 23, 329–337.
Date of first release	2007
Last update	2015
Main purpose (ecosystem service)	6. Grass for livestock, biomass (bioenergy) and other products <ul style="list-style-type: none"> • Soil management
Main purpose	Visual soil assessment
Target audience	Farmers Advisors
Format	Paper based (hard copy and electronic download)
Cost/availability	Free
Number of users	Unknown
Country of origin	UK & Denmark
Is it country or region specific?	Not specific to a country or region
Language	English, translated into Spanish, Portuguese, Norwegian, Danish, Turkish and French. A picture only version of the score card is also available for download.
Is the tool specifically targeted to permanent grassland?	All crops including grassland.
Grassland and livestock management	Not specific to a particular management system or livestock type.
Data input required for the DST	None. User follows instructions and compares condition of their soil with photographs provided on the scorecard to assign a soil structure 'score'
Use of data from other existing datasets	None
Data export	None
Data storage	None
Benchmarking	The guide includes photos of good and bad soil structure which farmers can use to benchmark their own soil structure.

Ability of the DST to deliver an impact	The scorecard provides guidance to help farmers to assess soil in the field. This can help farmers to identify and take action to mitigate poor soil structure.
Approach used to generate the outcome from the DST and degree of user interaction	Farmers use the photographs and descriptions on the scorecard to help them assess soil structure.
Additional comments	None


DST 61 AgriNet SUPER-G partner: AgriSearch	
DST provider	Irish Farm Computers Ltd
Funder	Private company (Irish Farm Computers Ltd)
Brief description	AgriNet software can be used to record grass measurements in grazed and growing paddocks, the movement of livestock (dairy, beef and sheep) between paddocks and it can record soil temperature and rainfall. The user can record on the PC in the office or using the smartphone application as the user walks the paddocks. By using key tools such as a spring rotation planner, grass wedges and the grass budget, the software can allow the user to track supply and demand of grass, which allows decisions to be made during times of grass surplus or deficit.
Links and references	AgriNet
Date of first release	2009
Last update	Web based – continually updated
Main purpose (ecosystem service)	6. Grass for livestock, biomass (bioenergy) and other products <ul style="list-style-type: none"> • Grass measurement & budgeting
Main purpose	Add any additional information (if necessary) to clarify main purpose of the tool.
Target audience	Farmers Advisors Discussion Groups
Format	Software – web based Software – mobile application ‘app’
Cost/availability	Annual one-off payment of €85 per year; this includes the grass online software, grass smartphone software, discussion group software and technical support and training.
Number of users	Unknown
Country of origin	Ireland
Is it country or region specific?	No
Language	English
Is the tool specifically targeted to permanent grassland?	All grassland types (primarily lowland)
Grassland and livestock management	The tool can be used in any livestock sector (dairy, beef, and sheep). The tool focuses on rotational grazing but can be used to record grass growth and quality in any grassland management system.
Data input required for the DST	Field details (size etc) Grass covers (measured on a weekly basis) Livestock numbers, supplementary feeding etc Land currently in grazing / out for silage Optional: Fertiliser application Milk sales Soil analysis

	Grass varieties sown Sprays
Use of data from other existing datasets	Some milk processors will send data on milk sales to the application
Data export	Not routinely but can be exported for research purposes if needed
Data storage	Yes
Benchmarking	Yes – you can compare your data with other farmers who agree to share data with you (e.g. within a discussion group)
Ability of the DST to deliver an impact	Tool has ability to greatly improve grassland management especially with regard to making prompt and informed decisions to address deficits and surpluses in grass supply.
Approach used to generate the outcome from the DST and degree of user interaction	On a (usually weekly) basis the farmer measures the grass covers on his grazing platform and inputs the data onto AgriNet. This can either be done through a smart phone or on the computer. The farmer also enters current livestock numbers and expected grass and supplementary / conserved feed intakes. From this the application produces a grazing wedge and a demand line which allow the farmers to assess grass supply against demand over the next couple of weeks and take appropriate action. The farmer can use the tool to look at the effect of taking out ground for silage, adjusting supplementary feeding etc.
Additional comments	None


DST 62 Grasshopper SUPER-G partner: France Chambre Regionale D'agriculture De Normandie		 Grasshopper [®] MAKE THE MOST OF YOUR GRASS
DST provider	True North Technology (Ireland)	
Funder	Commercial tool developed by True north Technology	
Brief description	Grasshopper can be used to measure and calculate available grass cover. A plate meter is used to measure the compressed grass height. The software uses algorithms to calculate grass covers from the plate meter measurements. This information can be used to plan grassland grazing and cutting management. The software includes a mapping function to map fields/paddocks.	
Links and references	Grasshopper webpage	
Date of first release	Unknown	
Last update	2019	
Main purpose (ecosystem service)	6. Grass for livestock, biomass (bioenergy) and other products <ul style="list-style-type: none"> • Grass measurement & short term budgeting 	
Main purpose	Measure grass covers and plan grassland management	
Target audience	Farmers Advisors	
Format	Software – desk based Software – mobile application 'app' Physical tools – includes use of plate meter	
Cost/availability	Unknown.	
Number of users	Unknown	
Country of origin	Ireland	
Is it country or region specific?	Not specific to a particular country. Manufactured in Ireland. Known to be used in Ireland and France	
Language	French and English	
Is the tool specifically targeted to permanent grassland?	All grassland types.	
Grassland and livestock management	Tool is targeted at livestock grazing systems – rotational and paddock grazing rather than set stocking	
Data input required for the DST	Soil type, density, different species	
Use of data from other existing datasets	Farm maps	
Data export	Grass cover data can be exported to a number of external grass management software packages.	
Data storage	Yes, stores grass cover data	
Benchmarking	None	
Ability of the DST to deliver an impact	The tool is used to measure grass covers and can therefore be used to improve the efficiency of grassland utilization.	
Approach used to generate the	The Grasshopper grass measurement system consists of the Grasshopper sensor, rising plate, and the Map & Measure App for	

outcome from the DST and degree of user interaction	Android and iOS device. Data from the plate meter is used to calculate grass covers.
Additional comments	None




DST 63 Pasture Profit Index SUPER-G partner: Agrisearch		
DST provider	Teagasc	
Funder	Teagasc / DAFM	
Brief description	<p>The Teagasc Pasture Profit Index (PPI) compares and ranks grass varieties based on economic worth and was established in 2015 as a guide to help farmers.</p> <p>The index is designed as a guide to assist in variety selection when planning to reseed. It indicates the relative profitability difference of grass varieties when compared to base values.</p> <p>Each variety is given a monetary value based on its contribution to net profit/ha. This is based on traits such as seasonal (spring, summer and autumn) DM yield, grass quality, silage DM production and varietal persistency.</p>	
Links and references	Pasture Profit Indexes on Teagasc website	
Date of first release	2015	
Last update	2019 (updated annually for each new season)	
Main purpose (ecosystem service)	6. Grass for livestock, biomass (bioenergy) and other products <ul style="list-style-type: none"> • Grass variety selection 	
Main purpose	Guidance on selecting grassland varieties	
Target audience	Farmers Advisors	
Format	Paper based (hard copy and as electronic download)	
Cost/availability	Free	
Number of users	Unknown	
Country of origin	Republic of Ireland	
Is it country or region specific?	Specific to Republic of Ireland (based on trials in ROI)	
Language	English	
Is the tool specifically targeted to permanent grassland?	All grassland types	
Grassland and livestock management	Mainly targeted at spring calving dairy farmers (as this is the dominant dairy system in ROI).	
Data input required for the DST	None	
Use of data from other existing datasets	No	
Data export	No	
Data storage	No	
Benchmarking	The tool compares characteristics of different grassland varieties (e.g yield, D-value, density) and ranks them on a composite economic index	

Ability of the DST to deliver an impact	Selecting high performing grassland varieties appropriate for the target end use (grazing/cutting) can increase yield and overall performance of the grassland.
Approach used to generate the outcome from the DST and degree of user interaction	Beneficial but not essential for user to have some basic information on what they require from grass varieties (cut or grazed, length of ley, desired production characteristics) and this is used to identify recommended varieties.
Additional comments	None

DST 64 PastureBase Ireland (PBI) SUPER-G partner: AgriSearch		
DST provider	Teagasc	
Funder	Teagasc / DAFM	
Brief description	<p>PastureBase Ireland (PBI) is a grassland management decision support tool and mechanism to capture background data on farms. PBI stores all grassland measurements in a common structure. This allows for the quantification of grass growth and DM production across different farming enterprises, grassland management systems, regions and soil types using a common measurements protocol and methodology. The app can record grass covers, graze/silage events, fertiliser/slurry applications, livestock/demand and milk details. PBI can provide farmers with a grass wedge, rotation planners and budgets to help farmers make day to day management decisions.</p>	
Links and references	<ul style="list-style-type: none"> • PastureBase Ireland • Group leader manual (PDF) • PastureBase Ireland app • PastureBase Ireland – Increasing Grass Utilisation on Irish Dairy Farms (PDF) • PDF Publication list • Hanrahan <i>et al.</i> (2017) PastureBase Ireland: A grassland decision support system and national database. Computers and Electronics in Agriculture 136, 193-201 	
Date of first release	2013	
Last update	Continuously updated	
Main purpose (ecosystem service)	6. Grass for livestock, biomass (bioenergy) and other products <ul style="list-style-type: none"> • Nutrient management (including fertilisers and organic manures) • Grass measurement & short-term budgeting • Whole season/long term modelling or forecasting 	
Main purpose	Measure grass growth and plan grass management	
Target audience	Farmers Advisors	
Format	Software – web based Software – mobile application ‘app’	
Cost/availability	Charged for €85 per year	
Number of users	Unknown	
Country of origin	Ireland	
Is it country or region specific?	The available information regarding grass growth is based on farms from the Republic of Ireland. The tool is only available in Ireland.	
Language	English	
Is the tool specifically targeted to permanent grassland?	All grassland types	
Grassland and livestock management	Not specific to a particular management system or livestock type	

Data input required for the DST	Grass covers Graze/silage events Fertiliser/slurry application Livestock/demand Milk details
Use of data from other existing datasets	None
Data export	None
Data storage	Yes, it stores grass growth measurements
Benchmarking	Yes, it compares grass growth figures from across Ireland.
Ability of the DST to deliver an impact	The DST will help farmers record and track grass growth to help improve efficiency and utilisation of grass.
Approach used to generate the outcome from the DST and degree of user interaction	Tool uses data submitted by the user and requires a high degree of user interaction (entering of paddock details as a one off and grass covers and livestock details – ideally on a weekly basis during the grazing season). While it is relatively intensive it does generate extremely useful information for farmers.
Additional comments	None


DST 65 Spring Rotation Planner (SRP) SUPER-G partner: AFBINI		 <small>AGRICULTURE AND FOOD DEVELOPMENT AUTHORITY</small>
DST provider	Teagasc (Ireland)	
Funder	Dairy Research Ireland	
Brief description	The Spring Rotation Planner (SRP) allocates an appropriate proportion of the farm each day from February 1st to early April. It uses weekly measurement of Average Farm Cover (AFC) and the SRP to allocate grass - this is to ensure that there is sufficient grass available until the end of the 1st grazing rotation.	
Links and references	Spring rotation planner (PDF)	
Date of first release	2015	
Last update	2019	
Main purpose (ecosystem service)	6. Grass for livestock, biomass (bioenergy) and other products <ul style="list-style-type: none"> • Grass measurement & short term budgeting 	
Main purpose	Measure grass covers and plan spring grazing.	
Target audience	Farmers Advisors Other (Students)	
Format	Software – desk based Physical tools – includes use of plate meter	
Cost/availability	Free	
Number of users	Unknown	
Country of origin	Ireland	
Is it country or region specific?	Not specific to a particular country. Produced in Ireland.	
Language	English	
Is the tool specifically targeted to permanent grassland?	All grassland types	
Grassland and livestock management	Tool is targeted at livestock grazing systems, for rotational and paddock grazing.	
Data input required for the DST	Grass covers, fields areas, cow numbers	
Use of data from other existing datasets	Accurate farm map	
Data export	None	
Data storage	Data can be retained from year to year	
Benchmarking	For same farm from year to year, and to compare with other farms in same region	
Ability of the DST to deliver an impact	The tool is used to improve the efficiency of grassland utilization.	
Approach used to generate the outcome from the	Grass cover measurement; inputting data; monitoring the plan through spring.	

DST and degree of user interaction	
Additional comments	None



DST 66 Teagasc Green Book SUPER-G partner: AgriSearch	
DST provider	Teagasc
Funder	Teagasc
Brief description	The Teagasc Green Book provides fertiliser recommendations and nutrient management advice for the Republic of Ireland. The Major and Micro Nutrient Advice For Productive Agricultural Crops known as the Green Book provides nutrient advice for a wide range of crops grown under Irish conditions. Nutrient advice starts with taking soil samples to provide a basis for building an effective fertiliser programme. The Green book provides details on taking soil samples to ensure reliable results. Nutrient advice is presented for all major grassland, cereal, root, vegetable and fruit crops.
Links and references	Green Book webpage on Teagasc website Green Book 4th edition (PDF)
Date of first release	Unknown
Last update	Current 4 th edition published in 2016
Main purpose (ecosystem service)	6. Grass for livestock, biomass (bioenergy) and other products <ul style="list-style-type: none"> • Nutrient management (including fertilisers and organic manures) • Soil management
Main purpose	Fertiliser recommendations and nutrient management advice
Target audience	Farmers Advisors Policy makers
Format	Paper based (hard copy and electronic download)
Cost/availability	Online version free. Print version €15 (Teagasc Clients) €25 non Teagasc Clients
Number of users	Unknown – but likely to be high as industry standard fertiliser recommendations.
Country of origin	Republic of Ireland
Is it country or region specific?	Fertiliser recommendations are specific to Republic of Ireland
Language	English
Is the tool specifically targeted to permanent grassland?	All crop types including grassland
Grassland and livestock management	Not specific to a particular management system or livestock type. The Green Book provides fertiliser recommendations for both cut and grazed grass for dairy, beef and sheep livestock systems.
Data input required for the DST	No specific data entry (guidance document). User needs certain farm and field details including annual rainfall, soil type, past cropping, soil analysis, planned cropping and planned manure use in order to select the correct recommendations.
Use of data from other existing datasets	None, the Green Book is based on the results of a large amount of nutrient management research, but the published guidance does not dynamically use data from other datasets)

Data export	No
Data storage	No
Benchmarking	No
Ability of the DST to deliver an impact	The Green Book provides guidance for farmers to improve their farm nutrient management. This has the potential to improve crop growth, farm profitability and reduce diffuse pollution (by maximizing nutrient use efficiency).
Approach used to generate the outcome from the DST and degree of user interaction	User needs basic farm and field details to select the appropriate value from tables of fertiliser recommendations.
Additional comments	None

DST 67 Beteskalendar (Grazing calendar) SUPER-G partner: SLU		
DST provider	Svenska Vallföreningen	
Funder	KSLA	
Brief description	Beteskalendar is a hard copy grazing calendar to help farmers keep a diary of the paddocks on which the animals graze. By marking with a pen, you get a clear diagram of how the paddocks are grazed or harvested. Other measures are also introduced such as fertilization, irrigation, etc. You can also enter feeding on stables and delivered milk and can thus calculate milk / ha. The grazing calendar gives an overview of the farms grazing system and this can be used to help review grazing management.	
Links and references	Beteskalendar webpage	
Date of first release	2010	
Last update	2010	
Main purpose (ecosystem service)	6. Grass for livestock, biomass (bioenergy) and other products <ul style="list-style-type: none"> • Whole season/long term modelling or forecasting 	
Main purpose	Paper based grazing calendar to help plan and record grazing management.	
Target audience	Farmers Advisors	
Format	Paper based (hard copy only)	
Cost/availability	Charged for 100 sek (about 10 Euro)	
Number of users	Unknown	
Country of origin	Sweden (Swedish version adapted from Pasture calendar in Belgium and Switzerland)	
Is it country or region specific?	No	
Language	Swedish	
Is the tool specifically targeted to permanent grassland?	All grassland types	
Grassland and livestock management	Targeted at grazing systems. The grazing calendar is written for dairy cows but is easy to use for youngstock, beef cattle and sheep as well.	
Data input required for the DST	<ul style="list-style-type: none"> • Field details (size etc) • Livestock numbers, supplementary feeding etc Optional: <ul style="list-style-type: none"> • Fertiliser application • Milk sales • Grass varieties sown • Sprays 	
Use of data from other existing datasets	No	
Data export	No	
Data storage	No	

Benchmarking	No
Ability of the DST to deliver an impact	Beteskalendern is a simple recoding tool to help farmers with their grassland management. By collecting all the information together, it makes it easier for the farmer to review the whole farm grassland management (on his own or with an advisor) and to compare with previous seasons.
Approach used to generate the outcome from the DST and degree of user interaction	Simple farm recording tool which helps farmers record details of their grassland management.
Additional comments	The Swedish 'pasture calendar' was developed for Swedish conditions based on existing 'pasture calculators' in Belgium and Switzerland.

DST 68 Govfoderkalkylen SUPER-G partner: SLU		Grovfoderkalkylen
DST provider	The Rural Economy and Agricultural Societies in collaboration with the agricultural industry.	
Funder	The Rural Economy and Agricultural Societies	
Brief description	The roughage calculation includes, among other things, production cost calculations for whey, whole grain and forage maize. By entering some basic data on farm production, you quickly get a calculation. There you can choose to rely on the spreadsheet or go in and adjust the values of input means, machine usage, storage costs, etc. therefore you can calculate your cost at a level of detail that you choose.	
Links and references	Govfoderkalkylen webpage	
Date of first release	Unknown	
Last update	Unknown	
Main purpose (ecosystem service)	6. Grass for livestock, biomass (bioenergy) and other products	
Main purpose	Forage crop production cost calculation	
Target audience	Farmers Advisors	
Format	Software – web based	
Cost/availability	First month free. Charged for SEK 850/year (about €80) for “Forage Producer” which allows maximum of three farms. SEK 1450/year (about €140) for “Advisor” which allows an unlimited number of farms	
Number of users	3700 visits to grovfoderverktyget.se per month	
Country of origin	Sweden	
Is it country or region specific?	Cost calculations developed for Sweden, but calculations maybe able to be used elsewhere (but tool is in Swedish)	
Language	Swedish	
Is the tool specifically targeted to permanent grassland?	No, used for production cost calculations for a variety of forage crops.	
Grassland and livestock management	Not specific to a particular management system or livestock	
Data input required for the DST	General crop production information	
Use of data from other existing datasets	No	
Data export	No	
Data storage	The output can be saved to assess impacts of minor adjustments or compare year-on-year results.	
Benchmarking	The tool can be used to compare production costs between years.	
Ability of the DST to deliver an impact	Farmers and advisors can identify areas of high cost and potential areas for cost reduction to increase their profit margins.	

Approach used to generate the outcome from the DST and degree of user interaction	User inputs farm operation data into web-based tool. Users can rely on standard data for some inputs or modify with their own values to increase the accuracy and relevance for their business.
Additional comments	None



DST 69 Räknehjälpen SUPER-G partner: SLU		Räknehjälpen
DST provider	SLU	
Funder	The Rural Economy and Agricultural Societies in collaboration with the agricultural industry.	
Brief description	A collection of about 15 excel spreadsheet tools for calculating separate issues, e.g. cost of transporting slurry or forage, demand of nitrogen to reach a given amount of crude protein, cost of different storage systems, cost of additives, cost of forage handling and losses in the feeding system on farm level, price model for ley or maize when selling between farms.	
Links and references	Räknehjälpen webpage	
Date of first release	Unknown	
Last update	Unknown	
Main purpose (ecosystem service)	6. Grass for livestock, biomass (bioenergy) and other products <ul style="list-style-type: none"> Nutrient management (including fertilisers and organic manures) 	
Main purpose	General grassland production	
Target audience	Farmers Advisors	
Format	Spreadsheets	
Cost/availability	Free	
Number of users	3700 visits to grovfoderverktyget.se per month	
Country of origin	Sweden	
Is it country or region specific?	Many of the sources draw on studies and projects conducted in Sweden and so will be primarily relevant to Swedish farmers though this does not preclude use by others	
Language	Swedish	
Is the tool specifically targeted to permanent grassland?	Forage crops including grass and maize	
Grassland and livestock management	Not specific to a particular management system or livestock type	
Data input required for the DST	The different calculator tools require different data inputs. This range includes but is not limited to: crop, yield, legumes, raw protein desired, storage and transport types and cost and fertilizer tank volume etc.	
Use of data from other existing datasets	No	
Data export	No	
Data storage	Yes – excel sheets can be saved.	
Benchmarking	No	
Ability of the DST to deliver an impact	Users can use these spreadsheet calculator tools to optimize their on farm operations and identify areas for improvement which has the potential to reduce costs and improve results.	

Approach used to generate the outcome from the DST and degree of user interaction	Users input data into an excel spreadsheet which automatically generates results such as costs, input requirements or consequences of a management decision.
Additional comments	No


DST 70 Vallprognos SUPER-G partner: SLU		Vallprognos
DST provider	SLU	
Funder	SLU and participating organisations	
Brief description	Vallprognos is a web based tool to help estimate/plan the date for cutting grass. The tool used weather data to calculate cumulative day degrees above 5°C and based on this estimates the optimum cutting date to achieve good grass quality with a high MJ. In addition, the tool provides data on grass quality from a number of regional sampling points during the year.	
Links & references	Vallprognos website	
Date of first release	2007	
Last update	2019	
Main purpose (ecosystem service)	6. Grass for livestock, biomass (bioenergy) and other products <ul style="list-style-type: none"> • Grass measurement & short term budgeting 	
Main purpose	Estimate/plan grass cutting dates	
Target audience	Farmers Advisors Other (Agro industry, e.g. feed companies)	
Format	Software – web based	
Cost/availability	Free	
Number of users	~5000	
Country of origin	Sweden	
Is it country or region specific?	The tool is specific to Sweden (only supplies data for Sweden)	
Language	Swedish	
Is the tool specifically targeted to permanent grassland?	No – all grassland types	
Grassland and livestock management	Targeted at cut grass for any livestock sector	
Data input required for the DST	No data required by the user.	
Use of data from other existing datasets	The system uses weather data from a number of regional weather stations.	
Data export	No	
Data storage	Stores weather data, but no storage of user entered data	
Benchmarking	No	
Ability of the DST to deliver an impact	The tool is frequently used presumably due to that it's appreciated by its user.	
Approach used to generate the outcome from the DST and degree of user interaction	The tool uses weather data to predict the optimum date for cutting.	

Additional comments	Users are interested in development of the system to make it more site specific, e.g. by including soil characteristics. Lack of funding is limiting development.
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DST 71 Bilance živin (Farm Nutrient Balance) SUPER-G partner: MENDELU		NITRAT.CZ
DST provider	Crop Research Institute (VURV)	
Funder	Ministry of Agriculture	
Brief description	This excel based tool helps farmers to evaluate net export/import of main nutrients (N, P, K) at a field level. It calculate nutrient export in the form of sold crops and forage and import in purchased mineral fertilizers and manure applied.	
Links and references	<ul style="list-style-type: none"> • Farm Nutrient Balance website • Webpage on VURV (with download links) 	
Date of first release	2018	
Last update	2019	
Main purpose (ecosystem service)	4. Water quality (1 st) 5. Grass for livestock, biomass (bioenergy) and other products (2 nd) <ul style="list-style-type: none"> • Nutrient management (including fertilisers and organic manures) 	
Main purpose	Field level nutrient balance	
Target audience	Farmers Advisors	
Format	Spreadsheet	
Cost/availability	Free	
Number of users	Unknown	
Country of origin	The Czech Republic	
Is it country or region specific?	No. The tool contains thresholds and nutrient limitations for The Czech Republic but that doesn't necessarily preclude use elsewhere.	
Language	Czech	
Is the tool specifically targeted to permanent grassland?	All crops including grass	
Grassland and livestock management	Not specific to a particular management system or livestock type	
Data input required for the DST	User inputs data on harvest yields and crop types including green maize, silage and perennial forage as well as information on the mineral fertilisers and manure used.	
Use of data from other existing datasets	Basic data concerning nutrient content and manure is already filled from tables but the user can edit these with their own.	
Data export	Data is input and calculated all within an excel spreadsheet.	
Data storage	Data is saved within the excel spreadsheet.	
Benchmarking	None at present. This tool only generates data at a field level. A new version of the tool should be able to calculate farm gate values.	
Ability of the DST to deliver an impact	The tool helps manage nutrient application to farms to improve efficiency and reduce water pollution. It also helps to prevent nutrient depletion of the soils	

Approach used to generate the outcome from the DST and degree of user interaction	High level of user interaction. User must input data on all crops they grow and the yields as well as the mineral and organic fertilisers used.
Additional comments	None




DST 72 Metodické pokyny k ekologické obnově travních porostů (Methodological instructions to organic restoration of species-rich grasslands) SUPER-G partner: MENDU		
DST provider	Czech Association of Nature Protection – White Carpathians (ČSOP Bílé Karpaty)	
Funder	European Union	
Brief description	The booklet describes the importance of species rich grasslands in a landscape and provides guidelines on how to establish them.	
Links and references	Methodological instructions to organic restoration of species-rich grasslands (PDF) (in Czech)	
Date of first release	2012	
Last update	2012	
Main purpose (ecosystem service)	1. Biodiversity and pollination (1 st) 5. Landscape and recreation including cultural values (2 nd)	
Main purpose	To guide the user towards the best practices for high biodiversity.	
Target audience	Farmers Advisors Other (Nature conservationists)	
Format	Paper based (electronic version available)	
Cost/availability	Free	
Number of users	Unknown	
Country of origin	The Czech Republic	
Is it country or region specific?	No	
Language	Czech	
Is the tool specifically targeted to permanent grassland?	Targeted at species rich grassland	
Grassland and livestock management	Suitable for extensive livestock management	
Data input required for the DST	None	
Use of data from other existing datasets	No	
Data export	No	
Data storage	No	
Benchmarking	No	
Ability of the DST to deliver an impact	Material describes how to convert arable land or species-poor grasslands into stands of high biodiversity.	
Approach used to generate the outcome from the DST and degree of user interaction	No user interaction (guidance)	

Additional comments	None
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DST 73 Metodika na zlepšení travních porostů v Národním hřebčíně Kladruby nad Labem (Methodology for grasslands improvement utilized by horses) SUPER-G partner: MENDU		 
DST provider	Mendel university in Brno	
Funder	Ministry of Agriculture of the Czech Republic	
Brief description	<p>Guidelines for grassland management for horses. Grass forage in the form of hay, silage or grazing should account for at least 50% of the dry matter intake of all horse feed. The guidance includes information on soil types, fertilisation and weed management. The guidelines describes the occurrence of endophytic fungi of the genus <i>Epichloë</i> on the plots of NS Kladruby n.L., which produce poisonous alkaloids in grasses. Finally, the specifics of the behaviour of horses on pastures and their preferences in the selection of plants are presented and the danger of intake of large amounts of fructans in pasture forage is mentioned.</p>	
Links and references	Methodology for grasslands improvement utilized by horses (PDF) (in Czech)	
Date of first release	December 2018	
Last update	2018	
Main purpose (ecosystem service)	6. Grass for livestock, biomass (bioenergy) and other products (1 st) <ul style="list-style-type: none"> • Nutrient management (including fertilisers and organic manures) • Grass measurement & short term budgeting • Soil management 5. Landscape and recreation including cultural values (2 nd)	
Main purpose	Guidelines for good forage production specifically for horses	
Target audience	Farmers Advisors Policy makers Other (Students)	
Format	Paper based (electronic version available)	
Cost/availability	Free	
Number of users	Unknown	
Country of origin	The Czech Republic	
Is it country or region specific?	Provides information for management regarding the soil types of the National Stud Farm but otherwise could be applicable elsewhere	
Language	Czech	
Is the tool specifically targeted to permanent grassland?	Specific to permanent grassland	
Grassland and livestock management	Targeted to horses	
Data input required for the DST	None	

Use of data from other existing datasets	No
Data export	No
Data storage	No
Benchmarking	No
Ability of the DST to deliver an impact	By advising on good management of permanent grassland renovation and fertilizing, productivity is optimized allowing for efficient horse nutrition.
Approach used to generate the outcome from the DST and degree of user interaction	Guidance document based on the four-year research focused on improving grassland forage production and quality for horse nutrition.
Additional comments	None

DST 74 Metodika optiMalizace Mulčování s ohledeM na výskyt fuzárií (Methodology of grasslands mulching optimization with regards to Fusarium fungi occurrence) SUPER-G partner: MENDU		  
DST provider	Oseva PRO, Agriculture Research, Crop Research Institute	
Funder	Ministry of Agriculture	
Brief description	<p>Guidance for conservationists and farmers which provides information and arguments for suitable ways of grassland mulching in areas where grass is no other use for the grass. 'Mulching' refers to where the farmer cuts the grass and leaves it in the field as a mulch. There was some concern that this practice may pose a risk to human and animal health from pathogen species in the mulch. Three-year research has shown that spores of Fusarium fungi can be detected above mulched vegetation, but their frequency in the air is relatively low. Similarly, the number of detected species was low compared to the species spectrum captured in the mulch itself. The frequency of mulching twice per season is sufficient for grassland functioning and is not hygienically dangerous due to the occurrence of potentially allergenic Fusarium species.</p>	
Links and references	Methodology of grasslands mulching optimalisation with regards to Fusarium fungi occurrence (PDF) (in Czech)	
Date of first release	2014	
Last update	2014	
Main purpose (ecosystem service)	5. Landscape and recreation including cultural values (1 st) 1. Biodiversity and pollination (2 nd)	
Main purpose	A tool for preserving semi-natural grasslands.	
Target audience	Farmers Advisors Policy makers Other (Nature conservationists)	
Format	Paper based (electronic version available)	
Cost/availability	Free	
Number of users	Unknown	
Country of origin	The Czech Republic	
Is it country or region specific?	No	
Language	Czech	
Is the tool specifically targeted to permanent grassland?	For all grasslands not used primarily for commercial production	
Grassland and livestock management	Not specific to a particular management system or livestock type	
Data input required for the DST	None	

Use of data from other existing datasets	No
Data export	No
Data storage	No
Benchmarking	No
Ability of the DST to deliver an impact	The methodology provides a proof that above ground biomass mulching does not pose hygienic risk for humans. It can prevent the loss of biodiversity due to grasslands abandonment.
Approach used to generate the outcome from the DST and degree of user interaction	Document describing the methodology and hygienic impact of grassland mulching.
Additional comments	None

DST 75 Metody regulace plevel ůu na trval ůch travn ůch porostech (Methods of weed control on permanent grasslands) SUPER-G partner: MENDU		
DST provider	Crop Research Institute, Prague-Ruzyně	
Funder	Ministry of Agriculture of the Czech Republic	
Brief description	Guidance documents which presents to the professional public comprehensive information on biology, ecology, reproductive capacity and methods of regulation of selected weed species, which occur significantly on meadows and pastures. The basic rules of care of these stands are described. From the point of view of weed control the tool presents a synthesis of pratotechnical interventions, the possibility of using herbicides and the use of elements of biological weed control.	
Links and references	Methods of weed control on permanent grasslands (PDF) (in Czech)	
Date of first release	2009	
Last update	2009	
Main purpose (ecosystem service)	6. Grass for livestock, biomass (bioenergy) and other products (1 st) 1. Biodiversity and pollination (2 nd)	
Main purpose	Weed control in grasslands	
Target audience	Farmers Advisors	
Format	Paper based (electronic version available)	
Cost/availability	Free	
Number of users	Unknown	
Country of origin	The Czech Republic	
Is it country or region specific?	No	
Language	Czech	
Is the tool specifically targeted to permanent grassland?	All grassland types	
Grassland and livestock management	All management systems and livestock sector	
Data input required for the DST	None (guidance document)	
Use of data from other existing datasets	No	
Data export	No	
Data storage	No	
Benchmarking	No	
Ability of the DST to deliver an impact	By advising on good management of weeds the permanent grassland productivity is optimized allowing for higher forage yields of better quality for livestock.	

Approach used to generate the outcome from the DST and degree of user interaction	Guidance document. Users consult photographs and description to identify weed species and based on this identifies optimal management techniques.
Additional comments	None





DST 76 MOŽNOSTI REGULACE ŠIROKOLISTÝCH ŠŤOVÍKŮ V TRAVNÍCH POROSTECH V SYSTÉMU EKOLOGICKÉHO ZEMĚDĚLSTVÍ (Broad-leaved docks control in grasslands within organic farming) SUPER-G partner: MENDU	
DST provider	Crop Research Institute, Prague Czech Agricultural University, Prague
Funder	Crop Research Institute, Prague Czech Agricultural University, Prague
Brief description	Guidance document which summarizes recent findings about the ecology of the most common broad-leaved dock, the issue of germination, sprouting and behaviour under different management systems. Although docks are among the most frequently occurring weeds in grassland and causes loss of production (forage yield and quality) and biodiversity, their response to various management practices is not sufficiently studied. This is related to insufficient knowledge of their control especially in organic farming, which is not allowed to use herbicides.
Links and references	Broad-leaved docks control in grasslands within organic farming (PDF)
Date of first release	2011
Last update	2011
Main purpose (ecosystem service)	6. Grass for livestock (1 st) 5. Landscape and recreation including cultural values (2 nd)
Main purpose	Weed control in grassland
Target audience	Farmers Advisors Policy makers Other (Workers specifically in the organic sector. Students and teachers of secondary schools and universities)
Format	Paper based (electronic version available)
Cost/availability	Free
Number of users	Unknown
Country of origin	The Czech Republic
Is it country or region specific?	No.
Language	Czech
Is the tool specifically targeted to permanent grassland?	All grassland types
Grassland and livestock management	Targeted at organic grasslands
Data input required for the DST	None (guidance)
Use of data from other existing datasets	None




Data export	None
Data storage	No
Benchmarking	No
Ability of the DST to deliver an impact	Better management of broad-leaved dock weeds in grassland can increase forage production, quality and biodiversity.
Approach used to generate the outcome from the DST and degree of user interaction	Users consult the report and methodologies presented to manage dock weed species on their land.
Additional comments	None





DST 77 OBHOSPODAŘOVÁNÍ TRAVNÍCH POROSTŮ ve vztahu k agro-environmentálním opatřením (Grassland management in relation to Agri-environmental schemes) SUPER-G partner: MENDU	
DST provider	Crop Research Institute
Funder	Ministry of Environment
Brief description	The publication provides answers to frequently asked questions regarding the management of grasslands in the foothills and mountain areas. The publication reflects mainly the effect of management on botanical composition and structure of vegetation.
Links and references	Grassland management in relation to Agri-environmental schemes (PDF) (in Czech)
Date of first release	2011
Last update	2011
Main purpose (ecosystem service)	<ol style="list-style-type: none"> 1. Biodiversity and pollination (1st) 5. Landscape and recreation including cultural values (2nd) 6. Grass for livestock, biomass (bioenergy) and other products (3rd) <ul style="list-style-type: none"> • Nutrient management (including fertilisers and organic manures) • Soil management
Main purpose	Environmental issues linked with grassland management
Target audience	Farmers Advisors Policy makers Other (It is intended primarily for official nature conservationists. It can also be used by students and teachers of secondary schools and universities)
Format	Paper based (electronic version available)
Cost/availability	Free
Number of users	Unknown
Country of origin	The Czech Republic
Is it country or region specific?	No
Language	Czech
Is the tool specifically targeted to permanent grassland?	Permanent grassland
Grassland and livestock management	Where it mentions livestock it only discusses grazing livestock. Also discusses the implications of mowing as a management technique.
Data input required for the DST	None (guidance document)
Use of data from other existing datasets	No
Data export	No

Data storage	No
Benchmarking	No
Ability of the DST to deliver an impact	Document provides semi-natural grasslands management recommendations which aim to preserve biodiversity, sustainable food production and landscape conservation.
Approach used to generate the outcome from the DST and degree of user interaction	Descriptive approach of particular management options which should support biodiversity and landscape conservation.
Additional comments	None

DST 78 Ověřená technologie produkce osiva kokrhele luštěnce (<i>Rhinanthus alectorolophus</i> (Scop.) Pollich) (Technology for <i>Rhinanthus alectorolophus</i> seed multiplying) SUPER-G partner: MENDU		
DST provider	Technology Agency of the Czech Republic	
Funder	Technology Agency of the Czech Republic	
Brief description	<p><i>Rhinanthus alectorolophus</i>, previously considered a weed, is now appreciated for its ability to inhibit aggressive grasses thereby facilitating increased species diversity of plants and insects.</p> <p>The aim of this publication is to present the steps for successful production of <i>R.alectorolophus</i> seed. Using the technologies described here speed of seed production can be significantly increased and thus its availability which will lead to reduced cost. This will allow its wide use in various applications, which have been previously hindered by lack of seed on the market.</p>	
Links and references	Technology for <i>Rhinanthus alectorolophus</i> seed multiplying (PDF) (in Czech)	
Date of first release	2018	
Last update	2018	
Main purpose (ecosystem service)	1. Biodiversity and pollination (1 st) 5. Landscape and recreation including cultural values (2 nd)	
Main purpose	A tool for enhancing grassland diversity	
Target audience	Farmers Advisors Policy makers Other (Nature conservationists)	
Format	Paper based (electronic version available)	
Cost/availability	Free	
Number of users	Unknown	
Country of origin	The Czech Republic	
Is it country or region specific?	No	
Language	Czech	
Is the tool specifically targeted to permanent grassland?	No – the tool is targeted at producing a seed which can be included in grasslands	
Grassland and livestock management	Not specific to a particular management system or livestock type	
Data input required for the DST	None	
Use of data from other existing datasets	No	
Data export	No	
Data storage	No	
Benchmarking	No	


Ability of the DST to deliver an impact	Distribution and sowing of <i>R. alectorolophus</i> can lead to reduced growth of aggressive grasses, promoting species diversity and reduced growth in areas where high biomass is not desirable such as the edges of highways or in protected areas.
Approach used to generate the outcome from the DST and degree of user interaction	Methodology based on 4 year research including also biology of the hemiparasites species.
Additional comments	None



DST 79 Přehled vlastností odrůd trav a jetelovin (List of recommended varieties of grasses and forage legumes) SUPER-G partner: MENDU		 
DST provider	Central Institute for Supervising and Testing in Agriculture; Association of growers grass and forage legume seeds	
Funder	Ministry of Agriculture	
Brief description	Grass and forage crop variety recommendations. The document includes information on varieties of red and white clover, Lucerne and perennial ryegrass which have been tested for forage yield, resistance to fungal diseases, and persistence in distinct locations in the Czech Republic.	
Links and references	List of recommended varieties of grasses and forage legume website	
Date of first release	Unknown	
Last update	Unknown	
Main purpose (ecosystem service)	6. Grass for livestock, biomass (bioenergy) and other products <ul style="list-style-type: none"> • Grass variety selection 	
Main purpose	Grass and forage crop variety recommendations	
Target audience	Farmers Advisors	
Format	Paper based (electronic version available)	
Cost/availability	Free	
Number of users	Unknown	
Country of origin	The Czech Republic	
Is it country or region specific?	Yes, it was tested for specific use in the area of the Czech Republic	
Language	Czech	
Is the tool specifically targeted to permanent grassland?	No, the results can be used also for forages cultivation on arable land.	
Grassland and livestock management	Not specific to a particular management system or livestock type	
Data input required for the DST	No	
Use of data from other existing datasets	No	
Data export	No	
Data storage	No	
Benchmarking	It compares data from different pedo-climatic conditions	
Ability of the DST to deliver an impact	Enable farmers use most suitable varieties for particular conditions.	
Approach used to generate the outcome from the DST and degree of user interaction	Document shows the results of variety testing.	

Additional comments	None
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DST 80 Přísevy jetelovin a trav do trvalých travních porostů (Methodology for grasslands overseeding) SUPER-G partner: MENDU		
DST provider	Crop Research Institute	
Funder	Ministry of Agriculture	
Brief description	Guidance document on grassland overseeding. Considerable attention is paid to the factors influencing the success of the establishment of seeding. The guidance recommends initial assessment of the grassland and technologies used for seeding legumes, grasses and herbs.	
Links and references	Methodology for grasslands overseeding (PDF) (in Czech)	
Date of first release	2007	
Last update	2007	
Main purpose (ecosystem service)	6. Grass for livestock, biomass (bioenergy) and other products (1 st) <ul style="list-style-type: none"> • Nutrient management (including fertilisers and organic manures) • Grass measurement & short term budgeting • Soil management • Grass variety selection 3. Flood and erosion control (2 nd) 2. Carbon storage and GHG (3 rd) <ul style="list-style-type: none"> • Carbon sequestration / storage 4. Water quality (4 th)	
Main purpose	Grassland renovation and fertilizing	
Target audience	Farmers Advisors Policy makers Other (Intended also for use in further research and agricultural education and breeding.)	
Format	Paper based (electronic version available)	
Cost/availability	Free	
Number of users	Unknown	
Country of origin	The Czech Republic	
Is it country or region specific?	No	
Language	Czech	
Is the tool specifically targeted to permanent grassland?	All grassland types	
Grassland and livestock management	Specific to grassland overseeding. Not specific to any livestock type.	
Data input required for the DST	No	
Use of data from other existing datasets	None	

Data export	No
Data storage	No
Benchmarking	No
Ability of the DST to deliver an impact	Good grassland management reduces the risk of flooding and soil carbon loss
Approach used to generate the outcome from the DST and degree of user interaction	User consults the document to understand the best practices and approach recommended for over-seeding of grassland.
Additional comments	None


DST 81 PŘÍSEVY travních porostů (Grasslands overseeding) SUPER-G partner: MENDU	
DST provider	Agrokop HB
Funder	Agrokop HB
Brief description	This guidance document outlines the key steps and procedures to successfully manage seeding or renewal, to quantify the benefits of properly conducted seeding and at the same time suggest the optimal choice of grass and clover mixtures. The financial benefit of various grassland management options is included.
Links and references	Grasslands overseeding (PDF) (in Czech)
Date of first release	2012
Last update	2012
Main purpose (ecosystem service)	6. Grass for livestock, biomass (bioenergy) and other products <ul style="list-style-type: none"> • Nutrient management (including fertilisers and organic manures) • Soil management • Grass variety selection
Main purpose	Guidance on overseeding
Target audience	Farmers Advisors
Format	Paper based (electronic version available)
Cost/availability	Free
Number of users	Unknown
Country of origin	The Czech Republic
Is it country or region specific?	Yes, pricings are specific to the Czech market so the magnitude of savings that can be made, which influence the value in taking action, will be relevant only to The Czech Republic.
Language	Czech
Is the tool specifically targeted to permanent grassland?	All grassland types
Grassland and livestock management	Not specific to a particular management system or livestock type
Data input required for the DST	None
Use of data from other existing datasets	None
Data export	No
Data storage	No
Benchmarking	Yes, this commercial tool compares pricings in order to demonstrate cost benefits of good grassland management
Ability of the DST to deliver an impact	The guidelines compare pricings in order to demonstrate cost benefits of good grassland management. With minimum inputs less than 3 500 CZK / ha it is possible to provide an increase in milk production per hectare up to 47 000 CZK or even up to 60 000 CZK when seeding with

	red clover. The prerequisite is mastering the whole chain from planting through harvest and storage or preservation of feed and whether breeds with a high feed conversion are stocked.
Approach used to generate the outcome from the DST and degree of user interaction	User consults the document. Compares descriptions and pictures to their fields and by integrating with their targets uses the information presented to develop a reseeding plan.
Additional comments	None

DST 82 PROTIEROZNÍ KALKULAČKA (Erosion calculator) SUPER-G partner: MENDU		
DST provider	Research Institute for Soil and Water Conservation	
Funder	Ministry of Agriculture	
Brief description	Erosion calculator provides users with information on the level of erosion vulnerability of assessed sites and on the protective effect of model crop rotation methods with the possibility to create and evaluate their own crop rotation procedures. Complementary anti-erosion measures and the impact of organic matter balance on soil erodibility can be evaluated.	
Links and references	Erosion calculator	
Date of first release	Unknown	
Last update	Unknown	
Main purpose	3. Flood and erosion control (1 st) 4. Water quality (2 nd)	
Main purpose	Erosion control	
Target audience	Farmers Advisors	
Format	Software – web based	
Cost/availability	Free	
Number of users	Unknown	
Country of origin	The Czech Republic	
Is it country or region specific?	Map based tool including only regions within the Czech republic	
Language	Czech	
Is the tool specifically targeted to permanent grassland?	All crops including grass	
Grassland and livestock management	Not specific to a particular management system or livestock type	
Data input required for the DST	User draws the area on the provided map that they are interested in evaluating	
Use of data from other existing datasets	The application uses data from: <ul style="list-style-type: none"> • LPIS, WMS and WFS database of LPIS services, provider of the Ministry of Agriculture of the Czech Republic • Layers for erosion calculation and underlying layers of erosion, source VÚMOP, vvi • Erosion events recorded in the framework of Erosion Monitoring, source VÚMOP, vvi, SPÚ • Background data © ČÚZK, Conditions of providing ČÚZK network services over spatial data, http://geoportal.cuzk.cz 	
Data export	Unknown	
Data storage	Yes	
Benchmarking	Yes. It is possible to compare erosion potential under a proposed system with average/current erosion	




Ability of the DST to deliver an impact	Allows users to make informed decisions which can contribute to reducing soil erosion
Approach used to generate the outcome from the DST and degree of user interaction	User inputs their location data and can also input crop rotation plans to identify areas of erosion risk and potential mitigation strategies including grassing
Additional comments	None




DST 83 Trávy jako energetická surovina (Grasses as an energetic raw material) SUPER-G partner: MENDU		
DST provider	Crop Research Institute, South Bohemian university	
Funder	Ministry of Agriculture	
Brief description	<p>Guidance on grassland management for grass grown for biomass for industrial uses. The guidance briefly summarizes actual situation of the production, quality and utilization of energetic grass biomass in The Czech Republic. This includes descriptions of important grass species suitable for energy utilization, their botanical characteristics, yield, quality and technological parameters from the point of view of energy recovery and agronomical practise. The guidance predominantly focuses on the harvesting technology, ways of preservation, harvesting period and energy utilisation of the grass biomass through combustion or biogas production. The guidance also includes information on the economics of grass production.</p>	
Links and references	Grasses as an energetic raw material (PDF) (in Czech)	
Date of first release	2011	
Last update	2011	
Main purpose (ecosystem service)	6. Grass for livestock, biomass (bioenergy) and other products (1 st) 2. Carbon storage (2 nd)	
Main purpose	A tool for utilizing surplus grass biomass for industrial use.	
Target audience	Farmers Advisors Policy makers Other (Nature conservationists)	
Format	Paper based (electronic version available)	
Cost/availability	Free	
Number of users	Unknown	
Country of origin	The Czech Republic	
Is it country or region specific?	No	
Language	Czech	
Is the tool specifically targeted to permanent grassland?	Focused on harvesting of grasses	
Grassland and livestock management	Focused on harvesting for energy and therefore not suitable for any livestock type	
Data input required for the DST	None	
Use of data from other existing datasets	No	
Data export	No	
Data storage	No	

Benchmarking	No
Ability of the DST to deliver an impact	Material describes how to convert energy from grass biomass into heat or electricity.
Approach used to generate the outcome from the DST and degree of user interaction	No user interaction (Guidance)
Additional comments	None




DST 84 Zakládání porostů trav na semeno (Methods of grass stands establishment for seed production) SUPER-G partner: MENDU		  
DST provider	OSEVA research and development Ltd. Zubří, Mendel University in Brno, Agricultural research Ltd. Troubsko	
Funder	Ministry of Agriculture of the Czech Republic	
Brief description	Guidance document aimed at farmers who produce grass seed. The guidance is based on the results of a research project focused on improved efficiency of grass stands establishment and increased profitability of grass seed producers.. The guidance includes information on cultivation practices and new methods and procedures for setting up grass for seed and evaluates risks that are associated with alternative crop management.	
Links and references	Methods of grass stands establishment for seed production (PDF) (in Czech)	
Date of first release	2018	
Last update	2018	
Main purpose	6. Grass for livestock, biomass (bioenergy) and other products (1 st) <ul style="list-style-type: none"> • Nutrient management (including fertilisers and organic manures) • Soil management • Grass variety selection 5. Landscape and recreation including cultural values (2 nd)	
Main purpose	Novel approaches for grass seed production	
Target audience	Farmers Advisors Other (Agricultural University Students)	
Format	Paper based (electronic version available)	
Cost/availability	Free	
Number of users	Unknown	
Country of origin	The Czech Republic	
Is it country or region specific?	Suitable just for the conditions of central Europe	
Language	Czech	
Is the tool specifically targeted to permanent grassland?	Specifically at grass for seed production	
Grassland and livestock management	Intended for farmers who produce grass seed	
Data input required for the DST	None (guidance document)	
Use of data from other existing datasets	No	
Data export	No	

Data storage	No
Benchmarking	No
Ability of the DST to deliver an impact	Guidance document for farmers growing grass for seed
Approach used to generate the outcome from the DST and degree of user interaction	Guidance document for farmers growing grass for seed
Additional comments	None


DST 85 Fertiliser recommendations for permanent grassland SUPER-G partner: UGOE		
DST provider	Public extension bodies at level of Bundesland (Landesanstalt für Landwirtschaft, Landwirtschaftskammer) and Deutsche Landwirtschaftsgesellschaft (DLG)	
Funder	Regional government (Bundesländer), DLG	
Brief description	Fertilization recommendation for permanent grassland based on site conditions, type of utilization (pasture, mown), utilization frequency and soil tests, includes organic and mineral fertilizers.	
Links and references	<ul style="list-style-type: none"> • Fertiliser recommendations for Germany (in German) • Regional fertiliser recommendations (in German) 	
Date of first release	Various	
Last update	2018	
Main purpose (ecosystem service)	7. Grass for livestock, biomass (bioenergy) and other products <ul style="list-style-type: none"> • Nutrient management (including fertilisers and organic manures) 	
Main purpose	Fertiliser recommendations	
Target audience	Farmers Advisors	
Format	Paper based (electronic version available)	
Cost/availability	Free	
Number of users	Unknown	
Country of origin	Germany	
Is it country or region specific?	Some parts may be specific to German conditions (expected yield/nutrient removal based on management), others are more widely applicable.	
Language	German	
Is the tool specifically targeted to permanent grassland?	All grassland types	
Grassland and livestock management	Not specific to a particular management system or livestock type	
Data input required for the DST	Soil analysis, estimated nutrient removal based on grass management.	
Use of data from other existing datasets	No	
Data export	No	
Data storage	No	
Benchmarking	No	
Ability of the DST to deliver an impact	Includes guidance values for nutrient removal based on management and on nutrient concentrations of organic fertilizers, formulae to calculate fertilizer nutrient requirement and recommendations to enhance fertilizer efficiency and reduce emissions/losses.	

Approach used to generate the outcome from the DST and degree of user interaction	Paper-based, no direct interaction
Additional comments	None




DST 86 Grassland maturity monitoring (Grünlandreifepfung) SUPER-G partner: UGOE		
DST provider	Public extension bodies at level of Bundesland	
Funder	Regional government (Bundesländer), farmers	
Brief description	Weekly report on current forage quality of permanent and temporary grassland with a short term forecast based on current conditions. This can help farmers to achieve high forage quality in the first cut in spring by choosing the optimum cutting date. The bodies offering this service sample grassland forage quality at a number of representative sampling sites spread throughout the participating regions and report current forage quality (e.g. dry matter content, crude fibre content, crude protein content, energy content).	
Links and references	Information is provided each year during spring (April-May) on the website of the bodies offering this service, as well as in the agricultural press. <ul style="list-style-type: none"> • https://www.lksh.de • http://www.lms-lufa.de • http://www.lwk-niedersachsen.de • https://www.landwirtschaftskammer.de/riswick • https://www.llh.hessen.de • https://www.landwirtschaft.sachsen.de • http://www.lfl.bayern.de 	
Date of first release	1986	
Last update	2019	
Main purpose (ecosystem service)	6. Grass for livestock, biomass (bioenergy) and other products <ul style="list-style-type: none"> • Grass measurement & short term budgeting • Forage quality 	
Main purpose	Advice on forage quality and cutting dates.	
Target audience	Farmers	
Format	Paper based (Also available electronically)	
Cost/availability	Free	
Number of users	Unknown	
Country of origin	Germany	
Is it country or region specific?	Yes. Monitoring and forecast is specific to regions in Germany.	
Language	German	
Is the tool specifically targeted to permanent grassland?	Recommendations include permanent and temporary grassland.	
Grassland and livestock management	Focused on silage-making (non-grazing).	
Data input required for the DST	None	
Use of data from other existing datasets	Use of weather forecast (Deutscher Wetterdienst, DST) for forage quality forecasting.	

Data export	No
Data storage	No
Benchmarking	Yes. Farmers can compare forage quality of their first cut with typical regional values.
Ability of the DST to deliver an impact	DST helps farmers to select cutting date to maximise forage quality.
Approach used to generate the outcome from the DST and degree of user interaction	Provides information on forage quality which can help farmers select cutting dates. Guidance information, no direct interaction.
Additional comments	None


DST 87 Grassland temperature sum guidance for fertiliser application (Beratungsmodul Grünlandtemperatursumme (GTS)) SUPER-G partner: UGOE		 wissen wie's wächst
DST provider	ISIP - das Informationssystem für die integrierte Pflanzenproduktion	
Funder	Regional government (Bundesländer)	
Brief description	The tool estimates the start of vegetation growth based on temperature sum in order to give guidance on the timing of spring fertiliser application. The tool can help farmers reduce diffuse water pollution from fertilizers by providing guidance on application timing in the spring; to ensure farmers do not apply fertiliser too early when the grass is not actively taking up the applied nutrients and when the risk of nutrient losses is higher.	
Links and references	GTS webpage	
Date of first release	Unknown (the portal ISIP is available since 2003)	
Last update	2020	
Main purpose (ecosystem service)	4. Water quality (1st) 6. Grass for livestock, biomass (bioenergy) and other products <ul style="list-style-type: none"> • Nutrient management (including fertilisers and organic manures) (2nd) 	
Main purpose	Fertilizer application timing.	
Target audience	Farmers	
Format	Software – web based	
Cost/availability	Free	
Number of users	Unknown	
Country of origin	Germany	
Is it country or region specific?	Yes. Recommendations are specific to regions in Germany.	
Language	German	
Is the tool specifically targeted to permanent grassland?	Includes permanent and temporary grassland.	
Grassland and livestock management	Not specific to a particular management system or livestock type.	
Data input required for the DST	None	
Use of data from other existing datasets	Use of weather data (Deutscher Wetterdienst, DWD) to calculate temperature sum	
Data export	No	
Data storage	No	
Benchmarking	No	
Ability of the DST to deliver an impact	DST helps farmers to prevent nutrient losses / nutrient leaching caused by too early fertilizer application in spring and helps to increase the efficiency of fertilizer use.	


Approach used to generate the outcome from the DST and degree of user interaction	Map with region-specific guidance on whether fertilizer application can be recommended right now; no direct interaction.
Additional comments	None




DST 88 Grünland-Online SUPER-G partner: UGOE		
DST provider	Landwirtschaftliches Zentrum Baden-Württemberg (LAZBW)	
Funder	Ministerium für Ländlichen Raum und Verbraucherschutz Baden-Württemberg	
Brief description	Website collecting all grassland-related extension tools of the state agricultural research and extension institute LAZBW of the land Baden-Württemberg, including tools for: <ul style="list-style-type: none"> • Determining grass species based on vegetative and generative traits • Determining appropriate fertilisation levels based on site, management and soil tests • Evaluating the composition of grassland swards and deciding on necessary management changes, resowing/renovation measures and weed management • Evaluating silage quality and deciding on measures for improving silage success • Classifying wild boar damage in grassland and legal basis for recompense 	
Links and references	<ul style="list-style-type: none"> • Grünland-Online website • Elsässer M. & Thumm U. (2006) Modern transfer of grassland knowledge via WorldWideWeb using the German grassland platform gruenland-online.de. Grassland Science in Europe 11, 727-729. 	
Date of first release	2006	
Last update	2017 or later	
Main purpose (ecosystem service)	6. Grass for livestock, biomass (bioenergy) and other products <ul style="list-style-type: none"> • Nutrient management (including fertilisers and organic manures) 	
Main purpose	General grassland management including management of sward composition	
Target audience	Farmers	
Format	Software – web based	
Cost/availability	Free	
Number of users	Unknown	
Country of origin	Germany	
Is it country or region specific?	Specific to Germany (some information specific for the region Baden-Württemberg, other information would be applicable to Central Europe outside Germany, too).	
Language	German	
Is the tool specifically targeted to permanent grassland?	All grassland types	
Grassland and livestock management	Not specific to a particular management system or livestock type	

Data input required for the DST	For fertilization: cutting frequency, region, soil tests. For sward management: area percentage of open soil, estimated biomass percentage of good grasses, weedy grasses, weedy forbs
Use of data from other existing datasets	No
Data export	No
Data storage	No
Benchmarking	Partly – desirable sward composition and silage quality parameters are given
Ability of the DST to deliver an impact	Collection of relevant information for sustainable management of permanent grassland.
Approach used to generate the outcome from the DST and degree of user interaction	Partly information to read, partly decision trees based on user input
Additional comments	None


DST 89 Hinweisdienst Grünland SUPER-G partner: UGOE		
DST provider	Landwirtschaftskammer Niedersachsen	
Funder	Regional government (Bundesland Niedersachsen), farmers	
Brief description	Newsletter providing information on various aspects of grassland and forage crop management e.g. varieties and mixtures, optimum cutting dates, fertilizer application, legal framework. Issued 18 times per year.	
Links and references	Webpage for sign ups	
Date of first release	Unknown	
Last update	2020	
Main purpose (ecosystem service)	6. Grass for livestock, biomass (bioenergy) and other products	
Main purpose	General grassland management advice.	
Target audience	Farmers	
Format	Paper based (Can be sent by email)	
Cost/availability	€50 for email or fax. €60 for post. Subscription per year	
Number of users	Unknown	
Country of origin	Germany	
Is it country or region specific?	Yes. Recommendations are specific to regions in Germany	
Language	German	
Is the tool specifically targeted to permanent grassland?	Includes permanent and temporary grassland as well as forage crops.	
Grassland and livestock management	Not specific to a particular management system or livestock type.	
Data input required for the DST	None	
Use of data from other existing datasets	None	
Data export	No	
Data storage	No	
Benchmarking	No	
Ability of the DST to deliver an impact	DST gives timely recommendations for grassland and forage crop management.	
Approach used to generate the outcome from the DST and degree of user interaction	General grassland management advice. No direct interaction	
Additional comments	None	

DST 90 Riswick pasture planner (Riswicker Weideplaner) SUPER-G partner: UGOE		
DST provider	Landwirtschaftskammer Nordrhein-Westfalen, Haus Riswick	
Funder	Landwirtschaftskammer Nordrhein-Westfalen	
Brief description	The Riswick pasture planner is a spreadsheet based tool. The tool includes a 'pasture planner' and forms to plan and record the grazing regime and additional management (cutting & yield, fertilization, resowing, pesticide application) for all grassland fields of a farm. The 'pasture planner' is a spreadsheet containing average seasonal grass growth rates for different regions of Nordrhein-Westfalen in Germany.	
Links and references	Riswick pasture planner webpage with download links	
Date of first release	2014 (estimated)	
Last update	2019	
Main purpose (ecosystem service)	6. Grass for livestock, biomass (bioenergy) and other products <ul style="list-style-type: none"> • Grass measurement & budgeting 	
Main purpose	Grass measurement and budgeting	
Target audience	Farmers	
Format	Spreadsheet (available to download from website)	
Cost/availability	Free	
Number of users	Unknown	
Country of origin	Germany	
Is it country or region specific?	Yes, specific for the region Nordrhein-Westfalen due to the regional grass growth rates in the 'pasture planner'. Underlying equations and forms for recording could be used in other regions as well.	
Language	German	
Is the tool specifically targeted to permanent grassland?	All grassland types	
Grassland and livestock management	Cattle grazing, particularly dairy cow grazing.	
Data input required for the DST	Pasture planner: <ul style="list-style-type: none"> • Animal number • Grazeable pasture area OR pasture intake per animal per day • Farming system (organic/conventional) • Region (lowland, upland, intermediate) • Season (early spring, spring, summer, autumn, late autumn) Recording, optional: <ul style="list-style-type: none"> • Actual stocking rate per day and field • Fertiliser applications • Pesticide applications • Cutting & yield of each cut • Resowing • Pasture maintenance (rolling, harrowing, mulching etc.) 	


Use of data from other existing datasets	None
Data export	None
Data storage	Yes – excel sheets can be saved
Benchmarking	No
Ability of the DST to deliver an impact	Tool would be a first step towards planning and recording pasture management.
Approach used to generate the outcome from the DST and degree of user interaction	Calculates either pasture area needed for the herd or possible daily forage intake per cow on given pasture area, allows recording of grassland management
Additional comments	None

<p>DST 91 Seed mixtures with quality label (Qualitäts-Standard-Mischung für Grünland, QSM) SUPER-G partner: UGOE</p>		
DST provider	Public extension bodies at level of Bundelsand (Landesanstalt für Landwirtschaft, Landwirtschaftskammer)	
Funder	Regional government (Bundesländer)	
Brief description	Lists containing mixtures for (re-)sowing or oversowing permanent and temporary grasslands for different site conditions and intended management/use; gives recommended species composition including sowing density for each species as well as recommended varieties of each species.	
Links and references	<ul style="list-style-type: none"> • Grass variety recommendations 2018-19 (in German) • Quality standard for grassland (in German) • Mixtures and variety recommendations (in German) 	
Date of first release	Unknown	
Last update	The tool is updated annually or bi-annually, depending on region.	
Main purpose (ecosystem service)	7. Grass for livestock, biomass (bioenergy) and other products <ul style="list-style-type: none"> • Grass variety selection 	
Main purpose	Grass variety selection	
Target audience	Farmers Advisors	
Format	Paper based	
Cost/availability	Free	
Number of users	Unknown	
Country of origin	Germany	
Is it country or region specific?	Specific to Germany. Separate lists are available for each region (Bundesland) in Germany.	
Language	German	
Is the tool specifically targeted to permanent grassland?	Includes mixtures for oversowing or re-sowing permanent grassland as well as mixtures for temporary grassland.	
Grassland and livestock management	Not restricted to specific management form (although sometimes special mixtures, e.g. for horses, are included)	
Data input required for the DST	Site conditions, intended management, intended use.	
Use of data from other existing datasets	No	
Data export	No	
Data storage	No	
Benchmarking	No	
Ability of the DST to deliver an impact	Ensuring that site-adapted mixtures including tested and good-performing varieties are available to farmers. Many seed companies sell mixtures based on these guidelines with a label (QSM – Qualitäts-Standardmischungen)	


Approach used to generate the outcome from the DST and degree of user interaction	Farmers have access to advice on high performing grass mixes appropriate for their circumstances.
Additional comments	None

DST 92 Természetkímélő gyepgazdálkodás c. könyv (Conservation grass management) SUPER-G partner: MTA-OK		
DST provider	Pro Vértes (non-governmental body)	
Funder	Pro Vértes (non-governmental body)	
Brief description	Guidance book on grasslands management for farmers in Hungary. Book includes chapters on: <ul style="list-style-type: none"> • Historical introduction • Machinery used in grassland management • Grassland ecosystem types in different regions of Hungary • Environmentally friendly grass cutting • Methods of reclaiming arable land and fallow areas • Prevention of the spread of aggressive weeds • Effect of fires • Use of grass biomass for energy • Grassland management in Hungary 	
Links and references	Természetkímélő gyepgazdálkodás	
Date of first release	2011	
Last update	2011	
Main purpose (ecosystem service)	1. Biodiversity and pollination (=1 st) 5. Landscape and recreation including cultural values (=1 st) 6. Grass for livestock, biomass (bioenergy) and other products (=1 st) <ul style="list-style-type: none"> • Grazing management 	
Main purpose	Guidance for managing semi natural grasslands for farmers in Hungary	
Target audience	Farmers Advisors Policy makers Other – nature conservation staff	
Format	Paper based (available as electronic download)	
Cost/availability	Free	
Number of users	Unknown number, but this is a well-known book in the grassland manager community.	
Country of origin	Hungary	
Is it country or region specific?	The guidance in the book is specific to grassland management issues in Hungary. The book is targeted at the Hungarian practical situation (machinery, subsidies, etc), and the ecological situation, as this is the Pannonian biogeographic region. Rather small Pannonian grasslands are in other EU countries, like Check Rep.	
Language	Hungarian	
Is the tool specifically targeted to permanent grassland?	Mainly targeted at permanent grasslands as the majority of grassland in Hungary is permanent (rather than temporary short term) grassland.	
Grassland and livestock management	Not specific to a particular management system or livestock type. The book includes guidance on managing cut and grazed grass.	
Data input required for the DST	None	


Use of data from other existing datasets	None
Data export	None
Data storage	None
Benchmarking	None
Ability of the DST to deliver an impact	Provides general information on grassland management specific to farmers in Hungary.
Approach used to generate the outcome from the DST and degree of user interaction	Guidance book. No user interaction.
Additional comments	This book provides an example of the types of printed information used by grassland farmers in Hungary. Most of the grasslands in Hungary (more than 95%) are agrochemical free, with no artificial fertilizer, or pesticides. Most of these are seminatural grasslands with high nature conservation value. Therefore, grassland management books for farmers focus on nature friendly grassland management. Biodiversity, landscape aesthetics are key priorities, but these grasslands do need grazing. If not grazed, then afforestation will destroy the original habitat.

DST 93 Kalkulator porównawczy Nowy zasiew (Grassland renovation calculator) SUPER-G partner: WULS		
DST provider	DSV	
Funder	DSV	
Brief description	The Grassland renovation calculator determines the value in oversowing an existing sward. By entering values about target yield, methods and costs this web based calculator will give a forecast of the profit that could be expected three 3 years after oversowing and calculate the time taken to recoup the investment	
Links and references	Kalkulator porównawczy Nowy zasiew webpage	
Date of first release	2015	
Last update	2019	
Main purpose	6. Grass for livestock, biomass (bioenergy) and other products	
Main purpose	Estimate the benefits of oversowing an existing sward	
Target audience	Farmers Advisors Other (Dairy companies)	
Format	Software – web based	
Cost/availability	Free	
Number of users	Estimated 60 farmers	
Country of origin	Germany and Poland (version in Polish)	
Is it country or region specific?	Yes. Costs and values are presented in Polish currency. Data on treatment costs are based on average prices of agricultural services calculated by the regional advisory offices.	
Language	Polish	
Is the tool specifically targeted to permanent grassland?	All grassland types	
Grassland and livestock management	Mostly used by dairy farms using rotational grazing systems	
Data input required for the DST	Recorded values from old sward and target values for new sward for: Yield (dt/ha), Energy concentration (MJ NEL / kg), Value of 10 MJ NEL (in Polish groszy), value of silage per ha (in Polish złoty).	


	<p>Methods and cost associated with sowing (i.e. direct oversowing or ploughing, chemical destruction of old sward, seed costs, rolling, weed control etc.)</p> <p>Area of the field in question.</p>
Use of data from other existing datasets	None
Data export	None
Data storage	None
Benchmarking	None
Ability of the DST to deliver an impact	The tool has the potential to increase the value of a field by showing the benefits of oversowing. Based on an initial investment this tool will calculate the profit that will result from taking action and how long it will take to recoup the investment costs.
Approach used to generate the outcome from the DST and degree of user interaction	The tool can encourage farmers to invest in oversowing to increase grass productivity by demonstrating that the increased grass productivity more than covers the investment costs of oversowing.
Additional comments	None

DST 94 LANDVIEWER SUPER-G partner: CONSULAI		
DST provider	Earth Observing System (EOS)	
Funder	Earth Observing System (EOS)	
Brief description	LandViewer is a simple, intuitive web interface that allows non-expert users to select a geographic area for analysis, an earth observation data types, and then apply their choice of on-the-fly imagery analytics. The user can view different band combinations respectively different indices like NDVI/NDWI/NDSI or even calculate his own index, for improved vegetation analysis	
Links and references	EOS website	
Date of first release	2017	
Last update	Unknown	
Main purpose (ecosystem service)	6. Grass for livestock, biomass (bioenergy) and other products <ul style="list-style-type: none"> • Grass measurement & short term budgeting • Whole season/long term modelling or forecasting 	
Main purpose	Land cover/vegetation analysis from earth observation data	
Target audience	Farmers Advisors Policy makers	
Format	Software – web based	
Cost/availability	User is charged for images ('tiles') downloaded – cost from \$0.15 per tile	
Number of users	Unknown	
Country of origin	Ukraine/USA	
Is it country or region specific?	No	
Language	English	
Is the tool specifically targeted to permanent grassland?	All crop types including grassland.	
Grassland and livestock management	Not specific to a particular management system or livestock type	
Data input required for the DST	None	
Use of data from other existing datasets	Yes	
Data export	Yes – satellite images can be downloaded	
Data storage	LANDVIEWER saves satellite data, but does not save user entered data	
Benchmarking	None	
Ability of the DST to deliver an impact	LANDVIEWER can be used to monitor grass growth (and other crops)	


Approach used to generate the outcome from the DST and degree of user interaction	Every week, farmers can analyze pasture development using the Vegetative Development Index (NDVI)
Additional comments	None

DST 95 Azioni di conservazione LIFE RICOPRI - Ripristino e conservazione delle praterie aride dell'Italia centrale e meridionale SUPER-G partner: UNITO		
DST provider	LIFE RICOPRI	
Funder	EU LIFE program	
Brief description	Guidelines for the restoration and conservation of dry grasslands of the Central and Southern Italy. Various documents provide information relating to restoration and conservation of grasslands in central and southern Italy such as: <ul style="list-style-type: none"> • Shrub removal • Eradication of exotic species • Improvement of grazing facilities • Purchase of cattle • Application of grazing plans • Long term ex-situ collection and conservation of seeds of structural species from the priority grasslands. • Naturalistic engineering and planting of the endemic species 	
Links and references	<ul style="list-style-type: none"> • List of guidelines for download 	
Date of first release	2017	
Last update	2017	
Main purpose	1. Biodiversity and pollination (1 st) 5. Landscape and recreation including cultural values (2 nd) 6. Grass for livestock, biomass (bioenergy) and other products (3 rd) <ul style="list-style-type: none"> • Grass measurement & short term budgeting • Grass variety selection 	
Main purpose	Guidance on the restoration and conservation of grasslands in central and southern Italy	
Target audience	Farmers Advisors Policy makers	
Format	Paper based (Electronic downloads available)	
Cost/availability	Free	
Number of users	Unknown	
Country of origin	Italy	
Is it country or region specific?	Country	
Language	Italian	
Is the tool specifically targeted to permanent grassland?	Yes	
Grassland and livestock management	The grazing section is targeted to rotational grazing systems.	
Data input required for the DST	None	

Use of data from other existing datasets	None
Data export	None
Data storage	None
Benchmarking	None
Ability of the DST to deliver an impact	Provides information for restorative-maintaining-improving management of dry grasslands in specific regions of central and southern Italy
Approach used to generate the outcome from the DST and degree of user interaction	Guidelines on different aspects of grassland restoration/improvement
Additional comments	None


DST 96 I tipi pastorali delle Alpi piemontesi SUPER-G partner: UNITO		
DST provider	UNITO	
Funder	Regione Piemonte	
Brief description	I tipi pastorali delle Alpi piemontesi (the pastoral types of the Piedmont Alps) is written text which classifies the grassland types of Piedmont alpine areas and gives information concerning their management for maintenance, enhancement or restoration. The text provides specific knowledge that allows users to set actions and interventions capable of protecting the existing environment, recovering and requalifying abandoned and degraded marginal environments.	
Links and references	I tipi pastorali delle Alpi piemontesi information sheet (PDF) (in Italian)	
Date of first release	2007	
Last update	2007	
Main purpose (ecosystem service)	1. Biodiversity and pollination (2 nd) 5. Landscape and recreation including cultural values (3 rd) 6. Grass for livestock, biomass (bioenergy) and other products (1st)	
Main purpose	Grassland management in the Piedmont Alps region of Italy	
Target audience	Farmers Advisors Policy makers	
Format	Paper based book (accompanied by a CD with related images)	
Cost/availability	Charged for (one off cost of €37 = cost of the book)	
Number of users	Unknown	
Country of origin	Italy	
Is it country or region specific?	Region	
Language	Italian	
Is the tool specifically targeted to permanent grassland?	Yes	
Grassland and livestock management	Not specific to a particular management system or livestock type.	
Data input required for the DST	None	
Use of data from other existing datasets	None	
Data export	None	
Data storage	None	
Benchmarking	None	
Ability of the DST to deliver an impact	Provides information to farmers and agronomists for the identification and management of alpine pastures	

Approach used to generate the outcome from the DST and degree of user interaction	The user has to determine the botanical composition of the pasture and the book suggests the correct management to achieve the optimal restoration, maintenance or improvement
Additional comments	None

DST 97 Linee Guida Nazionali Di Produzione Integrata 2020 SUPER-G partner: UNITO		
DST provider	Italian ministry for agricultural policies	
Funder	Italian ministry for agricultural policies	
Brief description	Guidelines for agro-food production systems that use all the methods and means of production and defense against the adversity of agricultural production, aimed at reducing the use of synthetic chemicals and to rationalize fertilization, in compliance with the ecological, economic and toxicological principles.	
Links and references	Linee Guida Nazionali	
Date of first release	2017	
Last update	2020	
Main purpose (ecosystem service)	1. Biodiversity and pollination (2 nd) 5. Landscape and recreation including cultural values (1st)	
Main purpose	Provide Italian farmers with information specific to their region on best agricultural management practices	
Target audience	Farmers Advisors	
Format	Paper based (electronic download is available)	
Cost/availability	Free	
Number of users	Unknown	
Country of origin	Italy	
Is it country or region specific?	Specific to regions in Italy (information provided for each Italian Region)	
Language	Italian	
Is the tool specifically targeted to permanent grassland?	All crop types including grassland	
Grassland and livestock management	Not specific to a particular management system or livestock type.	
Data input required for the DST	None	
Use of data from other existing datasets	No	
Data export	No	
Data storage	No	
Benchmarking	No	
Ability of the DST to deliver an impact	Gives advice and guidelines for farmers to maintain more sustainable production practices	
Approach used to generate the outcome from the DST and degree of user interaction	Farmers and advisors consult the documents and based on the knowledge of their farm and region act upon the appropriate advice provided.	


Additional comments	None
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<p>DST 98</p> <p>Linee guida per la disciplina delle attività di pascolo nel Parco Nazionale Gran Sasso - Monti della Laga</p> <p>SUPER-G parent: UNITO</p>		
DST provider	Parco Nazionale Gran Sasso - Monti della Laga	
Funder	Parco Nazionale Gran Sasso - Monti della Laga	
Brief description	Guidelines for grazing activities in the Gran Sasso – Monti della Laga National Park	
Links and references	Guidelines for grazing activities in the Gran Sasso – Monti della Laga National Park (PDF) (in Italian)	
Date of first release	2015	
Last update	2015	
Main purpose (ecosystem service)	<p>5. Landscape and recreation including cultural values (=1)</p> <p>6. Grass for livestock, biomass (bioenergy) and other products (=2)</p> <ul style="list-style-type: none"> • Nutrient management (including fertilisers and organic manures) • Grass measurement & short term budgeting 	
Main purpose	Promotion and adoption of sustainable low impact methods for grazing and tourism in the Monti della Laga National Park	
Target audience	Farmers	
Format	Paper based (electronic download is available)	
Cost/availability	Free	
Number of users	Unknown	
Country of origin	Italy	
Is it country or region specific?	Region specific (Concerns only Monti della Laga National Park)	
Language	Italian	
Is the tool specifically targeted to permanent grassland?	Yes	
Grassland and livestock management	Pasture grazing	
Data input required for the DST	None	
Use of data from other existing datasets	No	
Data export	No	
Data storage	No	
Benchmarking	No	
Ability of the DST to deliver an impact	Gives rules for the grazing exploitations within the national park, to address grazing activity for maintenance, enhancement or restoration of mountain grassland, through grazing management. In particular, it includes stocking rates, grazing periods, mobile water sources, and fencings.	
Approach used to generate the	Farmers within the national park should follow the rules to maintain, enhance or restore the mountain grasslands	

outcome from the DST and degree of user interaction	
Additional comments	None




DST 99 Linee guida per la gestione degli habitat di interesse comunitario in Trentino SUPER-G partner: UNITO		
DST provider	LIFE+ "Ten"	
Funder	LIFE+ "Ten"	
Brief description	Guidelines for the management of habitats of community interest in Trentino region. Provides management notes on ecosystems found within the Trentino region including alpine meadows and grasslands. Details potential threats and actions that are positive or negative such as building infrastructure, tourism and intensive grazing.	
Links and references	<ul style="list-style-type: none"> • Guidelines for the management of habitats of community interest in Trentino region (PDF) (in Italian) 	
Date of first release	2009	
Last update	2014	
Main purpose (ecosystem service)	<ol style="list-style-type: none"> 1. Biodiversity and pollination (1st) 2. Carbon storage and GHG (=2nd) <ul style="list-style-type: none"> • Carbon calculator • Carbon sequestration / storage 3. Flood and erosion control (=2nd) 4. Water quality (=2nd) 5. Landscape and recreation including cultural values (=2nd) 6. Grass for livestock, biomass (bioenergy) and other products (=2nd) 	
Main purpose	Management of ecosystems found within the Trentino region including alpine meadows and grasslands	
Target audience	Advisors Policy makers	
Format	Paper based (electronic download available)	
Cost/availability	Free	
Number of users	Unknown	
Country of origin	Italy	
Is it country or region specific?	Region (Specific to the Trentino region)	
Language	Italian	
Is the tool specifically targeted to permanent grassland?	No	
Grassland and livestock management	Pasture grazing	
Data input required for the DST	None	
Use of data from other existing datasets	None	
Data export	None	
Data storage	None	
Benchmarking	None	


Ability of the DST to deliver an impact	Provides rules for the conservative management of habitats of community interest in the specific Trentino region
Approach used to generate the outcome from the DST and degree of user interaction	Farmers need to recognize which habitat they are operating in and follow the rules for its conservation
Additional comments	None

DST 100	
Linee guida per la gestione dei pascoli a Nardo	
SUPER-G parent: UNITO	
	
DST provider	Parco Orobie Valtellinesi
Funder	Fondazione Cariplo
Brief description	<p>Guidelines for the management of nardus-dominated pastures. Provides guidelines on management approaches to preserve or recover alpine pastures for conservation and forage. The topic is covered in three distinct sections:</p> <ul style="list-style-type: none"> • Systematic and phytosociological framework to recognize the habitat • Definition of pabular-nutritional characteristics • Fauna and animal biodiversity connected to these environments
Links and references	Guidelines for the management of nardus-dominated pastures (PDF) (in Italian)
Date of first release	2018
Last update	2018
Main purpose (ecosystem service)	<ol style="list-style-type: none"> 6. Grass for livestock, biomass (bioenergy) and other products (1st) 2. Biodiversity and pollination (2nd) 5. Landscape and recreation including cultural values (3rd)
Main purpose	Guidelines for nardus-dominated pastures
Target audience	Farmers Advisors
Format	Paper based (electronic download available)
Cost/availability	Free
Number of users	Unknown
Country of origin	Italy
Is it country or region specific?	Region (specific to the nardus stricta communities)
Language	Italian
Is the tool specifically targeted to permanent grassland?	Yes
Grassland and livestock management	Rotational grazing livestock is recommended.
Data input required for the DST	None
Use of data from other existing datasets	None
Data export	None
Data storage	None
Benchmarking	None
Ability of the DST to deliver an impact	Provides guidelines for the management of nardus-dominated pastures.

Approach used to generate the outcome from the DST and degree of user interaction	The users have to follow the sections in order to recognize the habitat and to apply the correct management practices for an optimal exploitation, while conserving plant and animal diversity
Additional comments	None

DST 101 Linee guida per la gestione delle aree pascolive del Parco Nazionale d'Abruzzo, Lazio e Molise SUPER-G partner: UNITO		
DST provider	Parco Nazionale d'Abruzzo Lazio e Molise	
Funder	Parco Nazionale d'Abruzzo Lazio e Molise	
Brief description	Guidelines for pasture management within the Abruzzo, Lazio and Molise National Park. Written guidance on the management objectives of the pastures designed to: <ul style="list-style-type: none"> • Increase knowledge of the types of grassland found in areas of the National Park of Abruzzo • Identify lines and management plans to implement a sustainable use of natural resources • Maintain environmental balance in areas of high nature value • Maintain extensive agroforestry activities • Recovery and management of permanent grassland and grazing area • Reduce excessive exploitation of the swards • Maintain or improve forage quality • Recover degraded plant communities • Safeguard plant formations of natural value • Contain the advance of the forest • Limit negative interactions with wildlife 	
Links and references	Guidelines for pasture management within the Abruzzo, Lazio and Molise National Park (PDF) (in Italian)	
Date of first release	2013	
Last update	2013	
Main purpose (ecosystem service)	1. Biodiversity and pollination (2 nd) 5. Landscape and recreation including cultural values (3 rd) 6. Grass for livestock, biomass (bioenergy) and other products (1 st)	
Main purpose	Guidelines for pasture management within the Abruzzo, Lazio and Molise National Park	
Target audience	Farmers Advisors	
Format	Paper based (Electronic download available)	
Cost/availability	Free	
Number of users	Unknown	
Country of origin	Italy	
Is it country or region specific?	Region (specific to Abruzzo, Lazio and Molise National Park)	
Language	Italian	
Is the tool specifically targeted to permanent grassland?	Yes	
Grassland and livestock management	Not specific to a particular management system or livestock type.	

Data input required for the DST	None
Use of data from other existing datasets	None
Data export	None
Data storage	None
Benchmarking	None
Ability of the DST to deliver an impact	Gives rules for the grazing exploitations within the national park, to address grazing activity for maintenance, enhancement or restoration of mountain grassland, through grazing management.
Approach used to generate the outcome from the DST and degree of user interaction	Guidelines to be respected by farmers exploiting grasslands within the Abruzzo, Lazio and Molise National Park
Additional comments	None

<p>DST 102</p> <p>Manuale pratico per la raccolta di seme e il restauro ecologico delle praterie ricche di specie</p> <p>SUPER-G partner: UNITO</p>		
DST provider	EU INTERREG IVB project "SALVERE - Semi-natural grassland as a source of biodiversity improvement" (1CE052P3).	
Funder	EU INTERREG IVB (European Territorial Cooperation 2007-2013) program, co-financed by the European Regional Development Funds (ERDF).	
Brief description	Guidelines for seed-harvesting and restoration of species-rich grasslands.	
Links and references	Practical manual for seed collection and ecological restoration of rich grasslands of species (PDF) (in Italian)	
Date of first release	2012	
Last update	2012	
Main purpose (ecosystem service)	<ol style="list-style-type: none"> 1. Biodiversity and pollination (1st) 3. Flood and erosion control (2nd) 5. Landscape and recreation including cultural values (3rd) 	
Main purpose	<p>The information and techniques described in the manual focus mainly on two main aspects of the ecological restoration of the prairies:</p> <ol style="list-style-type: none"> 1. The principles and techniques for the collection of the seed: Chapters 3-8 2. The techniques for the realization of semi-natural grasslands: Chapters 9-12. 	
Target audience	<p>Farmers</p> <p>Advisors</p> <p>Other – environmental engineering companies</p>	
Format	Paper based (electronic download available)	
Cost/availability	Free	
Number of users	Unknown	
Country of origin	Italy	
Is it country or region specific?	Country	
Language	Italian (English version available: Practical handbook for seed harvest and ecological restoration of species-rich grasslands. Edited by: Michele Scotton, Anita Kirmer and Bernhard Krautzer, 124 pages ISBN: 978-88-6129-800-2)	
Is the tool specifically targeted to permanent grassland?	Yes	
Grassland and livestock management	Targeted at species rich grasslands	
Data input required for the DST	None	


Use of data from other existing datasets	None
Data export	None
Data storage	None
Benchmarking	None
Ability of the DST to deliver an impact	The manual provides environmental engineering companies with technical information on machinery use and species selection.
Approach used to generate the outcome from the DST and degree of user interaction	Environmental engineering companies and experimental institutions can consult the book to get information they need
Additional comments	None




DST 103 webGRAS SUPER-G partner: UNITO	
DST provider	Centro di sperimentazione Agraria e Forestale Laimburg
Funder	Provincia autonoma di Bolzano
Brief description	Estimates the potential forage quality (at cutting and before conservation) from permanent meadows of Sudtirolo (province in Northern Italy) for the first cutting.
Links and references	webGRAS website
Date of first release	2015
Last update	Unknown
Main purpose	6. Grass for livestock, biomass (bioenergy) and other products <ul style="list-style-type: none"> • Grass measurement & short term budgeting
Main purpose	Estimates potential forage quality
Target audience	Farmers Advisors
Format	Software – web based
Cost/availability	Free
Number of users	Unknown
Country of origin	Italy
Is it country or region specific?	Region specific, only appropriate for the South Tyrolean permanent meadows.
Language	Italian, German, Ladin
Is the tool specifically targeted to permanent grassland?	Yes, permanent meadows
Grassland and livestock management	Targeted for cut (ungrazed) meadows
Data input required for the DST	<ul style="list-style-type: none"> • Map (chosen on cadastral map of the DST) • Date of 15 cm grass height • Cutting date • Estimate of botanical composition (rich in grasses, balanced, rich in legumes, rich in other dicotyledons) • Fertilisation information (period and quantity) • Cutting frequency (number of cuts per year) • Irrigation (yes or no) • Soil texture evaluation (light or heavy)
Use of data from other existing datasets	Weather data, cadastral map, elevation, aspect
Data export	Data can be exported in pdf format, as a result summary table
Data storage	No
Benchmarking	No
Ability of the DST to deliver an impact	It gives an estimate of the following values of forage composition (ash, protein, fibre, digestibility, net lactation energy, & other nutrients). These can be used by the farmer to define animal diet of the “tested” hay.




<p>Approach used to generate the outcome from the DST and degree of user interaction</p>	<p>The user enters field information and the tool provides an estimate of forage quality. The DST is very user friendly and the user can easily interact by filling the tables with the required information, with either written or pictured help.</p>
<p>Additional comments</p>	<p>The estimate of the potential quality of the forage can be obtained only if:</p> <ul style="list-style-type: none"> • At least one month has passed since the cutting date. This is due to the need for a sufficiently long series of temperature data also relating to the period of time following the cutting date; • The cut was made by 31 July and if no more than two months elapsed between the 15-cm-height stage and the cutting dates, e.g. if the meadow reached the 15-cm height at May 20, the method can be applied only if the meadow has been cut by July 20 • The meadow is located at an altitude between 500 and 1,800 meters above sea level; • Management is not extreme (for example in the case of heavily over-fertilized lawns and / or more than 6 cuts per year). <p>In addition, webGRAS automatically informs the user if the estimate is impossible or if the results are uncertain.</p>

DST 104 Feedbase – The Swiss Feed Database SUPER-G partner: ETH Zürich		
DST provider	Agroscope, University of Zürich	
Funder	Swiss National Science Foundation (SNF)	
Brief description	<p>Feed database and catalogue of optimal harvesting times. The database contains information about the composition and nutritional values of feed available in Switzerland, including a range of different grassland mixes. The screen query of averaged feed data is public for all feeds. All further functions are password protected but free of charge. Information provided is based on long-term data records over several seasons and years as well as modelling approaches.</p> <p>The online Swiss feed database allows detailed analysis of trends in forage nutritional quality. Spatial patterns in nutrient density (concentration) can be generated for large, geo-referenced data sets using the Kernel regression technique. There is strong evidence for regional influence on feed quality. The hay survey indicates an east-west and mountain-lowland divide with respect to energy, fiber, sugar and mineral content. Besides the location, users can choose further variable to predict their forage quality such as year of harvest, method of forage conservation (e.g. silage) and altitude of site.</p>	
Links and references	<ul style="list-style-type: none"> • The Swiss Feed Database • List of publication on the University of Zurich website • Presentation (PDF) (in English) • The Swiss Feed Database - Resources 	
Date of first release	2007; Available online from 2017	
Last update	2019	
Main purpose (ecosystem service)	6. Grass for livestock, biomass (bioenergy) and other products <ul style="list-style-type: none"> • Nutritional value of forage 	
Main purpose	Provides detailed information on the nutritional quality of feed and forage.	
Target audience	Farmers	
Format	Software – web based	
Cost/availability	Free	
Number of users	Unknown	
Country of origin	Switzerland	
Is it country or region specific?	Specific to Switzerland as based on analysis of forage crops grown in Switzerland.	
Language	German, French, English	
Is the tool specifically targeted to permanent grassland?	Specific to all feed crops	
Grassland and livestock management	Not specific to a particular grassland or livestock management system	
Data input required for the DST	No	


Use of data from other existing datasets	No long-term datasets of harvests and feed quality: Boessinger M., 2011. "Zur Verfügung gestellte Einzeldaten zur Dürrfutterenquête 2005 – 2010"
Data export	Data can be downloaded from the tool in excel form
Data storage	No
Benchmarking	No
Ability of the DST to deliver an impact	This DST provides detailed information such as the quality of forage harvested in previous years, supporting the planning of livestock feeding to increase production efficiency
Approach used to generate the outcome from the DST and degree of user interaction	The tool allows the user to query the database of feed analysis.
Additional comments	None

DST 105 GRUD 2017 – Fertilisation recommendations (Düngung von Grasland) SUPER-G partner: ETH Zürich		 Schweizerische Eidgenossenschaft Confédération suisse Confederazione Svizzera Confederaziun svizra
DST provider	Agroscope	
Funder	Agroscope	
Brief description	<p>The “Principles of Agricultural Crop Fertilisation in Switzerland (GRUD)” provides fertiliser recommendations for all crops grown in Switzerland. GRUD was first released in 1964 and the current edition was released in 2017. GRUD recommendations are regularly revised by Agroscope to take into account of new research results and the need to periodically update certain standards and guideline values. It is also based on the results of earlier experiments and research activities, which are subjected to a new critical evaluation, and - if applicable to Switzerland - on foreign findings.</p> <p>GRUD is a decision making tool for agricultural advisers and farmers regarding the fertilisation of agricultural crops, and a reference database for Swiss federal government and cantonal (regional) enforcement tools, such as Suisse-Bilanz.</p> <p>The GRUDs serve primarily to provide agricultural advice, but also to help farmers make decisions on practical fertilisation issues. In addition, the contents of the GRUD are used by researchers and employees of the cantonal and federal administration for their work. The information in the GRUD is based on scientific principles. They are therefore valid for all scientifically oriented agricultural production directions.</p>	
Links and references	<ul style="list-style-type: none"> • Principles of Agricultural Crop Fertilisation in Switzerland (PRIF) (English) • Fertilisation of grasslands webpage with PDF download link • Principles of Agricultural Crop Fertilisation in Switzerland (PDF) (in German) • Fertilisation of grasslands / GRUD 2017 	
Date of first release	1964	
Last update	2017	
Main purpose (ecosystem service)	4. Water quality (2 nd) 6. Grass for livestock, biomass (bioenergy) and other products (1 st) <ul style="list-style-type: none"> • Nutrient management (including fertilisers and organic manures) • Soil management 	
Main purpose	Provide fertiliser recommendations for all crops in Switzerland.	
Target audience	Farmers Advisors	
Format	Paper based (available as hard copy and as an electronic pdf)	
Cost/availability	Charged for (electronic version CHF 11.–, printed version CHF 21.–)	
Number of users	Unknown	
Country of origin	Switzerland	
Is it country or region specific?	Switzerland and similar biogeographic regions	
Language	German, French, Italian	


Is the tool specifically targeted to permanent grassland?	All crop types including grassland.
Grassland and livestock management	Not specific to a particular management system or livestock type. It includes recommendation from extensively used to intensively used grassland, covering both grazed and cut swards.
Data input required for the DST	Knowledge, on the grassland type such as the vegetation composition and the management of the grassland. Information on how to interpret basic soil (fertility) analysis is provided in the document, allowing for adapting fertilizer recommendations according to the site-specific conditions. Additionally, best-practice guidelines of how to technically best fertilise is provided.
Use of data from other existing datasets	None
Data export	None
Data storage	None
Benchmarking	None
Ability of the DST to deliver an impact	The provision of regularly updated fertilization recommendations contributes to an optimal nutrient supply of the crops and allows the production of high-quality products, sustainable conservation of soil fertility and protection of the environment.
Approach used to generate the outcome from the DST and degree of user interaction	The user needs information on grassland type, soil type, soil analysis and planned cropping to identify the correct fertiliser recommendations for the crop.
Additional comments	None

DST 106 L'enquête stades phénologiques des prairies (Phenological stages of grasslands in Western Switzerland) SUPER-G partner: ETH Zürich		 www.adcf.ch
DST provider	Agroscope	
Funder	Agroscope	
Brief description	Phenological status according to harvest dates per year (to trace back plant growth phase at harvest)	
Links and references	L'enquête stades phénologiques des prairies (PDF) (in French)	
Date of first release	Unknown	
Last update	2019	
Main purpose (ecosystem service)	6. Grass for livestock, biomass (bioenergy) and other products	
Main purpose	To help farmers identify grass growth stage and in turn estimate the nutritional value of the forage.	
Target audience	Farmers Advisors	
Format	Paper based	
Cost/availability	Free	
Number of users	Unknown	
Country of origin	Switzerland	
Is it country or region specific?	Grass growth stages are specific for Western Switzerland	
Language	French	
Is the tool specifically targeted to permanent grassland?	All grassland types	
Grassland and livestock management	Not specific to a particular management system or livestock type.	
Data input required for the DST	None	
Use of data from other existing datasets	No	
Data export	No	
Data storage	No	
Benchmarking	No	
Ability of the DST to deliver an impact	Farmers can use the tool to help them estimate the grass growth stage and nutritional quality of forage – having this information can help farmers plan to utilize the grass when the nutritional quality is highest.	
Approach used to generate the outcome from the DST and degree of user interaction	Farmer uses harvest date and thermal altitude to identify the average grass growth stage to deduce information on forage quality	
Additional comments	None	




<p>DST 107 Standardmischungen für den Futterbau (standard mixtures for forage production) SUPER-G partner: ETH Zürich</p>		
DST provider	Agroscope and AGFF (Swiss Grassland Society)	
Funder	Agroscope and AGFF (Swiss Grassland Society)	
Brief description	<p>'Standardmischungen für den Futterbau' is a list of standard mixtures for forage production in Switzerland provided by Agroscope and the Swiss Grassland Society (AGFF). In the 1960s the research institute Agroscope took over responsibility for testing new grass and legume varieties and their use in seed mixtures. The close cooperation with the AGFF, which tests the mixtures in strip tests under practical conditions, resulted in numerous successful varieties/cultivars and mixtures for the Swiss market, which are recommended to seed traders and farmers. Agroscope test these standard mixtures for temporary and permanent grasslands in experimental series developed in the field and tested in practice. Mixtures are tested in exact and on-farm trials and periodically adapted to the current requirements of economic fodder production. The proportions of the individual components are shown in the recipes in grams per area. A selection of mixtures receives the "AGFF quality label", certified by the AGFF, the Swiss Grassland Society. The AGFF quality label was introduced in 1974. For AGFF-certified mixtures, the following properties are regularly tested using particularly strict quality criteria such as the VESKOF norm:</p> <ul style="list-style-type: none"> • Standardised composition of the mixture • Low number of weed seeds such as <i>Rumex</i> species • High germination rates • Cultivar identity according to Agroscope field trials (best available cultivars) <p>These mixtures are recommended to Swiss grassland farmers and 90% of the mixtures sold in Switzerland hold the AGFF quality label.</p>	
Links and references	<ul style="list-style-type: none"> • Webpage with lists of PDFs of recommended varieties amongst other articles • Suter D., Rosenberg E., Mosimann E. and Frick R. (2017) Standardmischungen für den Futterbau. Revision 2017-2020. Agrarforschung Schweiz 8, 1-16. • Suter D., Frick R. and Hirschi H.-U. (2019) Liste der empfohlenen Sorten von Futterpflanzen 2019-2020. Agrarforschung 10. • Lüscher A, Grieder C, Huguenin-Elie O, Klaus VH, Reidy B, Schneider MK, Schubiger F, Suter D, Suter M, Kölliker R (2019) Grassland systems in Switzerland with a main focus on sown grasslands. Grassland Sciences in Europe 24: 3-16 (English) 	
Date of first release	1960s	
Last update	2017	
Main purpose (ecosystem service)	<ol style="list-style-type: none"> 1. Biodiversity and pollination (2nd) 6. Grass for livestock, biomass (bioenergy) and other products <ul style="list-style-type: none"> • Grass variety selection (1st) 	

Main purpose	The standard seed mixtures catalogue contains seed mixtures for temporary and intensively managed grasslands including the latest and most productive cultivar breeds, as well as species-rich mixtures for semi-natural, low-intensively managed grasslands containing species of regional provenance.
Target audience	Farmers Advisors Other (seed traders)
Format	Paper based
Cost/availability	Free
Number of users	90% of the seed mixtures sold in Switzerland hold the AGFF quality label
Country of origin	Switzerland
Is it country or region specific?	Specific to Switzerland and neighboring regions as the seed mixtures are developed and tested in Switzerland and its biogeographic regions (low to high altitude).
Language	German, French and Italian
Is the tool specifically targeted to permanent grassland?	Temporary and permanent grasslands
Grassland and livestock management	Not specific to a particular management system or livestock type
Data input required for the DST	No data input.
Use of data from other existing datasets	No
Data export	No
Data storage	No
Benchmarking	No
Ability of the DST to deliver an impact	The high percentage of seed mixtures sold holding this quality label shows the big success of this DST. Farmers utilize the recommendations to optimize grass and forage production according to the site-specific management and environmental conditions. This widely reduces the risk to use wrong or sub-optimal mixtures for grassland (re)seeding. Additionally, by also providing a recommendation for seed mixtures containing locally adapted plant species to be used for extensively managed grasslands, this DST helps conserving typical grassland biodiversity in Switzerland.
Approach used to generate the outcome from the DST and degree of user interaction	Testing of cultivars and mixtures in field trials Level of interaction: medium. Users select a mixture according to i) duration of using the sward, ii) the planned management such as grazing or mowing and iii) site specific conditions, especially whether the environmental allows for using ryegrass species or not.
Additional comments	None


DST 108 Swiss Grassland Society information sheets SUPER-G partner: ETH Zürich		
DST provider	AGFF (Swiss Grassland Society)	
Funder	AGFF (Swiss Grassland Society)	
Brief description	A range of information sheets covering many different topics of grassland management in Switzerland, including manure management, silage production, re-seeding, fertilization, alpine grassland grazing, grazing strategies, grassland weed management, creation of flower-rich hay meadows	
Links and references	<ul style="list-style-type: none"> • Order page for leaflets • Order page for information sheets 	
Date of first release	Unknown (before 1990s)	
Last update	2019	
Main purpose (ecosystem service)	<ol style="list-style-type: none"> 1. Biodiversity and pollination (1st) 3. Flood and erosion control (2nd) 4. Water quality (1st) 5. Landscape and recreation including cultural values (2nd) 6. Grass for livestock, biomass (bioenergy) and other products (1st) <ul style="list-style-type: none"> • Nutrient management (including fertilisers and organic manures) • Grass measurement & short-term budgeting • Soil management • Grass variety selection 	
Main purpose	Main purpose varies according to each individual information sheet	
Target audience	Farmers Advisors	
Format	Paper based	
Cost/availability	Charged for (1 or 2 Swiss francs per fact/info sheet)	
Number of users	Approximately 3000	
Country of origin	Switzerland	
Is it country or region specific?	Depending on the topic of the specific fact-sheet, these can also be used in other central European countries, but usually fact-sheets are not widespread outside Switzerland.	
Language	Mostly in German	
Is the tool specifically targeted to permanent grassland?	All grassland types, although the majority of the information sheets address issues which are most relevant to permanent grassland.	
Grassland and livestock management	Not specific to a management system or livestock type	
Data input required for the DST	Paper based guidance, no data input required.	
Use of data from other existing datasets	No	
Data export	No	
Data storage	No	

Benchmarking	No
Ability of the DST to deliver an impact	Paper based guidance, providing grassland management recommendations.
Approach used to generate the outcome from the DST and degree of user interaction	Paper based guidance, providing grassland management recommendations.
Additional comments	None




DST 109 Water vole radar (AGFF Schermausradar) SUPER-G partner: ETH Zürich		
DST provider	Agroscope, AGFF (Swiss Grassland Society)	
Funder	Agroscope, AGFF (Swiss Grassland Society)	
Brief description	<p>The water vole radar is an instrument for measuring the density of mouse populations. Mice can damage grass swards by feeding on roots and burrowing into the sward. Since spring 2010, the densities of water vole populations at more than 45 locations in the German-speaking Swiss mid-lands and adjacent hilly areas have been determined annually. The data from the mouse population estimates in the cantons (regions) of Fribourg, Jura and Neuchâtel are made available to AGFF by the respective specialist agencies for plant protection.</p> <p>Knowing whether there are currently many or few mice and how the situation will develop is of great benefit to farmers. The water vole radar, in combination with an assessment of the situation on the farm, can help, for example, to answer the following questions:</p> <ul style="list-style-type: none"> - When can a population collapse be expected? - Until when is it worthwhile to combat mice? - When do you have to start building up food reserves in order to get off lightly in the event of a total loss in the meadows? 	
Links and references	AGFF Schermausradar	
Date of first release	2010	
Last update	2019	
Main purpose (ecosystem service)	6. Grass for livestock, biomass (bioenergy) and other products <ul style="list-style-type: none"> • Grass measurement & short term budgeting • Whole season/long term modelling or forecasting • Soil management 	
Main purpose	Pest management to protect grass productivity	
Target audience	Farmers Advisors	
Format	Paper based (electronic version of reports are available)	
Cost/availability	Free	
Number of users	Unknown	
Country of origin	Switzerland	
Is it country or region specific?	German-speaking Swiss mid-lands and adjacent hilly areas including the cantons of Fribourg, Jura and Neuchâtel	
Language	German	
Is the tool specifically targeted to permanent grassland?	Not specific to permanent grassland as provides mice population data on a landscape map, however mice are not a significant issue in temporary grasslands as ploughing helps to control the populations.	
Grassland and livestock management	Not specific to a particular management system or livestock type.	
Data input required for the DST	No	

Use of data from other existing datasets	No
Data export	No
Data storage	No
Benchmarking	No
Ability of the DST to deliver an impact	The farmer can view mouse population data for their region and use this information to help them decide whether to take action to reduce the population and if necessary to purchase additional feed due to the damage done to the grassland.
Approach used to generate the outcome from the DST and degree of user interaction	The farmer can view mouse population data for their region.
Additional comments	None

DST 110 Wiesengräser: Grass species determination App SUPER-G partner: ETH Zürich		
DST provider	AGFF (Swiss Grassland Society)	
Funder	AGFF (Swiss Grassland Society)	
Brief description	<p>The Wiesengräser app can be used to identify meadow grass species. The app uses structured steps detailed descriptions and illustrations to help the user identify the grass species.</p> <p>The app contains:</p> <ul style="list-style-type: none"> • 2 identification keys: young shooting grasses and flowering ripening grasses • Elevation level filter for the grasses, divided into 3 alpine regions: North side of the Alps, Central and Southern Alps • 63 grass species cards with descriptions, pictures, illustrations and notepad • Search function for plant characteristics such as spikelet, awl and ligule lengths 	
Links and references	Webpage and download links	
Date of first release	2018	
Last update	2018	
Main purpose (ecosystem service)	<ol style="list-style-type: none"> 1. Biodiversity and pollination (2nd) 6. Grass for livestock, biomass (bioenergy) and other products (1st) <ul style="list-style-type: none"> • Grass variety selection 	
Main purpose	Identify grass species	
Target audience	Farmers	
Format	Paper based (book available) Software – mobile application ‘app’	
Cost/availability	Charged for (single payment of 7 Swiss francs, about 6.30 Euros)	
Number of users	Unknown	
Country of origin	Switzerland	
Is it country or region specific?	Specific to temperate and alpine grasslands of Europe	
Language	German	
Is the tool specifically targeted to permanent grassland?	The app is specific to temperate and alpine grassland which are mostly permanent grassland systems.	
Grassland and livestock management	Not specific to a particular grassland or livestock management system	
Data input required for the DST	No data input; the user follows guidance to identify grassland species	
Use of data from other existing datasets	No	
Data export	No	
Data storage	No	
Benchmarking	No	


Ability of the DST to deliver an impact	As knowledge on the grass species actually growing on the site is a fundamental prerequisite for farmers to adapt management and to identify a (miss-)development of the sward, this DST supports best-practice grassland management and also provides information on the biodiversity of grass species growing in Switzerland.
Approach used to generate the outcome from the DST and degree of user interaction	The user follows guidance to identify the grassland species
Additional comments	None

DST 111 AgroBI SUPER-G partner: CONSULAI		
DST provider	CONSULAI	
Funder	CONSULAI	
Brief Description	Business Intelligence system for processing and exhibiting information generated by agricultural Big Data, thus improving its user's decision making process.	
Links and references	AgroBI website	
Date of first release	2017	
Last update	Dec 2019	
Main purpose (ecosystem service.)	6. Grass for livestock, biomass (bioenergy) and other products	
Main purpose	Business management tool - analysis of all collected farm and company data, and its comparison	
Target audience	Farmers Advisors	
Format	Software – desk based Software – web based Software – mobile application 'app'	
Cost/availability	The cost of this software depends on the level of work required to adapt the platform to the data	
Number of users	Estimated > 20	
Country of origin	Portugal	
Is it country or region specific?	No	
Language	Portuguese	
Is the tool specifically targeted to permanent grassland?	All crop types including grassland.	
Grassland management	Not specific to a particular management system or livestock type	
Data input required for the DST	AgroBI is a 'Big data' tool – user inputs general farm and company data.	
Use of data from other existing datasets	Yes. AgroBI is a 'Big data' tool and is able to import data from different file formats (xlsx, csv, pdf, txt, doc)	
Data export	Yes	
Data storage	Yes	
Benchmarking	None	
Ability of the DST to deliver an impact	This software allows integrated analysis of all collected farm and company data, so the farmer can take medium and long term measures	
Approach used to generate the outcome from the DST and degree of user interaction	Whenever new records exist, and these are inserted in the AgroBI database, it is possible to update data analyzes almost instantly	


Additional comments	This is a new software that's being tested with CONSULAI clients
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DST 112 ISAMARGEM SUPER-G partner: CONSULAI	
DST provider	ISAGRI
Funder	ISAGRI
Brief Description	ISAMARGEM is a general software tool, that provides information about costs, labor, machinery, fertilizers, and maps from the parcels of the farm
Links and references	ISAGRI website
Date of first release	Unknown
Last update	Unknown
Main purpose (ecosystem service)	6. Grass for livestock, biomass (bioenergy) and other products
Main purpose	General farm recording software (crops and livestock)
Target audience	Farmers Advisors
Format	Software – desk based Software – web based Software – mobile application ‘app’
Cost/availability	Charged for (cost unknown)
Number of users	Estimated > 2000
Country of origin	Portugal
Is it country or region specific?	No
Language	Portuguese
Is the tool specifically targeted to permanent grassland?	All crop types including grassland.
Grassland management	Not specific to a particular management system or livestock type
Data input required for the DST	<ul style="list-style-type: none"> Animal data (species, number, age, sex) Crop/Grassland information (area, varieties, sowing date)
Use of data from other existing datasets	Yes – the tool can use data from other ISAGRI apps
Data export	Yes
Data storage	Yes – user entered data is saved.
Benchmarking	None
Ability of the DST to deliver an impact	Livestock management
Approach used to generate the outcome from the DST and degree of user interaction	General farm recording software – user can record details of livestock and crop management
Additional comments	None

DST 113 Digitanimal SUPER-G partner: UCO		
DST provider	Digitanimal	
Funder	Digitanimal	
Brief description	This tool consists of a GPS collar which informs the user of the animal's location on the pasture by sending information to the mobile app. The collars provide location data as well as body temperature and other parameters including the detection and flagging of anomalies.	
Links and references	Digitanimal website Digitanimal app on google play Digitanimal app on the App store	
Date of first release	2015	
Last update	2019	
Main purpose (ecosystem service)	2. Grass for livestock, biomass (bioenergy) and other products	
Main purpose	Helps users locate the animals on their pasture	
Target audience	Farmers	
Format	Software – desk based Software – mobile application 'app' Physical tools (GPS collar for the animal)	
Cost/availability	Charged (Collars cost 149.95€). Free 15 day trial period is available.	
Number of users	>1000 downloads of the app on the google play store	
Country of origin	Spain	
Is it country or region specific?	No, can be used in various places throughout the EU	
Language	Various	
Is the tool specifically targeted to permanent grassland?	Usually, farmers use the following tool for extensive livestock production on PG	
Grassland and livestock management	Targeted to grazing animals (cows, horses, goats and sheep)	
Data input required for the DST	None, user attaches the collar to their livestock and syncs with their app	
Use of data from other existing datasets	The tool uses data from European weather agencies.	

Data export	Yes, under request you can have them in a CSV file (compatible with Excel)
Data storage	The animal's tracks for the last 24hrs can be viewed. Data is stored for later export upon request
Benchmarking	None
Ability of the DST to deliver an impact	Digitanimal is a service platform designed to monitor and locate animals extensively to provide greater tranquility and greater profitability to farmers.
Approach used to generate the outcome from the DST and degree of user interaction	Once the user has attached the collar to their livestock they can monitor location and activity through the available software. In this way a farmer can identify if livestock are behaving abnormally and therefore need attention.
Additional comments	None

DST 114 Forage-SAFE SUPER-G partner: UCO		
DST provider	Forage-SAFE project	
Funder	EU funded project	
Brief description	<p>Forage-SAFE is a spreadsheet model that has been developed within the AGFORWARD project to better understand the interactions between trees, the grass understory and livestock on the profitability of wood pastures. It can be used to assess the daily balance between the demand for and the production of forage to estimate an annual farm net margin. It is possible to use the model to modify biophysical and financial parameters related to the tree, pasture and livestock components (such as tree cover density, carrying capacity and livestock species) in order to maximise net farm income</p>	
Links and references	Webpage on AGFORWARD website	
Date of first release	2017 (estimated)	
Last update	2017 (estimated)	
Main purpose	6. Grass for livestock, biomass (bioenergy) and other products	
Main purpose	Guidelines for various aspects of farm management	
Target audience	Farmers Advisors	
Format	Spreadsheet	
Cost/availability	Free	
Number of users	Unknown	
Country of origin	Spain	
Is it country or region specific?	Specific to Spain	
Language	Various EU languages	
Is the tool specifically targeted to permanent grassland?	Targeted at wood pasture systems	
Grassland and livestock management	Specifically targeted to the wood-pasture systems common across southwestern Spain that are grazed by livestock	
Data input required for the DST	A total of 304 parameters can be set in Forage-SAFE to define the biophysical, managerial and economic characteristics of wood pasture systems.	

	<ul style="list-style-type: none"> • Production data of pastures, fruit, timber and firewood. • Livestock data (e.g. species, age, weight, consumption) • Economic variables (sale of livestock and tree products, farm costs)
Use of data from other existing datasets	Unknown
Data export	Excel
Data storage	Data can be saved in the excel file
Benchmarking	No
Ability of the DST to deliver an impact	Comprehensive understanding of the interactions between the different components of the wood-pastures and associated costs and revenue streams allows the user to identify areas for optimization.
Approach used to generate the outcome from the DST and degree of user interaction	User can manually input data into the excel spreadsheet. A total of 304 parameters can be set resulting in a high degree of user interaction.
Additional comments	None

DST 115 Guideline book "Gestión de los pastos en la dehesa" SUPER-G partner: UCO		GESTIÓN DE LOS PASTOS EN LA DEHESA
DST provider	Alma María García Moreno et al.	
Funder	Andalusian Board, EU LIFE programme	
Brief description	This manual addresses issues related to the main types of pastures, their productive potentials and their ecological roles. It presents characteristics and proper management techniques for herbaceous pastures, types of improvement and support for decision-making. Tree, shrub and other species are reviewed for their productive potential and ability to diversify and generate the environments within the pasture. The final section is dedicated to the characterization of some forage crops that can be integrated into the pasture.	
Links and references	Gestión de los pastos en la dehesa webpage with download link	
Date of first release	2016	
Last update	2016	
Main purpose (ecosystem service)	1. Biodiversity and pollination (2 nd) 3. Flood and erosion control (3 rd) 6. Grass for livestock, biomass (bioenergy) and other products (1 st) <ul style="list-style-type: none"> • Soil management • Grass variety selection 	
Main purpose	Guidelines for various aspects of grassland management	
Target audience	Farmers Advisors	
Format	Paper based (electronic copy available to download)	
Cost/availability	Free	
Number of users	Unknown	
Country of origin	Spain	
Is it country or region specific?	Specific to the Dehesa region in Spain	
Language	Spanish	
Is the tool specifically targeted to permanent grassland?	All grassland types	
Grassland and livestock management	Mainly targeted at the Dehesa area which can have rotational grassland management with rotation grazing of sheep, dairy and beef.	
Data input required for the DST	None (guidance)	
Use of data from other existing datasets	None (guidance)	
Data export	No	
Data storage	No	
Benchmarking	No	
Ability of the DST to deliver an impact	The manual provides advice and guidance which allows for sustainable management of grassland in the Dehesa area	

Approach used to generate the outcome from the DST and degree of user interaction	Paper based manual, therefore has minimal user interaction. User consults the document to understand the main issues in this system and how the system can be managed sustainably
Additional comments	None




DST 116	
Mejora de pastos de secano en Extremadura	
SUPER-G partner: UCO	
DST provider	Francisco Gonzalez Lopez and Valentin Maya White
Funder	European Regional Development Fund, CICYTEX
Brief description	This manual details the characteristics and opportunities for improvement of dryland pasture in Extremadura. It is intended to provide farmers with information on different types of improvement available for dryland pastures. Each method of improvement is presented with an economic assessment. This manual is a tool that aims to improve the economic-environmental sustainability of extensive livestock farms.
Links and references	Webpage on CICYTEX with PDF download link (In Spanish)
Date of first release	2015
Last update	2015
Main purpose (ecosystem service)	<ol style="list-style-type: none"> 1. Biodiversity and pollination (2nd) 6. Grass for livestock, biomass (bioenergy) and other products (1st) <ul style="list-style-type: none"> • Nutrient management (including fertilisers and organic manures) • Grass variety selection
Main purpose	General management of dryland pasture in Extremadura.
Target audience	Farmers Advisors
Format	Paper based (is an electronic version available)
Cost/availability	Free
Number of users	Unknown
Country of origin	Spain
Is it country or region specific?	Specific to the Extremadura region of Spain
Language	Spanish
Is the tool specifically targeted to permanent grassland?	Yes, the Extremadura region of Spain where permanent grasslands are grazed
Grassland and livestock management	Rotational grazing, non-grazing of various livestock e.g. beef, sheep, dairy
Data input required for the DST	None (guidance)
Use of data from other existing datasets	None (guidance)
Data export	None (guidance)
Data storage	None (guidance)
Benchmarking	No
Ability of the DST to deliver an impact	This tool is a guidance document for sustainable pasture management and use of the Extremadura region in Spain.
Approach used to generate the	User consults the manual to identify methods of pasture improvement that may be relevant and beneficial to their operation.




outcome from the DST and degree of user interaction	
Additional comments	None




DST 117		
Red RIA SUPER-G partner: UCO		
DST provider	The Ministry of Agriculture, Fisheries and Food and Regional government	
Funder	Project co-funded by the European Regional Development Fund	
Brief description	The estimation of crop water needs requires quality meteorological information. This information is provided by a network of automatic meteorological stations and a regional center for data exploitation.	
Links and references	Weather station list	
Date of first release	2000	
Last update	2020 (updated daily)	
Main purpose	6. Grass for livestock, biomass (bioenergy) and other products	
Main purpose	Provides weather information from climate stations to help make irrigation decisions	
Target audience	Farmers Advisors	
Format	Software – web based	
Cost/availability	Free	
Number of users	Unknown	
Country of origin	Spain	
Is it country or region specific?	Network of weather stations exists only across the Andalusia region	
Language	Spanish	
Is the tool specifically targeted to permanent grassland?	All crops including grass	
Grassland and livestock management	Not specific to a particular management system or livestock type	
Data input required for the DST	No	
Use of data from other existing datasets	Weather data	
Data export	Data can be exported in different file types	
Data storage	The tool stores daily weather data beginning in 2000	
Benchmarking	No	
Ability of the DST to deliver an impact	The tool can help farmers and advisors in the Andalusia region plan their irrigation which can contribute to the more efficient use of water.	
Approach used to generate the outcome from the DST and degree of user interaction	Minimal user interaction. User selects to view data from weather station closest to their area of interest and uses this to plan irrigation.	
Additional comments	None	



DST 118 Redalan DoVIVO SUPER-G partner: UCO		
DST provider	National research institute for the Agricultural Technology (INIA), Regional Research Services for the Agriculture Development	
Funder	National research institute for the Agricultural Technology (INIA), Regional Research Services for the Agriculture Development	
Brief description	This tool presents in a spreadsheet the currently available in vivo digestibility data of various forages available as feed across Spain. It also offers a web consultancy services	
Links and references	DoVIVO page on Redalan website	
Date of first release	Unknown	
Last update	Unknown	
Main purpose	6. Grass for livestock, biomass (bioenergy) and other products	
Main purpose	Database on forage quality	
Target audience	Farmers Advisors	
Format	<ul style="list-style-type: none"> • Paper based – web based manual • Spreadsheet of data available to download from website 	
Cost/availability	Free	
Number of users	Unknown	
Country of origin	Spain	
Is it country or region specific?	No, the tool can be used in other countries	
Language	Spanish	
Is the tool specifically targeted to permanent grassland?	All forage crops	
Grassland and livestock management	Not targeted at a specific management system or livestock type	
Data input required for the DST	None (guidance)	
Use of data from other existing datasets	The information in the tool is based on the analysis of a large number of samples	
Data export	The data can be downloaded in an excel spreadsheet.	
Data storage	Yes	
Benchmarking	No	
Ability of the DST to deliver an impact	By selecting forage that is best for the farm and for the livestock's digestibility, production efficiency is improved. Redalan generally advise on sustainable practices.	
Approach used to generate the outcome from the DST and degree of user interaction	User downloads the spreadsheet database and can query it to identify in vivo digestibility of the feeds of interest	

Additional comments	None
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DST 119 Servifapa SUPER-G partner: UCO		
DST provider	The Andalusian Ministry of Agriculture and Fisheries, through the Andalusian Institute for Agricultural and Fisheries Research and Training (Ifapa)	
Funder	European Union European Regional Development Fund	
Brief description	Consultancy platform, providing technical advice for farming management. Registered users can submit different questions on the platform and these are answered by an expert <i>via</i> email. The platform was established as a public, universal and free service for the transfer of agricultural knowledge.	
Links and references	Pasture webpage on Servifapa website	
Date of first release	Unknown	
Last update	2020	
Main purpose (ecosystem service)	6. Grass for livestock, biomass (bioenergy) and other products <ul style="list-style-type: none"> • Nutrient management (including fertilisers and organic manures) • Soil management • Grass variety selection 	
Main purpose	Expert assessment and online consultancy	
Target audience	Farmers Advisors	
Format	Software – web based	
Cost/availability	Free (user must register with the portal)	
Number of users	Unknown	
Country of origin	Spain	
Is it country or region specific?	Expert advice is relevant only to Spain	
Language	Spanish	
Is the tool specifically targeted to permanent grassland?	All crops including grass	
Grassland and livestock management	Not specific to a particular management system or livestock type	
Data input required for the DST	User submits questions to the online platform	
Use of data from other existing datasets	Not applicable	
Data export	No	
Data storage	No	
Benchmarking	No	
Ability of the DST to deliver an impact	Yes – provision of expert advice	
Approach used to generate the	Expert-based tool where different questions by the user are directly answered by an expert	


outcome from the DST and degree of user interaction	
Additional comments	None




DST 120 SIA UCO SUPER-G partner: UCO	
DST provider	UNIVERSIDAD D CORDOBA
Funder	UNIVERSIDAD D CORDOBA
Brief description	<p>The Feed Information Service provides information on the nutritional quality of animal feed. The service aims to integrate feed composition and nutritional value data obtained in different laboratories and recommendations of animal feeds used in Spain.</p> <p>In addition, the SIA has a legislative summary consultation service in the field of animal nutrition and develops new services, such as a database of equations for predicting nutritional value.</p> <p>The SIA information refers to both raw materials and compound feeds, as well as to pasture species and other fibrous foods commonly consumed by extensive livestock.</p>
Links and references	Food information service website
Date of first release	Unknown
Last update	2017
Main purpose (ecosystem service)	6. Grass for livestock, biomass (bioenergy) and other products
Main purpose	Database on forage quality
Target audience	Farmers Advisors
Format	Software – web based
Cost/availability	Free
Number of users	Unknown
Country of origin	Spain
Is it country or region specific?	National impact, but it can be used also in other part of EU.
Language	Spanish
Is the tool specifically targeted to permanent grassland?	All grassland types
Grassland and livestock management	Not specific to a particular management system or livestock type
Data input required for the DST	None
Use of data from other existing datasets	The information in the tool is based on the analysis of a large number of samples
Data export	Excel sheet or pdf
Data storage	No
Benchmarking	No
Ability of the DST to deliver an impact	No
Approach used to generate the	User selects the feed of interest on the website to view its properties

outcome from the DST and degree of user interaction	
Additional comments	None




DST 121 Grazemore SUPER-G partner: AgriSearch		
DST provider	Swedish University of Animal Sciences (SLU)	
Short summary	<p>The Grazemore DSS 1.0 was developed for evaluation of different grazing management strategies on dairy farms. The functions of the software are only partly validated.</p> <p>The Grazemore DSS was developed for rotational grazing systems with perennial ryegrass (<i>Lolium perenne</i> L.) and white clover (<i>Trifolium repens</i> L.) swards. The DSS is a large simulation platform displaying the effect of variance of management and environment on, MY (kg cow/day), herbage intake (HI) (kg DM/cow/day) and HG (kg DM/ha/day). The solution of the DSS can be described as a group of bank accounts. The "accounts" (paddocks) are replenished with grass with individual growth rates (interest rates) predicted by an HG model (Barrett et al., 2004). The removal of grass from the paddocks acts as withdrawals, and is predicted by an HI model (Delagarde et al., 2004). The DSS can also optimise a suggested grazing and cutting calendar for the farm depending on the management and feeding preferences of the user. Different grazing scenarios can be biologically and economically evaluated under different climatic conditions.</p> <p>Simulations are available from the first of March to the end of November based on, N fertilizer input, daily measurements of average temperature (°C), precipitation (mm) and photosynthetic active radiation (MJ/m²). The DSS performs daily predictions of herbage mass (HM) (kg DM/ha), HG, organic matter digestibility (OMD, %), crude protein (g/kg) and white clover contribution (% DM) for each paddock. MY and HI are predicted as herd averages for the residence period in each individual paddock, depending on the grazing management, supplementary feeding and the status of the herd. The DSS predictions of HM on a paddock level and MY on herd level have been externally evaluated by Centro de Investigaciones Agrarias Mabegondo, Spain on 27 farms in five countries in Western Europe during the 2004 season. The evaluation is based on weakly measurements of HM in individual paddocks and herd average MY, during the residence in the paddocks.</p>	
Funder	EU – developed as part of a European Project	
Links and References	<ul style="list-style-type: none"> • Barrett, P.D., Laidlaw A.S. and Mayne C.S. (2004). Development of a European herbage growth model (The EU Grazemore project) In: Lüscher, A. Jeangros, B. Kessler, W. Huguenin, O. Lobsiger, M. Millar, N. & Suter, E. (eds.) Proceedings of the 20th General Meeting of the European Grassland Federation, Volume 9 Grassland Science in Europe 653-655. • Delagarde R., Faverdin, P., Baratte, C., Bailhache, M. & Peyraud, J.L. (2004). The herbage intake model for grazing dairy cows in the EU Grazemore project. Proceedings of the 20th General Meeting of the European Grassland Federation, Volume 9 Grassland Science in Europe 650-652. 	

	<ul style="list-style-type: none"> • Mayne, C.S., Rook, A.J., Peyraud, J.L., Cone, J.W., Martinsson, K. and Gonzalez, A. Improving the sustainability of milk production systems in Europe through increasing reliance on grazed pasture. Grassland Science in Europe Vol 9, 584-586
Date of first release	2004
Last update	2004
Main purpose (ecosystem service)	6. Grass for livestock, biomass (bioenergy) and other products <ul style="list-style-type: none"> • Nutrient management (including fertilisers and organic manures)
Main purpose	Management tool for evaluation of different grazing management strategies.
Target audience	Farmers (advanced) Advisors
Format	Standalone computer programme available on CD-ROM (MS Access database but does not require this to run the programme)
Cost/availability	Free, but not easily available
Number of users	Unknown
Country of origin	EU
Is it country or region specific?	No
Language	English
Is the tool specifically targeted to permanent grassland?	All grassland types
Grassland management	Dairy
Data input required for the DST	Land area, growth patterns, livestock numbers, N fertiliser use
Use of data from other existing datasets	No
Data export	No
Data storage	Yes
Benchmarking	No
Ability of the DST to deliver an impact	Used to plan various scenarios. Relatively advanced and beyond most farmers. No longer in circulation
Approach used to generate the outcome from the DST and degree of user interaction	The DSS provides prediction of grass growth rates based on data input to the Herbage Growth Model (HGM) whilst also predicting the extent of grass removal through grazing (via the HGM) Inputs to the DSS include information on meteorological data and fertiliser Nitrogen application, paddock size and animal characteristics and the DSS predicts growth rates, herbage intake and animal performance on a daily basis.
Additional comments	None


DST 122 JRC MARS Explorer, MARS crop monitoring Bulletin and AGRI4CAST Data Portal SUPER-G partner: ETH Zürich		
DST provider	EU	
Funder	EU	
Brief description	<p>The JRC MARS Explorer displays information on current weather conditions and the progress of crop growth across the European Union. The data displayed are based on meteorological station data, crop growth simulations and remote sensing observations, originating from the JRC MARS Crop Yield Forecasting System. Weather information is based on observations from several thousand meteorological stations across Europe, while simulations using a computer model provide information on crops. Users can download EU-wide maps at a resolution of 25km x 25km.</p> <p>A full analysis of weather and crop conditions as well as quantitative forecasts of crop yields in Europe are published in the monthly JRC MARS Bulletins Crop monitoring in Europe.</p> <p>Datasets of the MARS Crop Yield Forecasting System are freely available from the AGRI4CAST portal.</p>	
Links and references	<ul style="list-style-type: none"> • Information page on the European Commission website (in English) • Agri4Cast ToolBox • JRC MARS Explorer • van der Velde, M., Biavetti, I., El-Aydam, M., Niemeier, S., Santini, F., & van den Berg, M. (2019). Use and relevance of European Union crop monitoring and yield forecasts. <i>Agricultural Systems</i>, 168, 224-230. 	
Date of first release	Bulletin 1993, MARS Explorer 2017	
Last update	2019	
Main purpose (ecosystem services)	6. Grass for livestock, biomass (bioenergy) and other products <ul style="list-style-type: none"> • Whole season/long term modelling or forecasting 	
Main purpose	To provide meteorological and crop growth data across the whole of the EU.	
Target audience	Farmers Advisors	
Format	Software – web based	
Cost/availability	Free	
Number of users	Unknown	
Country of origin	EU	
Is it country or region specific?	EU	
Language	Various languages	
Is the tool specifically targeted to permanent grassland?	All crop types including grassland	

Grassland and livestock management	Not specific to a particular grassland or livestock management system
Data input required for the DST	None
Use of data from other existing datasets	The system uses meteorological station data, crop growth simulations and remote sensing observations, originating from the JRC MARS Crop Yield Forecasting System
Data export	Data is available to download from the AGRI4Cast tool box.
Data storage	No user entered data
Benchmarking	No
Ability of the DST to deliver an impact	The DST provide the user with weather and crop growth information which they can use in any way they want.
Approach used to generate the outcome from the DST and degree of user interaction	The DST provides data, but doesn't provide any recommendations or guidance based on this data. It is up to the user to interpret and use the data.
Additional comments	None


DST 123 Linee guida mantenimento prati permanenti SUPER-G partner: UNITO		
DST provider	EU Commission	
Funder	EU Commission	
Brief description	Guidance document on the implementation by member states of permanent grassland provisions in the context of the payment for agricultural practices beneficial for the climate and the environment (greening payment)	
Links and references	Permanent lawn maintenance guidelines webpage	
Date of first release	2015	
Last update	2015	
Main purpose (ecosystem service)	1. Biodiversity and pollination (=1 st) 5. Landscape and recreation including cultural values (=1 st) 6. Grass for livestock, biomass (bioenergy) and other products (=1 st)	
Main purpose	Provides guidance on the management of permanent grassland	
Target audience	Farmers Advisors Policy makers	
Format	Paper based (electronic download is available)	
Cost/availability	Free	
Number of users	Unknown	
Country of origin	EU	
Is it country or region specific?	Specific to countries in the EU	
Language	English	
Is the tool specifically targeted to permanent grassland?	Yes	
Grassland and livestock management	Not specific to a particular management system or livestock type	
Data input required for the DST	None	
Use of data from other existing datasets	None	
Data export	None	
Data storage	None	
Benchmarking	None	
Ability of the DST to deliver an impact	Defines rules for greening policies related to CAP payments	
Approach used to generate the outcome from the DST and degree of user interaction	Farmers have to follow the rules to obtain the payments related to greening defined by CAP	

Additional comments	None
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DST 124 NaturEtrade SUPER-G partner: ADAS		
DST provider	University of Oxford	
Funder	Co-funded by University of Oxford and the EC LIFE+ programme	
Brief description	<p>NaturEtrade is a web-based mapping tool that demonstrates a novel approach to assessing the ecological potential of land in terms of the ecosystem services that it provides, and then "trading" these services. It is an easy-to-use automated ecosystem service evaluation tool that can assess uploaded information on a land parcel to determine its ecological potential. Beneficiaries of ecosystem services (including businesses, other land owners, national or regional/local government agencies) can contract with landowners for the continued (and ultimately enhanced) provision of these services. It was originally conceived as an "eBay for ecosystem services" and has potential for use in this way, or adapted for reverse auction contracting systems. The five ecosystem services included in the tool are: carbon in above ground biomass, pollination, water flow regulation, soil erosion protection and recreation.</p> <p>The website allows land owners and managers in Europe to map their land parcels by using a sophisticated user-friendly drawing tool and download information on five ecosystem service categories in a simple report. The website also demonstrates how investors of ecosystem services can form contracts with landowners to ensure continued provision of these valuable services. The tool has been tested with stakeholders in four case study regions, representing different dominant land-uses (UK, Estonia, Portugal, and Romania). The website notes that no transactions are taking place in this demonstration phase.</p>	
Links and references	NaturEtrade website	
Date of first release	2013	
Last update	2019	
Main purpose (ecosystem service)	<ol style="list-style-type: none"> 1. Biodiversity and pollination (pollination) (=1st) 2. Carbon storage and GHG (carbon storage only) (=1st) <ul style="list-style-type: none"> • Carbon sequestration / storage (=1st) 3. Flood and erosion control (soil erosion control) (=1st) 4. Water quality (water flow regulation) (=1st) 5. Landscape and recreation including cultural values (recreation including cultural values) (=1st) 	
Main purpose	Assessing changes in land cover and associated ecosystem services on parcels of land, and calculating changes between time periods; providing a trading platform for contracts between individuals to maintain land cover over periods of time	
Target audience	Farmers Advisors Policy makers Other – landowners, businesses	
Format	Software – web based geospatial tool	
Cost/availability	Free	

Number of users	It is currently a demonstration tool, therefore no real-time users
Country of origin	EU
Is it country or region specific?	Specific to Europe (maps cover Europe)
Language	English
Is the tool specifically targeted to permanent grassland?	All land uses; grassland is a specific category of land cover assessed and reported
Grassland and livestock management	Not specific to a particular management system or livestock type.
Data input required for the DST	Land parcel areas
Use of data from other existing datasets	Global datasets of water flow, soil erosion, pollination services, and carbon are used, in combination with complex algorithms to determine land cover and ecosystem service provision on land parcels
Data export	Reports of individual land parcels can be downloaded and shared, but wholesale data sharing would be by agreement with University of Oxford
Data storage	Yes, on University of Oxford's servers. They will be stored securely for 5 years after completion of the project
Benchmarking	Yes, the reports provide relative values of ES, which are to some extent related to neighboring conditions. The main benchmarking is of parcels of land over time – change is detected and payment for NO CHANGE is the basis of the contract which attracts funding (not currently operational as this is a demonstration tool)
Ability of the DST to deliver an impact	The project has demonstrated that it is possible to map these ecosystem services across Europe and provide a platform to trade services with the aim of halting loss of biodiversity and related ecosystem services through reduction of deleterious land cover change
Approach used to generate the outcome from the DST and degree of user interaction	User selects their land parcel area and the tool will provide a pdf report listing the ecosystem services provided by the land and detail the land cover categories on their parcel
Additional comments	The project partners are actively seeking follow-on funding to keep the land cover classification up to date and develop the trading platform operationally

DST 125 AgriWebb SUPER-G partner: AgriSearch		
DST name	AgriWebb	
DST provider	AgriWebb	
Funder	AgriWebb (commercial software)	
Brief Description	Farm management software. Includes ability to track mob movements and grazing. Grazing planner projects feed-on-offer and daily consumption to help plan animal movements. (Used by some UK farmers)	
Links and References	AgriWebb website	
Date of first release	Unknown	
Last update	Frequently updated	
Main purpose (ecosystem service)	6. Grass for livestock, biomass (bioenergy) and other products <ul style="list-style-type: none"> • Grass measurement & short term budgeting 	
Main purpose	Farm management software including field operations and animal records	
Target audience	Farmers Advisors	
Format	Web based software	
Cost/availability	Charged for – £21-46/month	
Number of users	Unknown	
Country of origin	Australia	
Is it country or region specific?	Started in Australia now available in UK	
Language	English	
Is the tool specifically targeted to permanent grassland?	All crops including grassland	
Grassland management	The tool is not specific to a particular livestock type of system. However, the grazing management part of the tool is primarily targeted at beef and sheep livestock grazing systems – rotational and paddock grazing rather than set stocking.	
Data input required for the DST	Land area, livestock details, cropping, fertilizer, sprays etc	
Use of data from other existing datasets	Use of existing maps (google maps) to identify field boundaries.	
Data export	No	
Data storage	Yes	
Benchmarking	No	
Ability of the DST to deliver an impact	Used mainly for compliance and farm management.	
Approach used to generate the outcome from the DST and degree of user interaction	Comprehensive farm management package.	


Additional comments	None
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DST 126	
Farmax	
SUPER-G partner: AgriSearch	
DST provider	Farmax
Funder	Commercial software/AgrResearch (NZ)
Brief description	<p>Farm management software for grassland farmers. Includes ability to track mob movements and grazing. Developed in New Zealand, but now also sold in Australia, UK and Ireland.</p> <p>The program includes two grazing management tools – one is for short-term monitoring of feed supply and the other is a long-term modelling tool to investigate the effect, on both feed supply and financial parameters, of different farming strategies.</p>
Links and References	<ul style="list-style-type: none"> • FARMAX website • AHDB Beef & Lamb report on UK use of Farmax
Date of first release	2003
Last update	Continual
Main purpose (ecosystem service)	<p>6. Grass for livestock, biomass (bioenergy) and other products</p> <ul style="list-style-type: none"> • Grass measurement & short term budgeting • Whole season/long term modelling or forecasting
Main purpose	Farm management software to help farmers plan grazing and improve grassland utilization.
Target audience	Farmers Advisors
Format	Software – desk based
Cost/availability	Charged for - £100/quarter for modelling package or £50/month for monitoring package.
Number of users	Unknown
Country of origin	New Zealand
Is it country or region specific?	No – now selling in New Zealand, Australia, UK and Ireland
Language	English
Is the tool specifically targeted to permanent grassland?	All grassland types, but mainly used by beef and sheep farmers where permanent grassland systems are dominant.
Grassland management	Has modules for dairy and beef & sheep.
Data input required for the DST	Farm management information including land area, land type, livestock numbers, number and size of mobs, fertilizer, purchased feed
Use of data from other existing datasets	No
Data export	No
Data storage	Yes
Benchmarking	None
Ability of the DST to deliver an impact	Helps farmers to look at optimum stocking rates and guiding farmers through whole farm options, supplementation strategies, when to sell off stock etc. to maximize farm profit.

Approach used to generate the outcome from the DST and degree of user interaction	Complex tool with high degree of user interaction – aimed at advisors and top farmers.
Additional comments	None



DST 127 Visual Soil Assessment SUPER-G partner: ADAS		
DST provider	Graham Shepherd, BioAgriNomics	
Funder	New Zealand Ministry of Agriculture funded publication of Field Guide (Volume 1)	
Brief description	<p>Visual Soil Assessment (VSA) is based on the visual assessment of soil 'state' and plant 'performance' indicators of soil quality, presented on a score card. Plant indicators extend or qualify the soil quality assessment to allow users to make cause and effect links between management practices and soil characteristics. Each indicator is given a visual score (VS) of 0 (poor), 1 (moderate), or 2 (good), based on the soil quality observed when comparing the paddock sample with three photographs in the field guide manual. An explanation of the scoring criteria accompanies each set of photographs. Because some soil factors or indicators are relatively more important for soil quality than others, VSA provides a weighting factor of 1, 2 or 3. The score you give each indicator is multiplied by the weighting factor to give a VS ranking. The total of the VS rankings gives the overall ranking score for the sample, which is compared with the score ranges at the bottom of the page to determine whether the soil has good, moderate, or poor soil quality. Volume 1 is the guide to assessing soil structure. Volume 2 provides guidance on soil management practices including guidance on reducing soil erosion.</p>	
Links and references	<ul style="list-style-type: none"> • Visual soil assessment – BioAgriNomics website • Visual soil assessment Field Guide Volume 1 (PDF link) • Visual soil assessment Field Guide Volume 2 (PDF link) 	
Date of first release	2000	
Last update	2000 (more recent versions available to purchase e.g. 2009; first edition is the free version)	
Main purpose (ecosystem service)	<ol style="list-style-type: none"> 3. Flood and erosion control (2nd) 4. Water quality (3rd) 6. Grass for livestock, biomass (bioenergy) and other products (1st) <ul style="list-style-type: none"> • Soil management 	
Main purpose	Visual soil assessment and soil management guidelines	
Target audience	Farmers Advisors	
Format	Paper based (hard copy and electronic download)	
Cost/availability	Free – Volume 1 and 2 available to download free Additional VSA publications available to purchase from BioAgriNomics website	
Number of users	Unknown	
Country of origin	New Zealand	
Is it country or region specific?	Not specific to a country or region	
Language	English	
Is the tool specifically targeted	All crops including grassland	

to permanent grassland?	
Grassland and livestock management	Advice on assessing grassland soil structure is targeted more at grazed rather than cut grass. Field guide includes guidance on assessing soil damage from grazing animals.
Data input required for the DST	None. User follows instructions and compares condition of their soil with photographs provided in the guide to assign a soil structure 'score'
Use of data from other existing datasets	None
Data export	None
Data storage	No – although the guide includes tables for recording soil assessment scores.
Benchmarking	The guide includes photos of good and bad soil structure which farmers can use to benchmark their own soil structure.
Ability of the DST to deliver an impact	Volume 1 provides guidance to help farmers to assess soil in the field. Volume 2 provides soil management guidance. This can help farmers to identify and take action to mitigate poor soil structure.
Approach used to generate the outcome from the DST and degree of user interaction	Guidance manual. Farmers use the photographs and descriptions to help them assess soil structure.
Additional comments	None