

European Monitoring of Biodiversity in Agricultural Landscapes

EMBAL

Survey Manual 2017



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from the

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1 Purpose of the EMBAL field survey

The EU Biodiversity Strategy to 2020 aims to halt the loss of biodiversity and the degradation of ecosystem services in the European Union (EU). In this process, agriculture should contribute substantially to the maintenance and enhancement of biodiversity. Among the measures applied to achieve that it seeks to increase the contribution of agriculture to maintaining and enhancing biodiversity. The Common Agricultural Policy (CAP) and in interaction with other relevant agricultural and environmental policies and programmes, biodiversity protection is addressed as well. However, it is not only about the general policies which are relevant for biodiversity protection and enhancement but also the performance and implementation of these policy sectors in detail. In order to effectively maintain and enhance biodiversity in agricultural areas, the evaluation of the biodiversity strategy and evaluations of the contribution of other policies, namely the CAP, are necessary and allow effective adjustments of policy mechanisms. However, this requires good data on the state of biodiversity, both in terms of spatiotemporal coverage and quality. A robust process for monitoring biodiversity in agricultural landscapes would ensure systematic collection of such data and would effectively address the current gaps in this regard. Besides the evaluation and enhancement of relevant policies and programmes, such a biodiversity monitoring process would also support their development and implementation, showing positive and negative outcomes.

Against this background, EMBAL (European Monitoring of Biodiversity in Agricultural Landscapes) delivers a robust monitoring tool and contributes towards the monitoring of farmland biodiversity across the European Member States. As a sampling approach based on field surveys, EMBAL serves several purposes:

- Recording of the current situation of land cover and biodiversity throughout European Member States in order to obtain up-to-date data, constantly updated by a continuous monitoring cycle;
- Recording the types, quality and extent of land cover and landscape elements within the agricultural landscape with a common European-wide approach.
- Photo documentation of different examples of land use, landscape elements and ecological impacts (such as erosion).

The EMBAL field survey is based on a sound methodology, which is harmonized with European approaches, like the Land Use/Cover Area Survey (LUCAS), in order to achieve synergy effects. With core elements of the approach, namely the area survey, with which type and quality of parcels and elements within defined plots are recorded and the vegetation records, with which detailed biodiversity data are generated, EMBAL is a unique monitoring programme at EU-level. Details on the survey elements are provided in section 3.3.2 and 4-6 in this manual.

The data obtained from the EMBAL field survey allows the interpretation in the following seven main sectors, relevant to a wide range of agricultural and environmental concerns:

1. Land cover and land use
2. Landscape elements
3. Nature value of all surveyed land use units and landscape elements
4. Habitat types (EUNIS classification)

5. Biodiversity of grassland, arable land, fallow land as well as plot biodiversity
6. Nature value of the landscape
7. Pollination potential through the assessment of flowering species, their density and distribution.

In the following, guidance to the field survey is provided, beginning with the structure and timing of the survey, followed by a thorough description of the parameters recorded in the field as well as a FAQ section and important attachments, such as the field survey sheets.....

2 Definitions of elements in the agricultural landscape

2.1 Agricultural landscape and landscape elements

In the study, only areas which are under agricultural use are surveyed. The differentiation between agricultural and non-agricultural areas is based on the definition of the Regulation (EU) 1307/2013, Art. 4:

“Agricultural area means any area taken up by arable land, permanent grassland and permanent pasture, or permanent crops”;

“Arable land means land cultivated for crop production or areas available for crop production but lying fallow, including areas set aside [...], irrespective of whether or not that land is under greenhouses or under fixed or mobile cover”;

“Permanent grassland and permanent pasture (together referred to as permanent grassland means land used to grow grasses or other herbaceous forage naturally (self-seeded) or through cultivation (sown) and that has not been included in the crop rotation of the holding for five years or more; it may include other species such as shrubs and/or trees which can be grazed provided that the grasses and other herbaceous forage remain predominant as well as, where Member States so decide, land which can be grazed and which forms part of established local practices where grasses and other herbaceous forage are traditionally not predominant in grazing areas”.

However, sometimes the border between agricultural and non-agricultural land is difficult to see. If you are not sure whether the land is used agriculturally or not, please provide photos and make a note in the remarks section of the main sheet.

Landscape elements are placed within the agricultural landscape or alongside non-agricultural elements. Landscape elements are recorded from a minimum width of 1 m. Landscape elements cover:

- Wood/tree/bush elements
- Grass-herb elements and reed-sedge beds
- Water elements
- Stone, rock, raw soil and terrace elements
- Roads and tracks

Also, combinations of these landscape elements are frequently found in the landscape, e.g. a traditional stone wall that is partly overgrown by trees and bushes.

A list of the EMBAL land cover codes and according definitions is provided in the following Table 2-1.

Table 2-1 – Overview of definitions for land cover categories and landscape elements used in the EMBAL methodology.

LC	Category	Code	Definition	Extent min/max
A	Non-permanent crops	A11- A74		#
	Permanent cultures and trees	A81- A96		#
B	Fallow/uncultivated land	B11- B14	It consists of mostly agricultural land which has not been cultivated this year or the years before. It has not been prepared for sowing any crop this year. This class applies for unused grassland, clear-cut forest areas, industrial "brownfields", storage land and of course on abandoned or unused land etc. The vegetation is dominated by spontaneous vegetation and/or tall herbs or weeds.	#
C	Grassland with tree/shrub cover	C11- C13	Land predominantly covered by communities of grassland, grass-like plants and forbs including sparsely occurring trees (the tree canopy is between 5 and 10% and the total of the tree+shrub canopy is between 5 and 20% of the area).	#
	Grassland without tree/shrub cover	C21- C23	Land predominantly covered by communities of grassland, grass like plants and forbs without trees and shrubland (density of tree+shrub canopy is less than 5%).	#
D	Shrubland	D11, D12	Areas dominated (at least 10% of the surface) by shrubs and low woody plants normally not able to reach more than 5m of height. It may include sparsely occurring trees with a canopy below 10%.	#
E	Wood/tree/bush elements			
	Solitary trees and small groups of trees/bushes	E11	isolated trees with a crown diameter of minimum 4 meters and a height of minimum 5 m	≥ 5m height
	Tree lines and avenues	E12	Trees with minimum height of 5 m, space between trees maximum 50 m	≥ 5m height
	Hedges and bushes	E13	hedges or wooded strips with a width of up to 10 meters;	≤1ha
	Isolated field coppices	E14	trees in group, where trees are connected by overlapping crown cover, and field coppices of maximum 1 ha in both cases	≤1ha
	Wood areas along watercourses	E15	Riverine woodlands or galleries with characteristic species, such as alder (<i>Alnus</i> spp.), birch (<i>Betula</i> spp.), aspens (<i>Populus tremula</i>) and willows (<i>Salix</i> spp.) and others, when complex of wood area and watercourse exceeds a width of 15 m	
	Grass-herb elements and reed-sedge beds			
	Field margins	E19	field margins with a minimum width of 1 m, on which there shall be no agricultural production, between agricultural fields or alongside farm tracks with grassy or herbaceous vegetation.	≥ 1m width
	Embankments	E20	Embankments along streets/tracks/pathes or between agricultural fields, might be stocked with bushes and/or trees. Excluded are embankments along classified roads at district, regional or national level and railways.	≥ 1m width
	Buffer strips	E21	buffer along/around linear landscape elements, such as watercourses, hedges, field coppices and forest edges. Grassy appearance with herbs.	≥ 1m width

Ruderal-grass and herbal fields of the open countryside	E22	Different to set-aside/fallow agricultural land in that no signs of production are directly visible. Stands of grass and herbaceous vegetation, shrubs might occur at less than 10% of the area, up to a size of 1 ha.	≤1ha
Large and small reed beds	E23	Moist and wet patches of parcels or at the siltation zones of water courses, characterized by reeds	≤1ha
Large and small sedge beds	E24	Moist and wet patches of parcels or at the siltation zones of water courses, characterized by sedges	≤1ha
Water elements			
Springs and spring swamps	E31	Inland springs and marshy areas fed by spring water, up to 1 ha size.	≤1ha
Small and medium-sized inland flowing waters	E32	Inland channels of fresh water, including medium-sized rivers, streams, channels. Including banks and riverine vegetation with a width of up to 15 m.	≤15m width
Ditches	E33	With flowing or standing water, or dry, including banks and riparian vegetation. Usually, ditches are straight running structures.	≤15m width
Small standing water bodies	E34	Inland areas of still standing surface waters, including natural water bodies such as natural lakes and man-made water bodies, such as fish ponds. Includes oxbow lakes, Mediterranean natural ponds, Turloughs of Western Ireland, etc.	≤1ha
Stone, rock, raw soil and terrace elements			
Dry stone and natural stone walls	E41	Wall constructed with no additional material other than rock	≥ 1m width
Field stone heaps and cairns	E42	Heaps of stone in fields from former agriculture or structures of rock from prehistoric times	≥ 1m width
Sand, clay and loess escarpments	E43	Not formed through human activities, but e.g. glacier or alluvial processes.	≥ 1m width
Isolated rock outcrops	E44	Isolated elements of rock emergent from surrounding vegetation	≥ 1m width
Raw soil sites	E45	Stone, sand and dirt surfaces with little or no vegetation	≥ 1m width
Terraces	E46	Consisting of dry stone or natural stone walls, to use agricultural land in terrain with steep slope excludes classified roads at district, regional or national level and railways	≥ 1m width
Roads and tracks			
Dirt/gravel track	E51		≥ 1m width
Grass track	E52		≥ 1m width
Paved farm track	E53		≥ 1m width
Sunken roads	E54	Traditional road excavated below general ground level	≥ 1m width
Man-made structures, artefacts and other elements			
	E62- E67		≥ 1m width
Non-agricultural elements			
	N11- N61		

2.2 Non-agricultural elements

Elements that do not form part of the *agricultural* landscape will be excluded from the data analysis, though they might considerably contribute to the structural diversity of the plot. However, the focus of the survey lies in the structural diversity and biodiversity of agricultural land and therefore even valuable elements, e.g. hedges adjacent to motorways, allotment gardens or alike, are not taken into account. Those elements have to be contoured and numbered on the map like other elements. However, the only entries in the main sheet which

have to be made are in the fields “Number on map” and “Landcover” (Category N – Non-agricultural elements). They include:

- Official roads and railways and adjacent landscape elements
- Big rivers, lakes and marine waters and their banks/shores
- Elements of settlements including parks and public green areas, and privately used (not agriculturally) and fenced green areas at the outskirts of villages (e.g. allotment gardens)
- Wetlands including marshes, bogs, intertidal flats and salines
- Forests.

3 Overview of the EMBAL field survey

3.1 Structure of the survey

The field survey is organised as follows:

- On the basis of a regular grid with 2 x 2 km across European Member States (MS), a defined number of plots are surveyed in each country.
- Only plots with a share of minimum 10 % open land will be surveyed.
- The plots to be surveyed have a square shape with a side length of 500 m, thus cover an area of 25 ha. Each parcel within a plot is recorded once in a survey year during optimum vegetation conditions. Within each plot, four transect points are defined, at which the recording of vegetation/biodiversity data takes place.

3.2 Preparation of the survey

Before beginning with the survey in the field, some preparation will be necessary. The most important part is careful reading and understanding of the content of the present survey manual, which defines the parameters and rules that need to be applied during the field work.

The rules in this manual provide the baseline for any decisions taken in the field. In case certain structures or elements are not covered by the manual and according rules, feedback to the coordinator is essential so the manual can be adapted to specific situations. Uncertainties should always be communicated to the coordinator in order to prevent any misunderstandings or misinterpretations in the field. In case no direct communication with the coordinator is possible, the decision or uncertainty should be noted in the remarks section of the respective plot.

The manual is divided into two main sections, the main sheet and the vegetation sheets, covering the aerial survey and the biodiversity survey.

Topographic maps can be helpful to prepare the fieldwork and to get an overview on accessibility of the plots.

The daily route should be set up in advance to reduce the effort and time needed to approach the single plots. A navigation system in the car or proper map material might be necessary for the preparation. However, access to plots might be difficult and require more time than planned, so a buffer time should be included in the daily schedule.

3.2.1 When to go into the field

Since the EMBAL survey consists of both the mapping of the land cover and the recording of vegetation, the timing of the field work is crucial, especially for the vegetation part. Depending on the biogeographic region in which the plots are placed, the optimum time for carrying out the vegetation transects may vary considerably. It is important that surveys take place during the height of the growing season, which might already be in March for the Mediterranean countries or in late June for the Scandinavian countries.

3.2.2 Surveyor kit – what to take into the field

This list gives an overview of what you should take into the field.

- Sufficient print-outs of the blank main sheet and vegetation sheets
- Camera with a resolution of at least 1600 x 1200 pixel, extra battery and SD-card
- Overview maps as orientation in the field (optimum scale 1:25,000)
- Maps of the plots (provided by survey coordinators)
- Pencils (should be suitable for writing on colour prints, please test before)
- Clipboard
- Survey manual
- Flash drive
- Navigation system for the car
- GPS device
- Mobile phone
- Field guide for the vegetation
- Measuring tape
- First aid kit

3.3 During the survey

3.3.1 Safety

You are responsible for your own safety during the survey in the field. Be sure to carry a mobile phone with you. In very remote areas, the coordinators should establish a system to ensure that he or she knows when and where the surveyors are in the field and when they have left the field for the day. You are responsible for the risk assessment when entering a plot. Entering parcels with livestock or in difficult terrain, e.g. with steep slopes, is within your responsibility as well as proper field equipment, like protective clothing and safety gear, if necessary.

3.3.2 Elements to be surveyed

In each plot, the field survey comprises three elements:

1. Mapping / recording of all types of land cover/use and landscape elements on a map and assigned parameters in a so-called main-sheet. The surveyors will collect information on the type and quality of land use, as well as on agro-ecological impact and landscape features of the study plots. For all types of land cover and landscape elements, the “nature values” is recorded: this term is used as a summarizing expression for biodiversity and structural richness of farmland and landscape elements.
2. Detailed records of four transects: biodiversity will be recorded on four transects of 20 m length in each plot. Lists with plant key species serve as qualification for the recording of biodiversity. The lists are provided in the record sheets. For grassland, the key species lists are adapted to the biogeographic regions in Europe, for arable land there is one key species list covering all biogeographic regions. The key species list represent species easily identifiable in the field which are neither too common nor too rare. So you won't find species of the Red List, but species that help to characterize certain grassland habitats.
3. Photo documentation of the plot and its elements.

In the field survey, two different types of information are recorded:

In the main sheet, information on the share of land cover and land use, the type and extent of landscape elements, their nature value and impacts of land use are collected. This is done by mapping different units on a field map (based on a satellite photo) and filling in the main sheet.

The investigation plots comprise 25 ha with a differing number of land cover types in parcels and landscape elements. On average, a time of 1 to 1.5 hours in the field will be necessary for the mapping of one plot.

In the transect sheets, detailed information on biodiversity is recorded from 4 defined transect points. The length of the transects is 20 m. The observation frame will be 1.25 m to the left and 1.25 m to the right-side walking along the transect, thus a total width of 2.5 m is observed (20 m x 2.5 m \equiv 50 m²). During the transect walks, the surveyors will record the presence of potential key plant species given in a list as well as information on the structure of the fields. This information will serve as biodiversity record which enables further data interpretation.

The transect walks will need 15 minutes each in average and all 4 transect records will take in average 1 hour per investigation plot. Walking from the car to the plot needs to be added. We estimate a total time per plot of about 1.5 – 2 hours. 5 plots can be completed in one day.

3.3.3 Recording the field survey data

For the first survey

Each plot is approached separately, and for each plot, the main sheet is filled-out and the vegetation transects are walked. The field maps, provided in form of aerial photos, are the basis for the field survey data. The field maps shall be used to record the parcels of agricultural use and the landscape elements within the plot. The elements are marked with consecutive numbers with at least two digits. Similarly, these digits given in the map are recorded in the main sheet and all requested parameters are collected.

Mark the boundaries of all elements on the map for which a number was assigned. Please note that the satellite images do not necessarily show the current situation in the field, as they may date from some years ago. Therefore, please contour the elements according to the current situation in the field! Elements which are visible on the satellite image but do not exist in the field any more should be crossed out, e.g. single trees or hedges. Note that cutting/mowing lines might be clearly visible on the aerial photo but do not mark an individual element!

On the following pages, some examples of how elements are marked in the field map and recorded in the main sheet are given.

For follow-up surveys

You will be equipped with the relevant information that were recorded in the previous field survey as well as up-to-date ortho-images of the plots. The aim of the follow-up surveys within the monitoring programme is to record all changes that can be found compared to the previous survey. The input mask for the follow-up survey contains obligatory fields which you need to fill, namely the type of land cover and the assigned nature value. Changes can be either attributed to the geographic extent of the element (e.g. a wider buffer strip as compared to the previous survey) and/or to a change in value of the element (e.g. arable land that is cultivated more

extensively in the year of the survey). It is very important to record all changes, also those that might occur due to a mistake in the previous survey, e.g. a hedgerow that had been coded as tree line. The data entry form will guide you through the fields that need an entry.

3.4 Processing of the field survey data

Depending on the kind of recording in the field (digital via field computer or on paper) the data processing requires the following steps.

3.4.1 Digitization

For the first survey

With the help of the data entry software, parameters of the main sheet and vegetation sheet can be directly recorded in the field. When connected to the internet, an automated upload of the processed data sets is started. Digitization is only necessary for the mapping of the extent of the land cover and landscape elements. The elements that you marked in the field on the printed ortho-image need to be transferred into a digital map at home (e.g. with ArcMap or QGIS). Areas are digitized by creating a shape file with polygons based on the underlying satellite image/map. Please make sure that the complete area of the plot has an attributed land cover or landscape element code and no “empty” spaces remain after the digitization. Be sure that the ID numbers of the digitized elements correspond to the numbers that you recorded for the particular parcel/element in the field. Otherwise, an error message will occur during the quality check.

For follow-up surveys

For plots which have already been recorded in a previous survey, amendments to the digitized elements is only necessary for the parcels/elements for which a geometric change was recorded during the follow-up survey. For the other areas, no further digitization is necessary. Be sure that no “empty” spaces emerge when editing existing polygons.

3.4.2 EUNIS habitat types

In order to harmonize European land cover assessments, EMBAL land cover and landscape element codes can be translated into EUNIS habitat types.

The EUNIS habitat types cover the main levels listed in Table 3-1. The translation from EMBAL to EUNIS will be done automatically during data entry in the digital field form.

Table 3-1 – First level habitat types according to EUNIS classification and corresponding EMBAL codes, adapted from <http://eunis.eea.europa.eu/habitats-code-browser.jsp> (last accessed 18.04.2017)

EUNIS Code	EMBAL Code	Relevance for EMBAL survey
A Marine habitats		Not part of the agricultural landscape.
B Coastal habitats	N33	Not part of the agricultural landscape.
C Inland surface waters	E31 – E35 or N31, N32	Coded as landscape element or non-agricultural element within EMBAL land cover code.
D Mires, bogs and fens	N22	Coded as non-agricultural element within EMBAL land cover code.
E Grasslands and lands dominated by forbs, mosses or lichens	C11-13, C21-23	Habitat type needs to be indicated since grasslands are a major agricultural land cover.
F Heathland, scrub and tundra	E11, E13, D11, D12	Habitat type needs to be indicated, scrubs and shrub communities are a main component of many landscape elements relevant in the EMBAL survey.
G Woodland, forest and other wooded land	E11-15, N11	Woodland and forest not part of the agricultural landscape, but lines of trees and coppices (G6) are important landscape elements relevant in the EMBAL survey.
H Inland unvegetated or sparsely vegetated habitats	C-1-5, a-e	Can be part of the agricultural landscape if within grasslands or arable fields, additional feature in grasslands (1-5, a-e).
I Regularly or recently cultivated agricultural, horticultural and domestic habitats	A11 – A96	Habitat type needs to be indicated since arable land is a major agricultural land cover.
J Constructed, industrial and other artificial habitats	E46, E51– E54, E62-67	Artificial habitats might comprise landscape elements (e.g. roads, field barns etc.)
X Habitat complexes		Special complexes like “crops shaded by trees”, further distinguished in EMBAL.

The differentiation of EUNIS habitat types follows the identified elements of the EMBAL survey, i.e. a gravel track is recorded separately from the adjacent hedgerow. The translation of EMBAL codes to EUNIS habitat codes is automated and will be done during data entry.



Main sheet

Surveyor: IFAB

Date: 2017 / 09 / 25
yyyy mm dd

Plot-ID: DE-02-18

N° on map	Land cover / LE code		Width (length) in [m]	Ecological impact Type and intensity	Nature value [1-5]		Photo	Remarks e.g. LC3
	LC1	LC2			LC1	LC2		
1	N41		___ / ___					
2	N11		___ / ___					
3	N11		___ / ___					
4	E51		_3_ / ___			3.5	6672	
5	C11-1	A96	___ / ___			3	4	6675 Two pine trees
6	C21		___ / ___			4		6676
7	E21		_1_ / ___	Fert-2		2.5		6677, 6678 Dominated by nitrophytic plants
8	C21		___ / ___			5		6679
9	C21		___ / ___			4		6680
10	E67		_8_ / _8_			4.5		6682-6684 doline
			___ / ___					
			___ / ___					



Figure 4-2 – Left: Dehesa in Spain: barley with holm oaks.
LC1 = A13 (barley) + LC = A96 (other trees)

Right: Fruit orchards in Germany: fruit trees with grassland.
LC1 = C11-3 (meadow grassland with tree cover 25-25 %) + LC2 = A95 (fruit trees)

For those of you who are familiar with the LUCAS (Land Use/Cover Area frame survey), please be aware that some of the land cover codes are similar, but have a different qualifying letter, e.g. arable fields cultivated with common wheat are coded as B11 in LUCAS, but A11 in EMBAL!

4.2.2 Land cover with more than one type of cover

For agroforestry systems, the land cover consists of two layers: the ground layer (arable land, grassland, fallow land) and the tree layer (could be each kind of permanent culture or other kind of tree). For these situations, the tree layer is noted with the respective code, and the ground layer in the second position, as shown in the examples below.

Since the two land cover types occur on the same area, they are recorded as one element (one number on the map), but nature values are recorded for both land cover types separately.

Some of these agroforestry systems are typical for a region, e.g. the Dehesas in western Spain or the fruit orchards in south-west Germany. These systems form landscape complexes which can be aggregated into one mapping unit when they consist of a largely homogeneous type of land cover regarding structure and use. The aggregated area does not necessarily reflect the structure of single parcels, but combines parcels with homogeneous land use. The following examples in Figure 4-4 show how complexes can be delineated. However, please be aware to have a look on both landcovers – if for example the understory is quite different in neighboring parcels but on the aerial photo you can't see differences due to a similar tree cover of fruit or oak trees (Dehesas) the parcels have to be differentiated.

4.2.3 Landscape elements with more than one element

Similar to land covers with more than one type, landscape elements can consist of several (e.g. two or more) elements, which cannot be distinguished from each other, e.g. because they occur on the same area. Please note the two main landscape elements as LC1 and LC2 in the main sheet. In case there is an additional third element, e.g. a stone heap < 5 m² you can note the element as an additional feature in the "Remarks" section, but you don't need to indicate the nature value, land use intensity and EUNIS type for the third element.

The full list of landscape elements (land cover code E) is given in the table in Annex 8.1.



Figure 4-3 – Left: The landscape element consists of a stone wall (LC1 = E41) and two small groups of trees (LC2 = E11).

Right: A (ponded) in-field depression (LC1 = E34) and a single tree (LC2 = E11).

4.3 Inaccessibility and irregularities

In case an element cannot be observed, this is noted in in the “Remarks” section including the reasons (e.g. “inaccessible because of fence”). If one or more characteristics can be determined or estimated from a distance, the observation point has to be marked on the field map and the approximate distance to the element is noted in the “Remarks” section.

Any other irregularities also have to be noted in the “Remarks” section, such as problems with land owners, outdated aerial photos, problems in the coding of items from the list (e.g. crop/habitat type recognition), burnt areas, etc., as well as any other information that might be relevant.

Observations of exceptional plant or animal species are noted, too.



Figure 4-4 – Examples of landscapes.

The region around Kirchheim unter Teck in southern Germany (left) is characterized by small parcels of fruit orchards with different management types of grassland. In order to simplify the mapping, larger areas with more or less identical structure can be regarded as one complex (orange line), given that the nature value is the same. The aggregated areas (orange) are fruit orchards with differing tree cover: A95 + C11-2/3. Without such an aggregation, more parcels would need to be differentiated (yellow, dotted line).

Example below from Viver, southern Spain, where a recording of complex structures is not possible due to the landscape elements, i.e. tracks, paths and terraces, that are found along each parcel. All elements of parcels, individual trees, paths/tracks and terraces need to be recorded with a distinct number in the main sheet.



4.4 Width (and length) of landscape elements

For landscape elements, the width of linear and punctual elements with a size of ≥ 1 m and < 10 m is recorded in the field. For elements with heterogeneous widths, the average width is estimated. For linear elements up to a length of 20 m, the length is recorded as well. For longer elements, the record of the length is appropriate via GIS mapping. A clear indication in the map of where the element begins and ends is crucial! For the measurement of the width (and length), use your step length. In case that the width of elements differs considerably, as shown in Figure 4-5, please note the average width.



Figure 4-5 – The width of the hedge (2) varies between 2 m and 15 m. In this case, the average width should be noted, in this example this would be 10 m.

4.5 Agro-environmental impacts

In some cases, a specific agro-environmental impact of the land use may be visible, e.g. more or less strong signs of erosion (e.g. gully erosion), arable use of bog soils (this leads to high denitrification and emission of greenhouse gases) or occurring pesticide and fertiliser drift to bordering habitats.

If any of the described impacts are clearly visible in the field, please take a photo and indicate the type and intensity of impact.

For example, a massive occurrence of nitrophytic plants such as *Urtica dioica* or *Cirsium arvense* in bordering habitats, e.g. along the borders of an agricultural parcel or between a parcel and a hedgerow, is mostly a sign of fertiliser application.

As insecticide and fungicide drifts may not be identifiable, signs of pesticide drift are restricted to herbicides. Signs of herbicide use are dead plants or plants showing signs of chlorosis (light-green or white colour). The use of plant protection products (PPP) is only recorded, if the application extends the arable field (e.g. an arable field with crops) and impacts the adjacent elements, i.e. buffer strips or grass-herb elements, hedgerows, wood areas.

Signs of fertiliser and pesticide drift on bordering landscape elements are noted with the respective landscape element.

For signs of agro-environmental impact, the type of impact and the intensity of impact shall be noted according to the following table.

Type of impact	Intensity of (potential) impact		
	1 (potential impact)	2 (slight impact)	3 (strong impact)
Eros Water erosion	Soil is potentially endangered by erosion (e.g. arable land on steep slope)	Slight signs of erosion, e.g. surface wash of soil (but no gullies)	Gully erosion
Shal Danger of water pollution on shallow soils	sensitive permeable underground, but cover soil normally has buffer function	Intensive arable use on stony soils, thin soils on permeable underground	Intensive arable use on very stony / very thin soils on permeable underground
Bog Denitrification of organic soils / bog soils	Arable use on muck soils	Arable use on transition soils (between muck soils and pure bog soils)	Arable use on pure bog soils
PPP Direct application of plant protection products (PPPs) or drift of PPPs	Slight signs of PPP impact	Conspicuous signs of direct impact of PPP	Large areas of direct impact of PPP *
Fert Drift of fertilisers	Some nitrophytic plants occur in the bordering habitat	Herds of nitrophytic plants occur in the bordering habitat	The bordering habitat is dominated by nitrophytic plants
Irr Irrigation	The intensity of irrigation is not differentiated.		

* If the whole or parts of the buffer strip are sprayed with herbicides, please take a photo and note this in the "Remarks" section.

Agro-environmental impact is noted as the following examples indicate:

Eros-2: at the lower border of the arable field silty soil is accumulated (being washed off from the upper part of the field), but no gullies occur.



Figure 4-6 – Left: signs of erosion can also be accumulated soil without crop coverage in depressions or at the lower edge of a slope: Eros-2.

Right: ditch adjacent to arable field is clearly dominated by *Urtica dioica*: Fert-3.



Figure 4-7 – Left: arable land use up to the border of the hedge with large areas of direct impact of herbicides on the hedge (ground vegetation is dead): PPP-3.

Right: Arable use on bog soil: Bog-3

4.6 Nature value

The nature value comprises the following categories and their intermediate stages:

1	very low nature value
1.5	between very low and rather low nature value
2	rather low nature value
2.5	between rather low and moderately high nature value
3	moderately high nature value
3.5	between moderately high and rather high nature value
4	rather high nature value
4.5	between rather high and very high nature value
5	very high nature value

In the following sections the characteristics of nature values for different types of land cover and landscape elements are described and illustrated in tables, using the scale and according colours indicated above.

4.6.1 Nature value of arable land / grassland

This parameter builds on an estimation of the nature value according to a five components scale, whereas the intermediate steps can be used equally, if appropriate.

For arable land and grassland, the nature value is mainly characterised by the diversity of herbaceous (non-crop) plant species. Also, other characteristics shall be used by the surveyor in case that either the field visit does not show the full development of the vegetation or the species richness is not the main characteristic. In these cases, the field surveyor could additionally judge the nature value from a phytocoenological aspect (e.g. very high nature

value of a moist / wet sedge community) or by the structure of the stand (e.g. in case of late developing dry meadows which show a sparse growth). A detailed description is given further down and in Annex 8.2.

The estimation of the nature value considers the nature region / the potential of the region. For example, grassland on acidic soils cannot be expected to be as species rich as it can be expected on calcareous soils. And on soils of good agricultural value, the segetal plant community normally is not as rich as it is on shallow soils.

A high nature value does not necessarily correlate with very extensive land use. For example, fertilised dense wheat fields may be managed without herbicides and can hence have a number of segetal plant species leading to a medium or even high nature value.

Please note: a very dense weed community suppresses the arable crop. Since we give high nature values at the “disadvantage” of agriculture as such, these fields cannot be judged as “nature value 5” but the specific category “X” is used to indicate the negative effect for the arable species. Thus, the estimation is always set in relation to a good agricultural management of the specific site. Remarks in this respect are welcome (see also general judgement of the whole plot).

Code / Type	Definition	Nature value
A11-A74 Arable land	Hardly any segetal plant species occur.	1
	A few segetal plants occur with a very low coverage; or a certain richness occurs only in some smaller parts of the parcels.	2
	Some segetal plants are present or at least some considerable parts of the parcels (beside the edge areas) show a moderate richness of segetal plants; or segetal plants occur with many species and a high coverage but they affect the growth of the crop (e.g. Galium aparine building dense parts of the weed community).	3
	A considerable number of segetal plants species are present in at least some larger parts of the field or many segetal plants occur but they probably do not affect the growth of the crop.	4
	Many segetal plant species occur in more or less the whole field without considerably dominating and affecting the crop and the structure of the field.	5



Figure 4-8 – Examples for arable land with a high nature value based on a high number of segetal plants (visible in the picture Poppy-flowered) and light vegetation structure (left, nature value 4) and a low nature value (right, nature value 1, dense growth, no segetal plants at all).

Code / Type	Definition	Nature value
C11-C23 Grassland	Mostly fertilised, intensively managed meadow or pasture without or with hardly any species which characterize species rich plant communities that are typical for this site.	1
	A few characteristic flower species occur but the meadow / pasture is dominated by only a few grass species; or the species richer parts of the meadow / pasture are restricted only to minor areas of the whole parcel.	2
	The meadow or pasture is characterised by some typical species of extensive land use, but other typical species are missing. Moreover, the structure of the vegetation is either too dense (due to fertiliser input) or too sparse (due to overuse e.g. by cattle or goats).	3
	Many characteristic flower species occur and the vegetation is typical for an extensive land use on this site, but there are considerable parts of the parcel which are characterised by less species richness or by other signs of over- or under-use.	4
	The grassland is rich in species and the plant composition of the vegetation of the whole parcel is typical for extensive land use.	5



Figure 4-9 – Examples for species rich grassland (left, nature value 4-5), medium species-rich grassland (middle, nature value 3-4) and fresh grassland with less species-diversity (nature value 2-3).

4.6.2 Nature value of permanent cultures and trees

Permanent cultures and other agricultural land with trees consist of the tree layer (LC1) and the ground layer (LC2). For each layer, the nature value should be judged separately. However, for permanent cultures like vineyards and low-stem fruit cultures, a differentiation of the tree and the ground layer is sometimes not feasible. In the table below, the nature value in these permanent cultures is outlined with reference to the vegetation between the rows.

If in deviation of the described value classes special biodiversity issues occur (e.g. several potential key species like *Muscari spec.* or *Ornithogalum spec.* on a sprayed vine field or very old trunks of the vine yard, one or at maximum 2 more score points can be given (e.g. value “2” or “3” instead of “1” on a sprayed vineyard). This must be noted under remarks.

For other permanent cultures, please try to find an adequate judgement (according to the characteristics described below) and note this under remarks. For fruit orchards, olive groves and other agroforestry systems, the nature value is indicated for the ground and tree layer separately.

Code / Type	Definition	Nature value
A81-A94 Permanent cultures and trees	Field with permanent cultures completely sprayed / ploughed, hardly any natural vegetation in the rows.	1
	Field with permanent cultures mainly with grass or natural segetal flora, but more or less wide strips being sprayed regularly (e.g. beneath the vines in vineyards) or /and ploughed alternating between the rows; or field with complete green cover, but this green cover being mulched intensively (many times / year).	2
	Field with permanent cultures with a complete green cover, low floral diversity; mulching is carried out irregularly or alternating between the rows.	3
	Field with permanent cultures with a complete green cover, medium floral diversity, mulching irregularly and / or alternating between the rows.	4
	Field with permanent cultures with species-rich flora or with species-rich seed mixture / flower strips.	5

4.6.3 Nature value of agricultural land with tree/shrub cover

For the assessment of the nature value of the tree cover, e.g. for arable land with trees or pasture orchards, the age of trees, the coverage and properties of the trees are taken into consideration. The coverage of the trees ranges from scattered (coverage < 5%) to a closed stand of trees/bushes (coverage > 75%).

Code / Type	Definition	Nature value
A95 - A96 Fruit orchards and other trees	The tree stand has a coverage of < 5% (scattered) and consists mainly of young trees without a distinct / discrete crown.	3
	The tree stand has a coverage of up to 50% and consists of native trees with a distinct / discrete crown or a heterogeneous structure of young and old trees.	4
	The tree stand covers more than 50% of the area and consists of characteristic native trees with a great habitat function.	5

The coverage area of one tree can be roughly calculated with $5 \times 5 \text{ m} = 25 \text{ m}^2$ on average.

If there is a mosaic of parcels with different densities of trees and/or slightly different ground layers, they can be compiled to one mapping unit (see section 4.2.3).

4.6.4 Fallow/uncultivated land (B11 - B14)

Fallow/uncultivated land is noted with the land use code “B” and the additional qualifier a – if management (such as mowing) is visible, b – if no management is visible, or c – if it is unclear.

For fallow grassland, managed land means that there may be a mulching or cutting of the biomass but obviously no permanent grassland with regular cut or grazing. In abandoned, unmanaged grasslands the vegetation from the previous years can be seen, e.g. a layer of dead leaves, tall and dry forbs or the development of small woody plants/bushes. In arable fallow land, the stalks from the previous year(s) are visible. The arable fallow land may be managed in that there is ploughing or any other cultivation of the soil, but no crop is sown for a certain time.

These parcels of unmanaged fallow or uncultivated land are judged with a nature value 3, 4 or 5 (plants and animals can develop on their own for a considerable time during the year). For

managed fallow (arable) land, lower nature values may be adequate, e.g. when segetal plants cannot develop because of frequent ploughing.

For brownfields like industrial areas, construction sites or alike, a low nature value of 2 might be appropriate, e.g. when the site is covered with demolition material and hardly any forbs can develop.

Please note that black fallow is recorded separately as A73 – arable land without plants!

Code / Type	Definition	Nature value
B11-B14 Fallow land or set-aside (incl. brownfields)	Only very few forbs can develop, e.g. because the soil is covered with demolition material (industrial or construction sites) or frequently ploughed (arable land).	2
	The vegetation stand consists of mainly one or very few species (e.g. huge <i>Urtica dioica</i> stand) and the structure is homogenous.	3
	The vegetation consists of some (more) species and the structure is partly heterogeneous.	4
	The vegetation consists of many different plant species and shows a heterogeneous structure.	5

4.7 Nature value – Landscape elements

The occurrence of a landscape element, which fulfils the requirements defined further down, is a value for itself. For this reason, the categories only comprise the values 3, 4 and 5 (e.g. except paved roads and tracks). Landscape elements which do not form part of the agricultural landscape are not evaluated (see definition in section 2).

4.7.1 Wood/ Tree/ Bush elements (E11 – E15)

For the nature value of wood/tree/bush elements, only elements with the following properties are taken into account:

Solitary Trees / Tree lines and avenues (E11 / E12): Only trees with a height of over 5 m (stem height 1.6 m for fruit trees) occurring in fields and meadows, along field tracks, paths and connecting roads (E51 – E54) are recorded. For tree lines, gaps between the trees do not exceed 50 m and bushes and shrubs under the trees cover maximally 50 %.

Hedges / Isolated field coppices/ Wood areas alongside watercourses (E13 – E15): Shrubby or woody areas without forest character (microclimate, ground vegetation). Minimum width 1 m; bushes and shrub cover at least 50 %. Only hedges and bushes in the agricultural landscape and alongside field lanes, narrow roads and small/medium sized water elements are recorded, but not those alongside bigger roads, railroads and large rivers/lakes.

If an element consists only of non-native trees or bushes, e.g. a planted hedgerow with *Thuja spec.*, the nature value of 2 might be appropriate. Please consider the ecological function of the stand.

Code / Type	Definition	Nature value
E11-E15 Wood/tree/bush element	Native trees without a distinct / discrete crown, at least 5 m high, fruit trees with stem height of $\geq 1,6$ m (bottom to first major branch). Non- native trees only if they are characteristic landscape elements (older trees with a height of > 10 m).	3
	Native trees with a distinct / discrete crown, at least 8 m high (fruit trees can be lower).	4
	Native or non-native trees which constitute characteristic landscape elements, with a height > 15 m, average tree-trunk perimeter of 400 to ≥ 250 cm (diameter 130 to ≥ 80 cm).	5

4.7.2 Grass-herb elements (E19 – E22)

Many lynchets, embankments or small patches between parcels or buffer strips are characterized by a heterogeneous grass- and / or herb vegetation. These can have a very diverse appearance, due to the cutting regime, use of herbicides or the site-specific conditions. Elements which are cut several times per year or sometimes sprayed with herbicides will in general be more species-poor and less structured than extensively managed elements. Therefore, you should take into account the management practice – if visible – when assigning the nature value for grass-herb elements (cf. Figure 4-10, left picture).

Code / Type	Definition	Nature value
E19-E22 Grass-herb elements	Species-poor, mainly grass-dominated or strongly interspersed with neophytes or nitrophytes (e.g. <i>Urtica spec.</i>).	3
	Moderately species-rich (not species poor, not species-rich) or moderately structured; < 25 % neophytes/nitrophytes.	4
	Species-rich and structured; < 5 % neophytes/nitrophytes.	5



Figure 4-10 – Examples for grass-herb elements with differing nature values: left - mulched buffer strip along grass track, nature value 3, middle - species-rich buffer strip along farm track, nature value 5, right - moderately species-rich embankment, nature value 3-4.

4.7.3 Reed and sedge beds and wet tall herb communities (E23 / E24)

Moist and wet patches of parcels or alongside ditches are often characterized by reed or sedge vegetation. This vegetation often is species-poor but nevertheless it has a high nature value as far as it is not “disturbed” by the growth of nitrophytic plants. The nature value is the following:

Code / Type	Definition	Nature value
E23-E24 Reed and sedge beds, wet tall herb communities	Reed and sedge beds with a high percentage (35 – 75 %) of nitrophytic or neophytic plants (over 75 % of these plants please note under E22).	3
	Reed and sedge beds with a typical structure and wet character, nitrophytes and neophytes only in a small extent (5 – 35 %).	4
	Typical reed and sedge beds, species rich or structure-rich or typical but without occurrence of “disturbing elements” (< 5 %).	5

Please take a photo of such vegetation and make a remark if you are not sure how to judge this vegetation.

4.7.4 Water elements (E31 – E35)

Water bodies (inclusive marginal strip and acclivities) are evaluated according to their structural diversity of the watercourse, structure of the ditch, structure of the bank and/or riverine vegetation. In case of fully artificial water elements, nature values below 3 might be appropriate, e.g. in case of a ditch completely made of concrete.

Natural or man-made water bodies; at least with a fragmented riverine vegetation; max. 1 ha inclusive aggradation areas and banks are judged accordingly.

Code / Type	Definition	Nature value
E31-33 Water elements	Moderately near-natural water bodies with relatively low structural diversity.	3
	Near-natural water bodies with an average structural diversity; indicators of disturbance or disturbed structures less than 25 %.	4
	Natural or near-natural water bodies, naturally high structural diversity; minor pollution; indicators of disturbance or disturbed structures less than 5 %.	5
E34 Small standing water bodies/oxbow lakes	Water body with only fragmented near-natural aggradation area and bank; indicators of disturbance and disturbed structures partly dominate, polytrophic water body.	3
	Water body with near-natural aggradation area and bank vegetation; several vegetation types; indicators of disturbance or disturbed structures less than 25 %.	4
	Water body with heterogeneously structured aggradation area and bank; numerous vegetation types; indicators of disturbance or disturbed structures less than 5 %.	5

4.7.5 Stone, rock, raw soil and terrace elements (E41 – E46)

The categories E 41 – E 46 are rather diverse and comprise different kinds of stone, rock, raw soil and terrace elements, - often or mainly man-built, but also influenced or overgrown by nature.

The nature value for most elements will be between 3 and 5, only pure cement walls are judged with 1 (nearly no nature value) or 2 (low nature value). The nature value for these elements can be judged according to their structural diversity, e.g. a stone wall with a lot of gaps and holes might be a valuable habitat for lizards or insects and judged with a high nature value. Also, vegetation growing on a wall or terrace might be judged with a high nature value, because it can be a habitat for plants, refuge for animals and insects.

The elements have a minimum height/width of 1 m. Photos shall be taken.

Code / Type	Definition	Nature value
E41-E46 Stone, rock, raw soil, terrace elements	Cement wall, without vegetation.	1
	Brick wall, with vegetation.	2
	Monotonous stone walls or terraces, habitat with hardly any structure and/or vegetation.	3
	Stone walls, terraces or other stone or rock elements with moderately diverse habitat structure, e.g. through vegetation.	4
	Stone walls, terraces or other stone or rock elements with a very diverse habitat structure, e.g. overgrown walls with a diverse vegetation structure.	5



Figure 4-11 – Example: stone wall (LC1 = E41) with trees (LC2 = E11). The combination of stones and trees serves as habitat for a variety of animals and could be judged with a nature value of 4 to 4.5.

4.7.6 Roads and tracks (E51 – E54)

Width of paved and unpaved paths at least 1 m. No paths which are only hard to distinguish from the adjacent area.

Code / Type	Definition	Nature value
E51-E54 Roads, tracks	Asphalt tracks.	1
	Pure gravel-tracks/paved asphalt tracks with grass strip in the middle.	2
	Dirt or gravel tracks with a simple grass or grass/herb strip in the middle or species-poor grass tracks (very obvious track function).	3
	Dirt tracks with a species rich grass/herb strip or medium species-rich grass tracks, sometimes small structures or wet patches occur.	4
	Very species rich track structures with at least 5 m in width, sunken roads or also pure dirt and grass tracks with a width of at least 10 m; small structures such as earth embankments or wet patches are present.	5



Figure 4-12 – Examples for different roads and tracks: left - paved farm track with grass/gravel strip, nature value 2, middle - paved farm track, nature value 1, right - dirt/gravel track, nature value 2-3

4.7.7 Other man-made structures and other elements (E62 – E67)

Man-made structures and artefacts are only recorded if they are completely surrounded by agricultural land use; they are not recorded if they occur adjacent to villages, houses and farms. The element is recorded separately from the adjacent natural structure such as a hedge or a grass-herb strip, regardless of the extent of the different structures. These elements primarily have a non-natural function (e.g. barns or refuges), elements such as ditches – though man-made – are defined as “water element” (codes E31-E35).

Other elements (E67) may occur, which are not described in this manual yet and which do not fit into the categories E11 – E66. Please describe them shortly. This will serve for the further development of the list of land cover codes.

Code / Type	Definition	Nature value
E62-E67 Other man-made structures, artefacts, other elements	Man-made structure without or with very low nature value (e.g. electric transformer tower with hardly any buffer strip).	1
	Man-made structure with low nature value (e.g. electric transformer tower with a small grass-herb buffer strip).	2
	Man-made structure with medium nature value (e.g. electric transformer tower with a broad and partly species rich grass-herb buffer strip).	3
	Man-made structure with high nature value (e.g. wooden field barn which serves as nesting place for birds and which is surrounded by a grass-herb buffer strip).	4
	Man-made structure with very high nature value (e.g. wooden field barn which serves as nesting place for birds/owls and which is surrounded by a species rich grass-herb buffer strip and a small hedge or a tree; but still the man-made artefact dominates).	5

4.8 Plot information

As second part of the main sheet, a short description and an estimation of the overall plot nature value needs to be given. “Remarks” should be noted in case if any special observations are made.

Plot description: _____

Plot nature value: ____

Remarks: _____

Transect information:

4 transects, each with 20 m length and 2.5 m width

Transect n°:	1	2	3	4
on G (grassland) or A (arable land):				
N° on map:				

Photos:

- 1-2 plot overview photos
- 3 transect photos
- All landscape elements
- Ecological impact (if present)

4.8.1 Plot description

For each of the plots, a short description has to be made in the main sheet. The description might only consist of one word, e.g. when the plot has a dominant landscape type (like “Dehesa”, “Vineyard”, etc.) or might be one sentence, e.g. “richly structured mix of extensive grassland and intensive arable land”.

4.8.2 Plot nature value (overall estimation)

The overall estimation of the plot nature value serves as a rough and more subjective estimation in order to compare the sum of the detail records with the overall impression. It

needs to be explored in detail whether this overall estimation can be used as additional information in the long term.

The item comprises the following categories 1 to 5 and their intermediate stages:

1	very low nature value
1.5	between very low and rather low nature value
2	rather low nature value
2.5	between rather low and moderately high nature value
3	moderately high nature value
3.5	between moderately high and rather high nature value
4	rather high nature value
4.5	between rather high and very high nature value
5	very high nature value

A low plot nature value (1) is given when the whole plots comprises arable fields or grassland with a nature value of 1.

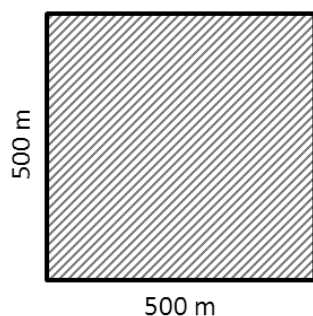
If in addition to these intensively used agricultural land with nature value 1 some landscape elements and structures occur (they have a nature value of 3 or 4 as singular elements) then the plot nature value raises to the value 2.

A plot nature value of 2 is also given if the majority of arable land and grassland has a nature value of 2. Then, depending on the extent and the nature value of landscape elements (nature value of singular elements 3, 4 or 5) the plot nature value may rise to a value of 2.5 or 3.

The same principle applies to the further categories: the dominating landuse type with its nature value determines the plot nature value to the main extent but depending on extent and nature value of additional structures the plot nature value may raise for a half or 1 value score.

Note: the plot as a whole can have a high nature value even if not every single parcel has a high nature value. For example a plot with a mosaic of high quality landscape elements, some species rich extensive agricultural parcels and some intensively used species poor parcels can have a rather high or very high nature value (same value as compared to complete species rich use of the whole plot); in detail it depends on the individual situation on the plot.

This is indicated in the following examples:

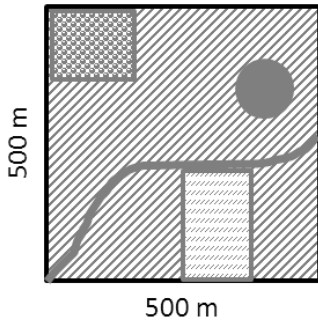


In this example the whole plot is characterised by extensively used species rich grassland. There are no structural elements.

According to species richness, completeness of the vegetation type the plot can be judged with a "4" or "5". If the vegetation in the plot is extensively used but species-poor the category "3" is appropriate. For intensively used plots also values of 1-2 can be appropriate.

Like in the example above most parts of this plot are extensively used and comprise species rich grassland (e.g. nature value 5). But the

plot also comprises a large and intensively used arable parcel (with use of fertiliser and plant protection products), a complex of hedges and shrub and an orchard.



Depending on the species-richness of the extensively used grassland also the whole plot can be judged with a “5”, when the arable parcel with a low nature value comprises a quarter of the whole plot at a maximum. Thus the species rich part is still predominant and the structural diversity is higher than in the example above. For the nature value of the whole plot, the lower percentage of species rich grassland is “compensated” by a higher structural diversity.



Figure 4-13 – Examples for plots with differing nature values: upper left - intensive agricultural fields, but also species rich grassland and a great number of hedgerows – plot NV 4; upper right: no landscape elements and intensive arable fields – plot NV 1; lower left: mix of arable land and grassland of differing nature values, individual trees and bushes – plot NV 3.5; lower right: mix of grassland and arable land, grass-herb strips between agricultural fields, but without any arable fields or grasslands with a nature value of more than 3 – plot NV 2 to 2.5.

Figure 4-14 – Transect photos: from start, from end and from above. There were no dominant or special species found in this transect.

4.8.3 Remarks

This field in the main sheet is for remarks concerning anything related to the observed land use, nature value and biodiversity of the plot as well as the study methodology.

5 Vegetation sheets

The method of recording key species on transect walks has proved to be effective in several grassland schemes in France, Germany and in small plots in Switzerland. Also for arable land, key species lists are applied for several purposes.

However, on the European level such an approach for arable land has not been applied yet. The record of potential key species is a new approach. Therefore, the species which are in the list are “potential” key species. It will have to be proved if they qualify as “real key species”. However, as it is important that at least all species or taxa on the list are recorded (for reasons of comparability). Therefore, of course many species are on the list which may not occur at all in your region or your country because the list comprises species of all European regions. In many cases it will be necessary or at least desirable to note in more detail which species of a taxon occur (e.g. *Ranunculus acris* or *Ranunculus bulbosus*).

There will be for sure some other species which you might consider as valuable potential key species. Please feel free to note these species. This will help to develop the approach further.

5.1 Transect walks

Transects are 20 m in length and the observation frame is 1.25 m to each side of the surveyor.

It is advisable to walk the 20 m transect first with a step length of 1 m to determine the end point and then walk the transect back to the starting point doing the observations.

5.1.1 Access to land

You will be equipped with an official document that explains the need to access the land and can serve as important item when permission by the owner is necessary to access the parcel. In case permission is not given and you are not able to walk the transect, a respective remark is necessary in the vegetation sheet. Please report the cases where access to land had been denied.

5.1.2 Exceptions – no transect possible

There might be some situations in which it will not be possible to walk a transect. The reason for this might be:

- Access to land is denied or not possible, e.g. due to a fence, cattle on the pasture etc.
- The transect point is located in non-agricultural land, e.g. in a forest, settlement area or large inland water body
- You are not able to reach the point without serious risk for your health or safety, e.g. when the point is located on a steep slope in mountainous areas.

Please tick the box “no transect possible” on the vegetation sheet and explain why the transect walk could not be done.

5.1.3 Starting point

For each study plot, four coordinates are given on the aerial photo. These coordinates determine the agricultural parcels in which the transect walks shall be carried out. The starting point of a transect is located by drawing the shortest possible line from the coordinate point to the edge of the parcel which lies within the study plot and which is accessible by foot e.g. via a field track, a parcel border, a walkable forest edge, etc. (causing the least possible damage to the crop). From this point, the starting point is reached by walking 10 m into the parcel.

5.1.4 Direction

Arable fields: From the starting point the transect is oriented in the direction of the sowing rows in order to cause as little damage as possible when walking through the crop. If the sowing rows can be walked for 20 m in two directions being always at least 10 m away from any edge of the parcel, the direction is determined by turning to the left after having entered 10 m into the parcel. If the edge is curved and any transect in direction of the sowing rows would contain parts that are closer to the edge than 10 m, walk further into the field until it is possible to walk a transect being always at least 10 m away from the edge.

If no sowing rows are identifiable, the direction of the transect is from the starting point parallel to the edge of the field. Again, if more than one direction is possible, turn to the left. If it is not possible to walk the parcel for 20 m to either side parallel to the edge, the direction is orthogonal to the edge of the parcel. If this is not possible either, the direction is determined by turning left and taking the first possible direction, which allows walking within the parcel and being always at least 10 m away from any edge. If this is not possible either, take one direction that fits, also if you have to lower the distance to the edge. Make a short remark on the map.

Flower areas/strips: Please take the nearest arable parcel with a crop.

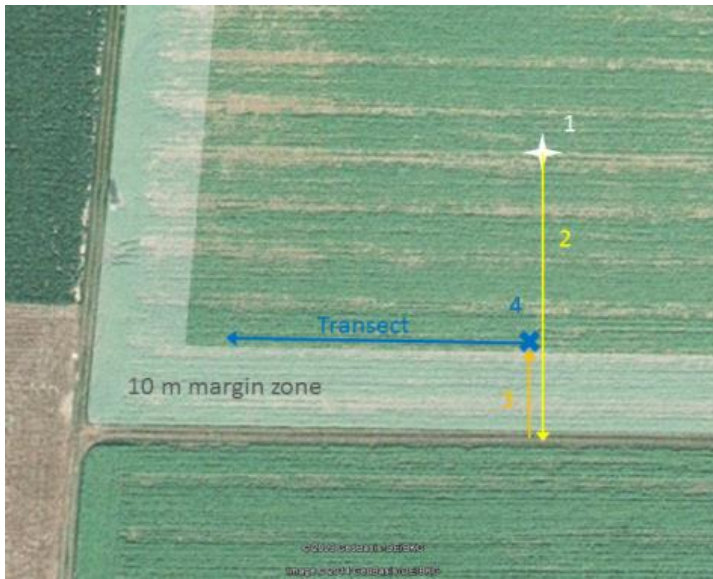
Fallow arable land or grassland/permanent cultures: Use the vegetation sheet for arable land and apply the rules for finding the transect as for arable land. For the record of key species, choose the most suitable key species list either from arable land or from grassland.

Meadows/pastures: From the starting point (10 m from the edge of the parcel as above) the transect is oriented strictly in the direction North if it is possible to walk a transect of at least 20 m without coming into the edge area of 10 m.

If a 20 m transect walk is not possible in direction North take the direction East; if this is not possible take the direction South; if neither this is possible take the direction West; and finally, if all this is not possible take one direction that fits, also if you have to lower the distance to the edge.

Please mark the direction on the vegetation sheet and indicate the direction on the map. The transect walk should be 20 m in length, otherwise you note the longest possible transect length in the remarks section.

5.1.5 Examples for arable land



1. The given coordinate point \star determines the parcel which has to be examined

2. Draw the shortest possible line from the coordinate point to a point at the edge of the parcel and within the study plot which is accessible (in this example the border to a field track)

3. From this point, walk 10 m into the field

4. You have located the starting point of the transect \times .

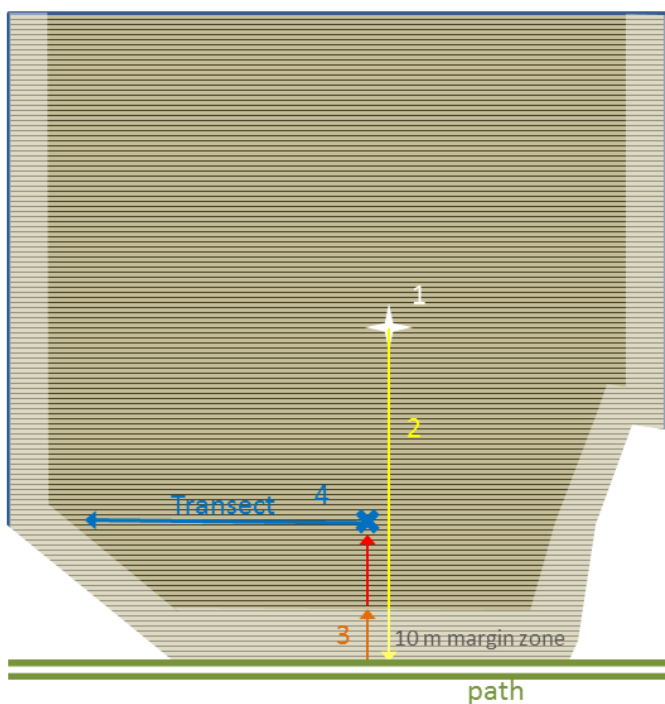
In the first example, the sowing rows are oriented parallel to the field track from which you entered the field. From the starting point of the transect, there are two possible directions in which a 20 m transect fits in the parcel without being closer than 10 m to the border. Following the rules, turn to the left to determine the direction of the transect.



In the second example the sowing rows are orthogonal to the field track from which you entered the field. As you are supposed to walk between the rows your transect lies straight ahead, in the direction of the given coordinate point.

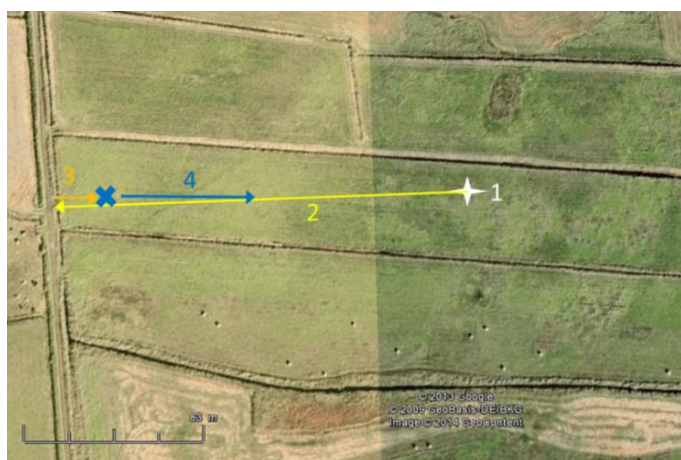


In the third example the sowing rows are parallel to the field track from which you entered the field. As you are not able to turn to the left, because there is not enough space for a 20 m transect without entering the margin zone, turn to the right.



In the fourth example the sowing rows are parallel to the field track from which you entered the field. After walking 10 m into the field you're not able to turn either to the left or the right without entering the margin zone. In this case follow the instructions above and walk further into the field till it is possible to walk a transect being always at least 10 m away from the edge.

5.1.6 Examples for grassland



1. The given coordinate point determines the parcel which has to be examined
2. Draw the shortest possible line from the coordinate point to a point at the edge of the parcel and within the study plot which is accessible (in this example there are ditches around the parcel, so the shortest possible line leads to a passage)
3. From this point, walk 10 m into the grassland.
4. You have located the starting point of the transect . You are not able to walk 20 m in the direction north without leaving the parcel. Following the instructions, you take the direction east.

5.1.7 Transect points in non-agricultural areas

If a transect point is indicated in a parcel where no transect is possible (e.g. because it is located in forest, settlement area or a lake etc.), the transect is skipped and the reason noted in the main sheet. Then the nearest point is taken in another parcel closest to the original coordinates.

5.2 General information on the vegetation sheet

5.2.1 Transect information

Number of transect (as marked in the map); Note: all four transects must be done in each plot, only very few exceptions allow less than 4 transects per plot! Please tick the box “no transect possible” if you are not able to walk the transect and give a short explanation.

5.2.2 Photos

2	Photos :	photo type	from start	from end	from above	Dominant /special species
		photo ID				

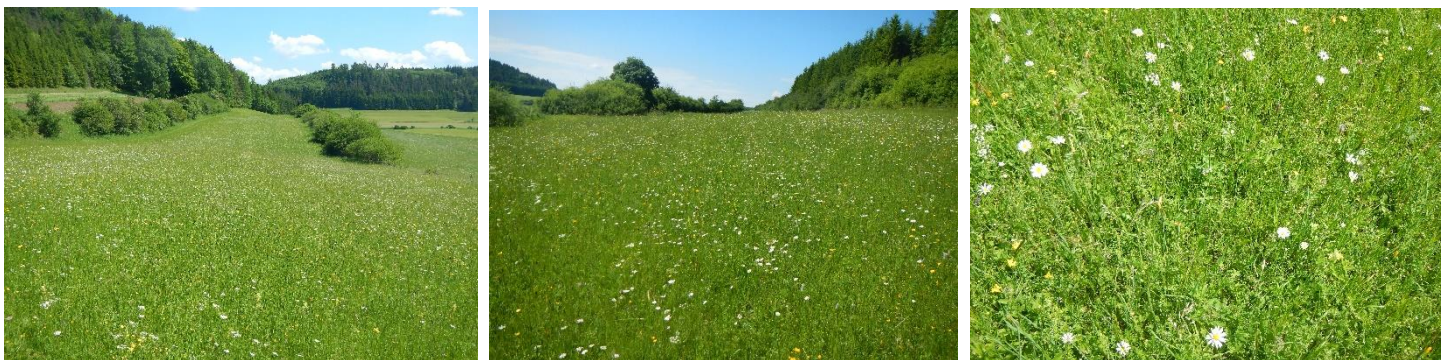


Figure 5-1 – Transect photos: from start, from end and from above. There were no dominant or special species found in this transect.

Please take at least three photos of the transect and indicate the photo ID in the vegetation sheet:

- One photo from the starting point in the direction of the transect
- One at the end of the transect backwards
- One from 1.5 m height, pointing the camera vertically downwards to a typical patch of vegetation

Please take further photos of any dominant, problematic or special species, especially if they are not indicated on the list of key species.

5.2.3 Slope

3	Site exposition:	3a <input type="checkbox"/>	_____	3b Inclination:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		Flat	direction of slope	Inclin. classes	0	1	2	3	4

Slope-classification: flat = (0) = 0-2°; (1) = 3-10°; (2) = 11-25°; (3) = 26-35°; steep slope (4) = >35°

If the slope is “flat”, the exposition needs to be indicated with [0].

5.2.4 Direction of slope / exposition

Note the exposition of the parcel: N = North, E = East, S = South, W = West; further differentiation: NE (Northeast), SE, SW, NW; or [0] for a parcel without a slope.

5.2.5 Site moisture

4b	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	wet	moist	mesic	semi-dry	dry	mixed
Site moisture						

Indicate the **soil moisture** (regardless of recent rainfall) of the site by ticking the box of the adequate category:

Dry – vegetation showing many indicator species for dry conditions; sparse growth; the site is permanently dry or, depending on the biogeographical region, in some seasons of the year (e.g. in the Mediterranean region)

Semi-dry – few/some indicator species, the site is partly dry during the growing season. This occurs often on south-facing slopes and free-draining calcareous or rocky soils.

Mesic – no specific indicator species; the site has regular water supply but doesn't suffer heavily from flooding or permanently high ground water.

Moist – few/some indicator species for moist/wet conditions; in grasslands, reeds, sedges or rushes may occur frequently.

Wet – dominant indicator species for wet conditions; for grasslands, reeds, sedges or rushes often dominate on permanently wet conditions.

Mixed – indicator species for both dry and moist conditions occur; for example some south-facing slopes may contain soil layers that frequently carry water, thus indicator species for wet conditions may occur alongside indicators of dry conditions.

5.2.6 Total number of flowering species

7	Flowering forbs:	7a	<input type="text"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
			number 1-10	> 10	> 15	> 20

Count the numbers of the all flowering **species**. This includes:

- Currently flowering species;
- Species about to flower with developed buds;
- Species that just finished flowering with visible dead flowerheads.

Only count the forbs with insect-pollinated flowers, no grasses/sedges and crop species shall be indicated.

For flower areas and strips (A74) on arable land all sown and wild plant species, except grass and sedge species, are counted as wild species.

The number of flowering species is not limited to the key species list! Count the exact number for up to 10 species, for numbers higher than 10, use the given estimation classes from >10, >15, >20.

5.2.7 Flower density

7b	Flower density:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		very few	few	me- dium	dense	very dense		

Indicate the flower density according to the scale:

- 1 no or hardly any flowers in the transect
- 1.5 between hardly any and a few scattered flowers
- 2 a few scattered flowers
- 2.5 between a few scattered flowers and regular flowers
- 3 some regular flowering in the transect but not a dense flowering
- 3.5 between some regular and many flowers
- 4 many flowers, but not a dense “flower carpet”
- 4.5 between many flowers and a “flower carpet”
- 5 dense “flower carpet”



Figure 5-2 – Left: Grassland in the Netherlands, hardly any flowers (1.5).

Right: Fallow land in Spain, many flowers (value flower density 4), but not a dense “flower carpet”.

5.2.8 Diversity of flower colours

8	Flowering colours:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		Green	Brown	White	Yellow	Red	Purple	Blue	Mixed

Indicate the different types of flower colours that you identify. For each colour that is present at the time of the survey, tick the box of the colour. The box is only ticked once, even if more species of the same colour occur. In case of mixed colours (when no single flower colour is dominant), use the box “mixed”, e.g. for *Melampyrum arvense*.

Flower colours
(left to right):

1st row:
white, green,
brown, yellow



Viola tricolor



Bupleurum rotundifolium



Rumex acetosa



Lathyrus pratensis

2nd row:
red, purple,
blue, mixed



Papaver dubium



Lychnis flos-cuculi



Centaurea cyanus



Melampyrum arvense

5.2.9 Remarks

9	Remarks: _____
---	----------------

In the remarks section of the vegetation record sheet, any comments that concern the vegetation survey are welcome.

5.2.10 Record of key species

For the record of key species, the lists are adapted to grassland and arable land, as shown below. The presence of these species should be recorded on the transect walk of 20 m length and 2.5 m width. While walking slowly along the transect line please tick the boxes of the key species that are present. After finishing the transect, please indicate the abundance of the species or the species group (e.g. for *Thymus spec.*, *Trifolium spec.* etc.):

- 1 = only 1-2 individual plants were seen within the transect;
- 2 = 3 – 10 individual plants were seen within the transect;
- 3 = more than 10 individual plants were seen within the transect.

If there are several species of one group (e.g. two *Campanula* species, for example *C. rotundifolia* and *C. patula*) the box is only ticked once and the abundance refers to all the plants in the group together.

Key species for structural characterisation in grassland: Certain species tend to dominate under certain conditions. These may indicate positive conditions for grassland nature value (signs of extensive use) or negative conditions (e.g. abandonment).

Please tick the boxes if the species listed are present in the transect.

In contrast to the record of the abundance based on counting individuals in three classes (1-3) (subparameter 10a) the key species for structural characterisation are recorded with the percentage coverage in following steps:

< 1 %	5-10 %	20-40 %	60-80 %
2-5 %	10-20 %	40-60 %	80-100 %

Always indicate the coverage you estimate over the whole transect of 20m x 2.5m (50 m²).

All species of one species group are counted together (e.g. all *Juncus* species, both large and small species).

A few species groups are present in both sections (10a and 10b): while they indicate species richness in the section 10a (depending on the survey region – differing across Europe) they indicate a structural characteristic in section 10b (here they are listed with their coverage in %).

Don't get confused by this – it is intended that this is recorded in a different way in 10a and 10b.

Please also indicate further dominant species (with its coverage in %) that are not listed in the column 10b) (also characteristic small species that cover more than 20 % of the ground – e.g. *Festuca ovina*). Please also take a photo of this additional structural species – see also 10e.

10	Eur. subregion 4 (Centr.Eur.)		Key species for species richness: 10a		for structural characterisation: 10b	
	Achillea spec.	<input type="checkbox"/> __	Rhinanthus spec.	<input type="checkbox"/> __	Shrub/ Brushwood/ Bramble	<input type="checkbox"/> ___ %
	Apiaceae spec.	<input type="checkbox"/> __	Salvia spec.	<input type="checkbox"/> __	Phrygana / Garrigue	<input type="checkbox"/> ___ %
	Bistorta officinalis / Pol. bistorta	<input type="checkbox"/> __	Sanguisorba spec.	<input type="checkbox"/> __	Thistles (Carduus etc.)	<input type="checkbox"/> ___ %
	Campanula spec.	<input type="checkbox"/> __	Scabiosa spec./Knautia spec./Succisa spec.	<input type="checkbox"/> __	Stinging nettles (Urt. dioica)	<input type="checkbox"/> ___ %
	Centaurea spec., Serr. tinctoria	<input type="checkbox"/> __	Silene spec. et al. - red flowering, Lychnis flos-cuc., Dianthus spec.	<input type="checkbox"/> __	Docks (Rumex obtus., etc.)	<input type="checkbox"/> ___ %
	Cichoriaceae, yellow without Tragopogon (see below)+Tarax. spec.	<input type="checkbox"/> __	Thymus spec.	<input type="checkbox"/> __	Bracken (Pteridium aquil.)	<input type="checkbox"/> ___ %
	Cirsium spec., Carduus spec., Carlina spec.	<input type="checkbox"/> __	Tragopogon spec., Scorz. spec.	<input type="checkbox"/> __	Rushes (Juncus spec.)	<input type="checkbox"/> ___ %
	Geranium spec. with big flowers	<input type="checkbox"/> __	Trifolium spec. - red flowering	<input type="checkbox"/> __	Sedges (Carex spec.)	<input type="checkbox"/> ___ %
	Leucanthemum spec.	<input type="checkbox"/> __	Trifol. spec., Medicago spec. Lotus spec., Coronilla. - yellow flow.	<input type="checkbox"/> __	Reed (Phragmites etc)	<input type="checkbox"/> ___ %
Orchidaceae spec.	<input type="checkbox"/> __	Vicia spec., Lathyrus spec., Astragalus spec.-blue+purple flowering	<input type="checkbox"/> __	Wood small-reed (Calam.)	<input type="checkbox"/> ___ %	
10c	Remarks / further species:				Moor grass (Molinia caer.)	<input type="checkbox"/> ___ %
				Feather grass (Stipa spec.)	<input type="checkbox"/> ___ %	
10d	Sum of key species: _____	10e	Dominant species: _____ % (Photo!)	Matgrass (Nardus stricta)	<input type="checkbox"/> ___ %	

Figure 5-4 – Key species for grassland, exemplary for Central Europe (Subregion 4, LUCAS grassland survey).

10	Key species for species richness: 10a		
	Adonis spec.	<input type="checkbox"/> __	Lapsana communis <input type="checkbox"/> __
	Anagallis spec.	<input type="checkbox"/> __	Lathyrus spec. <input type="checkbox"/> __
	Anthemis spec.	<input type="checkbox"/> __	Legousia spec. <input type="checkbox"/> __
	Calendula arvensis	<input type="checkbox"/> __	Linaria spec. <input type="checkbox"/> __
	Carduus pycnocephalus	<input type="checkbox"/> __	Lithospermum arvense <input type="checkbox"/> __
	Centaurea spec.	<input type="checkbox"/> __	Lythrum spec. <input type="checkbox"/> __
	Chrysanthemum spec.	<input type="checkbox"/> __	Matricaria spec. <input type="checkbox"/> __
	Consolida spec.	<input type="checkbox"/> __	Medicago spec. <input type="checkbox"/> __
	Epilobium spec.	<input type="checkbox"/> __	Mentha arvensis <input type="checkbox"/> __
	Erodium cicutarium	<input type="checkbox"/> __	Myosotis spec. <input type="checkbox"/> __
	Eryngium campestre	<input type="checkbox"/> __	Ornithogalum spec. <input type="checkbox"/> __
	Euphorbia spec.	<input type="checkbox"/> __	Papaver spec. <input type="checkbox"/> __
	Filago spec.	<input type="checkbox"/> __	Ranunculus spec. <input type="checkbox"/> __
	Fumaria spec.	<input type="checkbox"/> __	Rumex spec. <input type="checkbox"/> __
	Galeopsis spec.	<input type="checkbox"/> __	Silene spec. <input type="checkbox"/> __
	Geranium spec.	<input type="checkbox"/> __	Spergula arvensis <input type="checkbox"/> __
	Lamium spec.	<input type="checkbox"/> __	Stachys spec. <input type="checkbox"/> __
10c	Remarks / further species:		10b Dominant or problematic* species: Example: Cirsium arvense <input type="checkbox"/> ___ % <input type="checkbox"/> ___ % <input type="checkbox"/> ___ % <input type="checkbox"/> ___ %
10d	Sum of key species: _____	10e Dominant species: _____ % (Photo!)	<i>*Please add, if certain weed species are dominant or problematic.</i>

Figure 5-3 – Key species for arable land.

Grassland

There are several aspects to be recorded within the key species block for grassland:

- The first two columns comprise species that are indicators for species richness.
- The third column comprises species which tend to dominate a site or a parcel in the case of abandonment (e.g. stinging nettles) or they are signs of intensive slurry application (e.g. docks) or they are indicators for very extensive use or natural conditions (Moor grass, Feather grass or Matgrass).

Arable land

For arable land, the dominant or problematic species are not listed in the vegetation sheet but need to be added in case they are found in the field.

5.2.11 Dominant species/problematic species

10e	Dominant species: _____ % (Photo!)
-----	------------------------------------

Dominant species are species that cover a considerable proportion of the transect and/or occur in clusters, and are significantly more present than the other species occurring in the transect. Dominant species can cover from around 20 % of the transect to over 70 %, e.g. stinging nettles or matgrass.

Problematic species are species which are competitive, negatively influence the feed value (e.g. of grassland), or are toxic. Therefore, they should be recorded. Indicate the presence of the dominant/problematic species by giving the coverage in percent. Please take a photo.

5.3 Vegetation sheet – Arable land

The vegetation sheet has to be filled out during the transect walks. The transect point needs to be shifted, e.g. in case of dense crop cover like rape seed, otherwise the crop might be damaged when walking the transect, or if the parcel is fenced, or not accessible due to other reasons. The procedure for shifting transects is described in section 5.1.7. The information collected on the vegetation sheet will be used to assess the nature value of the arable fields. For flower areas/strips (A74) use the vegetation sheet for arable land. The items of the vegetation sheet are described in the following table.

5.3.1 Coverage of crop, wild plants and bare ground

5	Coverage:	5a	crop: _____ %	wild plants _____ %	bare soil, rock, stones _____ %
---	-----------	----	---------------	---------------------	---------------------------------

The coverage of the crop plants is estimated in %. For flower areas/strips (A74), the total coverage of plant species is estimated.

The coverage of non-crop (wild) plants is estimated in %, excluding second growth plants of a previous crop. For flower areas/strips (A74) the coverage of all wild and sown plant species is taken into account.

If the extent of open soil, sand, mud, rocks, stones, boulders and gravel is > 10 %, estimate the coverage in % by looking down at the ground from approximately 1.5 m height (a standing position).

In arable land, the estimation of the coverage of bare soil depends on the time of the survey and the (height of) vegetation. In crops, the bare soil in the beginning of the vegetation period can make up > 80 % of the field. At a later state, no bare soil will be visible in a dense stand, when recorded through a view from above.



Figure 5-5 – Extent of uncovered earth with stones and bare soil; left: 70 %, middle 85 %, right 100 %.

5.3.2 Height of crop

Crop: Height of crop: _____ cm

The height is measured in cm. Please consider the height of the main mass of the crop, not of single stalks, e.g. of wheat. For flower strips/areas (A74) the medium height is noted.

5.3.3 Growth stage of crop

Growth stage of crop: 0 1 2 3 4 5 6 7 8 9

The growth stages of the crop are outlined in Table 5-1 and the according illustrations below. Please tick the box in the vegetation sheet which represents the average growth stage of the crop.

Table 5-1 – Schematic growth stages of crops.

Stage	Description	Details
0	Germination/sprouting	Coleoptile visible, first leaf is visible
1	Leaf development	First leaf is out of the coleoptile
2	Formation of side shoots/tillering	First, second, third tillers are visible
3	Stem elongation/rosette growth/shoot development (main shoot)	Main shoot is growing, node development, flag leaf visible
4	Development of harvestable vegetative plant parts or vegetatively propagated organs/booting (main shoot)	Flag leaf sheath extending, swollen, opening
5	Inflorescence emergence (main shoot)/heading	Ear emergence, from just visible to completely emerged above flag leaf ligule
6	Flowering (main shoot)	Start of flowering up to flowering complete
7	Development of fruit	Milk development: thumbnail test → milk; dough development: soft to hard dough, not watery → thumbnail impression held
8	Ripening or maturity of fruit and seed	Grain hard (difficult to divide, or not dented by thumbnail)
9	Senescence, beginning dormancy	Stalks broken, death of the plant

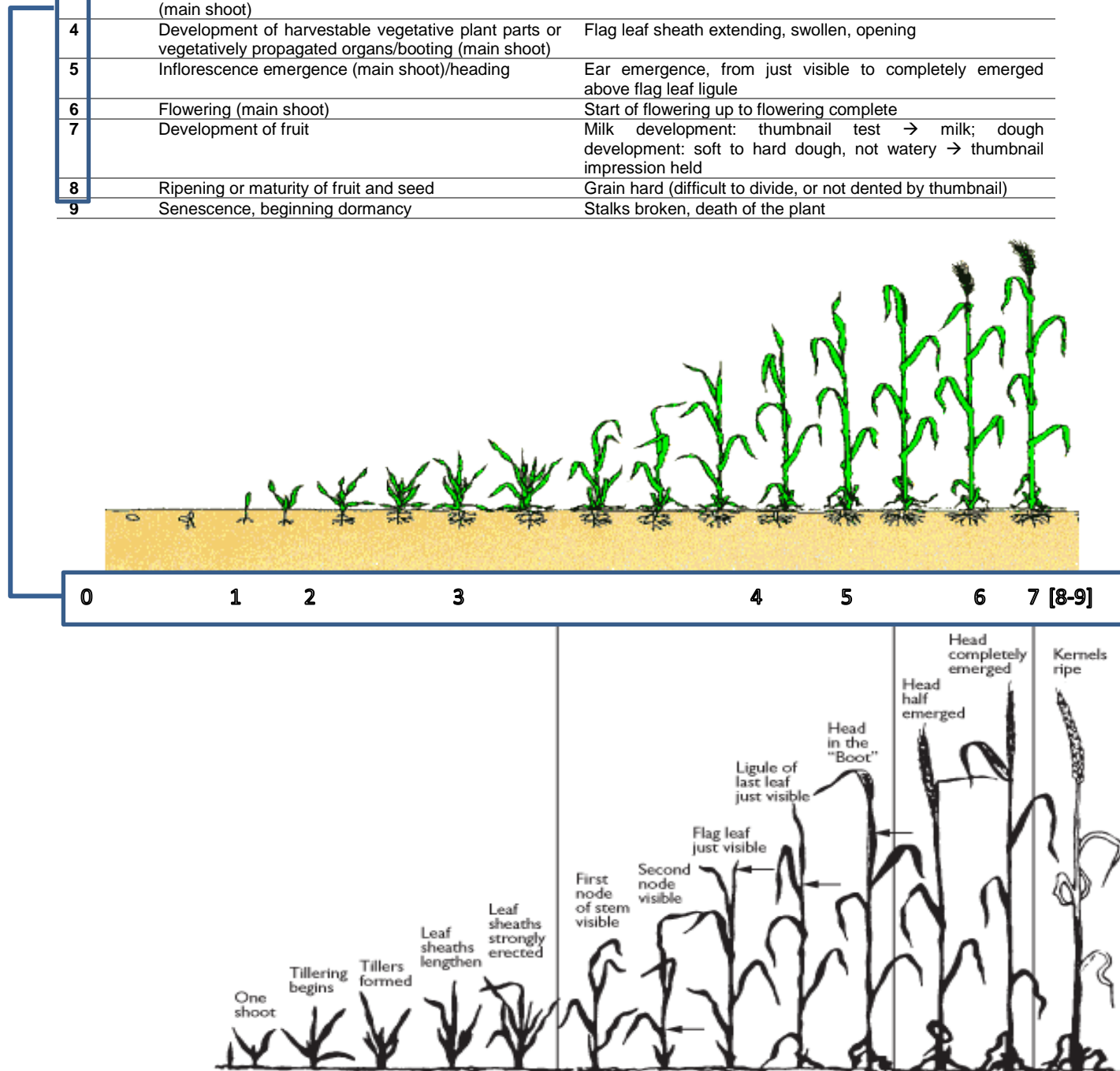


Figure 5-6 – Crop growth stages 0 to 6, modified from http://www.raiffeisen.com/pflanzen/ackermanager/ec_html (April 10, 2017)

5.3.4 Management type

6	Management type:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	<input type="checkbox"/>
		Tillage	direct drilling	fallow	other		unclear

For the arable field, the management type is indicated. Three main types of management can be differentiated:

- Tillage: the soil is either ploughed/tilled or wild plants are controlled with herbicide, so that the area around the crop is largely free of segetal plants.
- Direct drilling: the soil is covered with vegetation, the crop is sown directly into the cover; ploughless tillage.
- Fallow: the arable field is currently not used for crops, vegetation/stalks from the previous growing period are visible. Normally there is no tillage on fallow land.

If you encounter any other type of management in arable fields, please tick the box “other” and name the type of management. Sometimes a clear distinction of the management type might not be possible, e.g. for arable fields where no crop is visible but only a sparse segetal flora is developed because of frequent tillage. In these cases, please tick the box “unclear” and describe the management in the “remarks” section of the vegetation sheet.

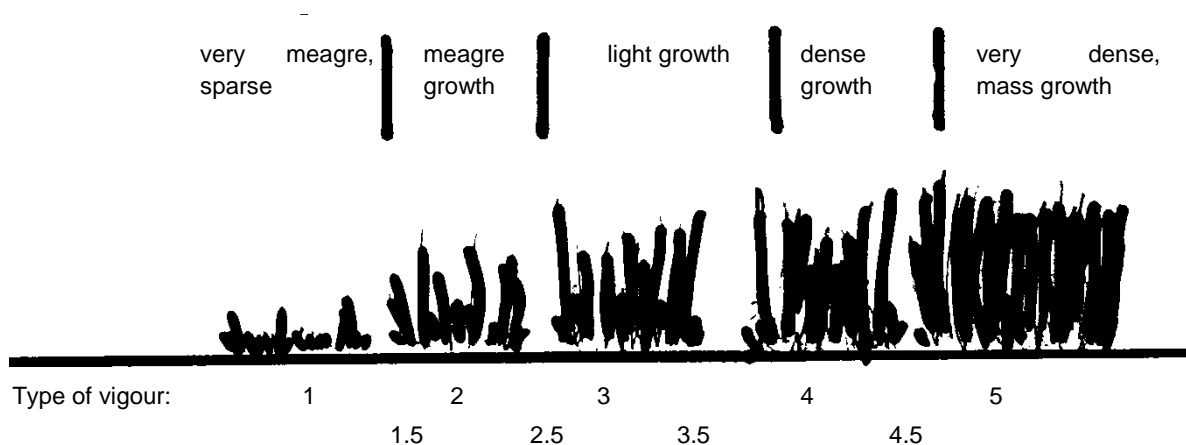
5.4 Vegetation sheet – Grassland

The vegetation sheet has to be filled out during the transect walks. The transect point needs to be shifted, e.g. if the parcel is fenced, stocked with animals, or not accessible due to other reasons. The procedure for shifting transects is described in section 5.1.7. The information collected on the vegetation sheet will be used to assess the nature value of the grassland.

5.4.1 Type of vigour

4a	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	1	1.5	2	2.5	3	3.5	4	4.5	5
Vegetation - type of vigour									

Grassland types are often characterized by their often quite different types of vegetation height and density (vigour), ranging from very meagre (nutrient-poor and/or dry sites) to very dense vigour (naturally or artificially fertilized sites). The type of vigour in the transect is indicated through the following scale:



The height is not relevant for the type of vigour as the height depends mainly on the dominant species. The main characteristic for the type of vigour is the density, which limits the extent of sunlight that can reach the low plant species near the ground. Look vertical to the ground and check to what extent the view can reach the ground, i.e. to what extent the lower plant layers are visible. Type 1 is a very meagre vegetation where the low plant species or open soil can be fully seen; type 3 is a light growth vegetation where the sunlight can reach almost all layers but with medium shadow effects given through higher plants; type 5 is very dense vegetation where only the highest plants receive sunlight.

However, difficulties may occur when the grassland is pastured or has already been mown. The type of vigour is indicated when the vegetation is in full development in spring; thus grazed patches may be judged with the help of ungrazed patches remaining on the pasture. Meadows before the first cut should be judged according to the density that will be reached when the most of the grass species are flowering. For example, a score of 4 or 5 can be expected if one or few highly productive species dominate, whilst the grassland will probably be 1, 2 or 3 if there is space between the tall grasses and forbs and sunlight reaches the ground. Meadows cannot be judged adequately after the first cut.

5.4.2 Coverage of vegetation layers

5	Vegetation layers:	5a	gramin.-herb: _____ %	_____ %
			total	graminoids forbs (dwarf) shrubs litter, moss bare soil, lichen rock, stones
5b	Height: _____ cm	5c	_____	
	of grass-herb layer(s)		no. of layers	

Grasslands show different kinds of layers. Besides the grass-herb layer, also woody plants (e.g. trees, bushes, dead woody plants) and bare ground (consisting of bare soil, rock/stone or litter) may be visible in the grassland. The grass-herb layer can be further subdivided into up to five sublayers:

- a) Graminoid layer: all graminoid species, including grasses, sedges, rushes, reed
- b) Forb layer: all forb species (i.e. non-woody plants that are not grasses, sedges, or rushes) as well as fern species
- c) (Dwarf) shrubs: all small to medium sized woody plants; dwarf shrubs < 1 m height, e.g. heath, blueberry; shrubs > 1 m up to 5 m height.
- d) Litter, moss, lichen layer (recorded if > 10 % coverage): dead leaves and vegetation from the previous years, all mosses and lichen in the herb layer and on the ground

- e) Bare soil, rock, stones (recorded if > 10 % coverage): If the extent of open soil, sand, mud, rocks, stones, boulders and gravel is > 10 %, estimate the coverage in % by looking down at the ground from approximately 1.5 m height (a standing position). In grassland, bare soil normally only covers small proportions of the area, however, under extreme conditions this category can reach values up to > 50 %.

The sum of all layers can exceed 100 % as for example the grass layer may cover 60 % and the forb layer may cover 60 % as well.

5.4.3 Number and height of vegetation layers

The height of the different grass-herb layers (parameter 5b) is determined by looking against the horizon. For each identified layer, the average height is recorded in cm. The grass-layer might for example consist mainly of *Arrhenatherum elatius*, of which a few stalks may have a height of 160 cm. However, the average height of the grass layer is 130 cm due to the majority of the *Arrhenatherum elatius* stalks. There might be several lower layers, e.g. the forb layer (e.g. with *Centaurea jacea*) with a height of 60 cm, and the legume layer (though part of the forb layer) with an average height of 20 cm.

The height of the different layers is recorded in the field with a meter rule and noted in the vegetation sheet.

Note the total number of identified vegetation layers in the grass-herb layer.

5.4.4 Grassland types

6	Grassland type:												
	6a Meadow:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>								
		1 st growth	2 nd growth	recently mown	fallow								
6b Pasture:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	before 1 st grazing	after 1 st grazing	freshly grazed	fallow	rough grazing	seasonal grazing	strip grazing	cattle	horses	sheep /goats	others		
6c Other grassland:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>					<input type="checkbox"/>			
	meadow or pasture	pastured woodland	amenity grassland	ruderal grassland	other	kind of other grassland				fallow			

The structure of the grassland depends on the type of management that is applied. Besides the differentiation of land cover types in meadow, pasture, mowed and grazed grassland or grassland with unclear use and the indication of the extent of woody plants on the parcel, further details regarding the management of the grassland are required in the transect sheet.

Meadow (land cover codes C11-*, C21): There is a broad range of meadow types and uses. The optimal time for carrying out the survey is before the first cut. It is important to note if the vegetation is first growth (i.e. before the first cut), second growth (after first cut, before second cut) or if it has recently been mown. During first growth, the grass species and many forb species develop flowers, in the second growth the grass species mainly develop leaves. Please indicate also if the meadow is fallow; this is the case if old vegetation from the previous year(s) can be seen (e.g. large amounts of dead leaves, tall and dry forbs or small woody plants).

Pasture (land cover codes C12-*, C22): Pastures can usually be easily distinguished from meadows by the presence of fences, by animals on the pasture, by animal tracks, by animal

dung, by a water supply or shelters for animals etc. As in meadows, the optimal time for carrying out the survey is the first growth of the vegetation during the year (before 1st grazing). It is important to note if the pasture is in its first growth or in its second growth (after 1st grazing) or if it is freshly grazed. Please indicate also if the pasture is fallow; this is the case when old vegetation from the previous year(s) can be seen (however, note that in contrast to meadows, regularly grazed pastures may have many tall forbs and small woody plants that are avoided by the livestock!).

Three types of grazing are differentiated:

- Rough grazing: very low-intensity grazing, whereby the animals do not graze for long in a single location and constantly wander. Often this kind of grazing is done without fences or on very large areas.
- Seasonal grazing: the animals graze the parcel 1-5 times a year. Normally these pastures are fenced.
- Strip grazing: the animals are fenced on small strips of a pasture and are moved every 1-5 days or every week. The biomass is grazed intensively and normally there are no ungrazed patches left after the animals are moved on.

If the kind of grazing is unclear, do not tick any of the boxes.

Please also note the type of grazing livestock, if either the animals are observed directly or if you can judge from the dung left by the animals or from the animal tracks.

Other grassland (land cover code C13-* / C23): If it is difficult to judge if the grassland is a meadow or a pasture, or it serves both purposes, tick the box “meadow or pasture”.

For fallow grassland it may be not possible to judge how it was used before management ceased; then classify it as “other grassland” and tick the box “fallow”.

Further special types of “other grassland” are:

- Pastured woodland: animals regularly graze the parcel and there is a tree cover;
- Amenity grassland: all kind of grasslands in and around cities, villages and human settlements (in parks, at the side of roads, football pitches, gardens etc.);
- Ruderal grassland: mainly self-seeded grassland with grasses and forbs – it may look similar to extensive used pastures or meadows;
- Other grassland not included in the categories above should be noted and described in a few words.

6 Photo documentation

Please use some time to take significant photos documenting the relevant land uses and landscape elements. Pictures of representative as well as of outstanding management practices (either positive or negative) are very important for the documentation of the plots and the characterization of the region.

The following photos must be taken on every study plot:

- Photos of every type of landscape element found on the plot (e.g. if there are several hedgerows, take a photo of each of them in the order that the landscape elements are recorded in the main sheet);
- Two photo of every transect. Take one photo at the starting point in walking direction and one photo at the end of the transect in the inverse direction.
- One photo of every legume field, every flower area / strip, every fallow land, every field margin / buffer strip and all terrace elements that are treated as a distinct element (do not take photos of strips less broad than 1 m which are not treated as individual landscape elements);
- One to several overview photos of the plot, if possible from an elevated point. The photos should give an impression of the character of the plot. Mark the point from where the photos are taken on the field map;
- Please take photos if any ecologically sensitive areas with an impact occur (e.g. gully erosion; flooding of arable land; hedges or buffer strips or ditches affected by pesticides).

If necessary, take further pictures (e.g. if an element is very heterogeneous or in any case you feel it could be helpful to have photos). Also, take photos of irregularities such as elements which cannot be seen on the field map or have changed from when the aerial photos were taken.

Furthermore, the surveyor should take **exemplary photos in the regions** of:

- Agricultural plots which are typical for the study regions
- Agricultural plots showing different classifications of the following categories on the main sheet: Nature value and Ecological impact
- Examples for good and bad agricultural practice, especially regarding environmental issues
- Key species: Take only photos of well-developed individuals, preferably with blossoms; especially photos of those species should be taken that you propose as additional key species.

For the transect photos and the overview picture, the pictures are taken horizontally (landscape format) in 4:3 format with a resolution of preferably 1600 × 1200 pixels, jpg file format and file sizes not greater than 2 MB. The sky should not make up more than 1/3 of the photo. The date should not be displayed on the photo. However, please make sure that the correct date and time is set on your camera as it is saved in the EXIF data of the photo file. Also make sure that the GPS of your camera is activated so the coordinates are saved in the EXIF data.

For every photo, the file number automatically given to the picture by the camera must be noted on the main sheet with reference to what is shown in the picture.

7 FAQs

- What should I do if I am not allowed to / can't access the land?
In case you are not able to identify a land owner in a reasonable amount of time, please tick the box in the transect sheet and give an explanation. Please give feedback to the coordinators so that they can find a solution for the next survey cycle.
- Should I walk a transect on mown/mulched grassland?
At a recently mown/mulched grassland, possibly no transect will be possible since it is difficult to judge the vegetation structure and to identify the key species. In case there is already the second growth (regrown vegetation) visible, please tick the box in the grassland vegetation sheet "2nd growth" and walk the transect. It might be helpful to look for an unmown part of the parcel to compare the vegetation structure with the mown/mulched part of the parcel.
- I can't find an appropriate code for the land cover/landscape element I see in the field, what should I do?
Please take a photo of the land cover/landscape element and send it to the helpdesk, describing your difficulties and indicate the Plot ID as well as the ID of the element. The helpdesk will provide help or can discuss jointly what is the best solution.
- There are no key species in the parcel, but other species which are not on the list. Should they be recorded anyway?
You can write down the identified species and take photos. This information might be used to improve the existing key species lists. Please make a note in the remarks section of the vegetation sheet.
- What should I do if there are obstacles on the transect?
In case you are not able to walk 20 m into the parcel without encountering an obstacle such as bushes, trees, boulders or other elements, make a slight deviation to finish the 20 m transect. If necessary, note the kind of obstacle in the remarks section of the vegetation sheets.
- What is the difference between a herbal field of the open countryside and a flower area?
The flower area is a sown area on agricultural land, which is eligible for subsidies. Flower areas can be annual as well as perennial, but are managed and the initial herbs were selected in a specific blend of seeds / flower mixture. Herbal fields of the open countryside are characterized by a heterogeneous vegetation stand that does not show signs of seeding.
- Should I record a species-rich grass-herb strip alongside a path though it is below 1 m width?
In general, strips or buffers below the threshold of 1 m are not recorded. This simplifies follow-up surveys, as for example in the following year another surveyors might not find the strip as species-rich and might discard it from the list of elements, because it has below 1 m width. This would not indicate a real change, but appears as loss when comparing the data. Therefore, please try to judge conservatively in this regard.

8 Annexes

Content

- 8.1 List of codes for types of land cover and landscape elements
- 8.2 Land cover types and nature values
- 8.3 Main sheet for field survey
- 8.4 Vegetation sheet – Grassland
- 8.5 Vegetation sheet – Arable land

8.1 List of codes for types of land cover and landscape elements

Landcover-code	Landcover	Category	Code	Specification		
A	Arable land	Non permanent crops	A11	Wheat	A51	Dry pulses
			A13	Barley	A52	Tomatoes
			A14	Rye	A53	Strawberries
			A15	Oats	A54	Other fresh vegetables
			A16	Maize	A55	Greenhouse culture
			A17	Rice	A56	Foil tunnel
			A19	Other cereals	A61	Clovers
			A21	Potatoes	A62	Lucerne
			A22	Sugar beet	A63	Mixed cereals for fodder
			A23	Other root crops	A64	Sown grass on arable land
			A31	Sunflower	A65	Grass-Clover-Mixture
			A32	Rape and turnip seeds	A66	Other Legumes and mixtures
			A33	Soya	A71	Floriculture and ornamental plants
			A34	Cotton	A72	Other non permanent crops
			A35	Other fibre and oleaginous crops	A73	Arable land without plants
			A41	Tobacco	A74	Flower areas and strips
			A42	Other non permanent industrial crops		
		Permanent cultures and trees	A81	Apple fruit	A91	Olive groves
			A82	Pear fruit	A92	Vineyards
			A83	Cherry fruit	A93	Nurseries
			A84	Nuts trees	A94	Other permanent cultures
			A85	Oranges		energy crops)
			A86	Lemons	A95	Fruit orchard
			A87	Other fruit trees and berries	A96	Other trees (e.g. Dehesas)
B	Set-aside	Fallow land or set-aside	B11	Arable fallow/set-aside		
			B12	Grassland fallow/set-aside	a	visible management
			B13	Brownfield (industrial, settlement etc.)	b	unmanaged
			B14	unclear fallow/set-aside	c	unclear
C	Grassland	Grassland with tree/shrub cover	C11-	Meadow / hay field	1	scattered trees/bushes (coverage < 5%)
			C12-	Grazing land/pasture	2	open stand of trees/bushes (cov. 5-25%)
			C13-	Mowed and grazed grassland / unclear use	3	half-open stand of trees/bushes (cov.25-50%)
				4	stand with greater gaps (cov. 50-75%)	
				5	closed stand of trees/bushes (cov. ≥ 75%)	
		Grassland without tree/shrub cover	C21-	Meadow / hay field		
			C22-	Grazing land/pasture		
			C23-	Mowed and grazed grassland / unclear use		
D	Shrubland	Shrubland with sparse tree cover	D11			
		Shrubland without tree cover	D12			
E	Landscape element	Wood/ Tree/ Bush elements	E11	Solitary trees and small groups of trees/bushes		
			E12	Tree lines and avenues		
			E13	Hedges and bushes (in wet, dry or other locations)		
			E14	Isolated field coppices		
			E15	Wood areas along watercourses		
			E19	Field margins		
			E20	Embankments		
			E21	Buffer strips		
			E22	Ruderal, grass and herbal fields of the open countryside		
			E23	Large and small reed beds		
			E24	Large and small sedge beds		
			E31	Springs and spring swamps		
			E32	Small and medium-sized flowing waters (streams, rivers, channels)		
			E33	Ditches		
			E34	Small water bodies (natural or man-made)		
			E41	Dry stone and natural stone walls		
			E42	Field stone heaps and cairns		
			E43	Sand, clay and loess escarpments		
			E44	Isolated rock outcrops		
			E45	Raw soil sites (stone, sand and dirt surfaces with little or no vegetation)		
	E46	Terraces				
	E51	Dirt/gravel track				
	E52	Grass track				
	E53	Paved farm tracks (also asphalt with grass strip)				
	E54	Sunken roads				
	E62	Field barn				
	E63	(Machinery/animal) shed				
	E64	Woodpiles				
	E65	Solar elements				
	E66	Antenna/electric pylon				
	E67	Other elements				
N	Non-agricultural elements	Forest	N11	Forest		
			N12	Reforestation area		
		Wetland	N21	Inland marshes		
			N22	Peat bogs		
			N23	Salt marshes		
			N24	Salines		
			N25	Intertidal flats		
		Open water	N31	Large inland water bodies and their banks		
			N32	Large inland running waters and their banks		
			N33	Coastal water bodies and their shores		
	N41	Buildings / villages and garden areas, official roads and railways inclusive adjacent landscape elements				
	N61	Mining area or renaturated former mining area				
X	Unknown	Not visible	X	not visible		

8.2 Land cover types and nature values

The following table lists the nature values for different types of land cover and landscape elements and gives an overview of the characteristics associated with each nature value. Nature value 1 (light red) is the lowest possible nature value, nature value 5 (dark green) indicates the highest nature value.

Code / Type	Definition	Nature value
A11-A73 Arable land	Hardly any segetal plant species occur	1
	A few segetal plants occur with a very low coverage; or a certain richness occurs only in some smaller parts of the parcels	2
	Some segetal plants are present or at least some considerable parts of the parcels (beside the edge areas) show a moderate richness of segetal plants; or segetal plants occur with many species and a high coverage but they affect the growth of the crop (e.g. Galium aparine building dense parts of the weed community)	3
	A considerable number of segetal plants species are present in at least some larger parts of the field or many segetal plants occur but they probably do not affect the growth of the crop	4
	Many segetal plant species occur in more or less the whole field without considerably dominating and affecting the crop and the structure of the field.	5
A74 Flower areas and strips	The vegetation mainly consists of problem weeds and flowering plants are very rare.	3
	The vegetation mainly consists of one or very few flowering species and the structure is homogenous	4
	The vegetation mainly consists of many different flowering plant species and shows a heterogeneous structure	5
A81-A94 Permanent cultures and other trees	vineyard / vine field completely sprayed / ploughed, hardly any natural vegetation in the rows	1
	vineyard / vine field mainly with grass or natural segetal flora, but more or less wide strips being sprayed regularly (e.g. beneath the vines) or /and ploughed alternating between the rows	2
	or vineyard / vine field with complete green cover, but this green cover being mulched intensively (many times / year)	3
	vineyard / vine field with a complete green cover, low floral diversity; mulching is carried out irregularly or alternating between the rows	4
	vineyard / vine field with a complete green cover, medium floral diversity, mulching irregularly and / or alternating between the rows	5
B11-B14 Fallow land or set-aside (incl. brownfields)	Only very few forbs can develop, e.g. because the soil is covered with concrete (industrial or construction sites) or frequently ploughed (arable land).	2
	The vegetation stand consists of mainly one or very few species (e.g. huge <i>Urtica dioica</i> stand) and the structure is homogenous.	3
	The vegetation consists of some (more) species and the structure is partly heterogeneous.	4
	The vegetation consists of many different plant species and shows a heterogeneous structure.	5
C11-C23 Grassland	Mostly fertilised, intensively managed meadow or pasture without or with hardly any species which characterise species rich plant communities that are typical for this site	1
	A few characteristic flower species occur but the meadow / pasture is dominated by only a few grass species; or the species richer parts of the meadow / pasture are restricted only to minor areas of the whole parcel	2
	The meadow or pasture is characterised by some typical species of extensive land use, but other typical species are missing. Moreover, the structure of the vegetation is either too dense (due to fertiliser input) or too sparse (due to overuse e.g. by cattle or goats)	3
	Many characteristic flower species occur and the vegetation is typical for an extensive land use on this site, but there are considerable parts of the parcel which are characterised by less species richness or by other signs of over- or under-use	4
	The grassland is rich in species and the plant composition of the vegetation of the whole parcel is typical for extensive land use.	5
E11-E12 Wood/tree/bush element	native trees without a distinct /discrete crown, at least 5 m high, fruit trees with stem height of $\geq 1,6$ m (bottom to first major branch). Non- native trees only if they are characteristic landscape elements (older trees with a height of > 10 m);	3
	native trees with a distinct / discrete crown, at least 8 m high (fruit trees can be	4

	lower);	
	Native or non-native trees which constitute characteristic landscape elements, with a height > 15 m, average tree-trunk diameter at 1,30 m \geq 80 cm	5
E13-E15 Hedges, isolated field coppices, wood areas alongside watercourses	simply structured / species-poor elements (e.g. "simple" hazelnut hedge with hardly any other species);	3
	heterogeneously structured and/ or species-rich elements (several woody species). Differentiated height structure, with margin alongside the element	4
	very heterogeneously structured and species-rich elements (many woody species). Differentiated height structure, with margin alongside the element.	5
E19-E22 Grass-herb elements	species-poor, mainly grass-dominated or strongly interspersed with neophytes or nitrophytes (e.g. <i>Urtica spec.</i>);	3
	moderately species-rich or moderately structured; < 25 % neophytes/nitrophytes	4
	species-rich and structured; <5 % neophytes/nitrophytes	5
E23-E24 Reed and sedge beds, wet tall herb communities	reed and sedge beds with a high percentage (35 – 75 %) of nitrophytic or neophytic plants (over 75 % of these plants please note under E 22);	3
	reed and sedge beds with a typical structure and wet character, nitrophytes and neophytes only in a small extent (5 – 35 %);	4
	typical reed and sedge beds, species rich or structure-rich or typical but without occurrence of "disturbing elements" (< 5 %).	5
E31-33 Water elements	moderately near-natural water bodies with relatively low structural diversity;	3
	near-natural water bodies with an average structural diversity; indicators of disturbance or disturbed structures less than 25 %;	4
	natural or near-natural water bodies, naturally high structural diversity; minor pollution; indicators of disturbance or disturbed structures less than 5 %;	5
E34-E35 Small water bodies/oxbow lakes	water body with only fragmented near-natural aggradation area and bank; indicators of disturbance and disturbed structures partly dominate, polytrophic water body	3
	water body with near-natural aggradation area and bank vegetation; several vegetation types; indicators of disturbance or disturbed structures less than 25 %	4
	water body with heterogeneously structured aggradation area and bank; numerous vegetation types; indicators of disturbance or disturbed structures less than 5 %.	5
E41-E46 Stone, rock, raw soil, terrace elements	cement wall, without vegetation	1
	brick wall, with vegetation	2
	monotonous elements, habitat with hardly any structure	3
	Elements with moderately diverse habitat structure	4
	Elements with a very diverse habitat structure, overgrown walls with a diverse vegetation	5
E51-E54 Roads, tracks	asphalt tracks	1
	pure gravel-tracks/paved asphalt tracks with grass strip in the middle	2
	dirt or gravel tracks with a simple grass or grass/herb strip in the middle or species-poor grass tracks (very obvious track function);	3
	dirt tracks with a species rich grass/herb strip or medium species-rich grass tracks, sometimes small structures or wet patches occur	4
	very valuable track structures, very species rich and at least 5 m in width, sunken roads or also pure dirt and grass tracks with a width of at least 10 m; small structures such as earth embankments or wet patches are present.	5
E62-67 Other man-made structures, artefacts, other elements	man-made structure without or with very low nature value (e.g. electric transformer tower with hardly any buffer strip)	1
	man-made structure with low nature value (e.g. electric transformer tower with a small grass-herb buffer strip)	2
	man-made structure with medium nature value (e.g. electric transformer tower with a broad and partly species rich grass-herb buffer strip);	3
	man-made structure with high nature value (e.g. wooden field barn which serves as nesting place for birds and which is surrounded by a grass-herb buffer strip);	4
	man-made structure with very high nature value (e.g. wooden field barn which serves as nesting place for birds/owls and which is surrounded by a species rich grass-herb buffer strip and a small hedge or a tree; but still the man-made artefact dominates – otherwise E 61 (complex element))	5

8.5 Vegetation sheet – Arable land

Arable land survey Surveyor: _____ Date: ___/___/___ Point-ID: _____

LC1: _____ LC2: _____

1 Transect information:
direct no transect possible

2 Photos :

photo type	from start	from end	from above	Dominant /special species
photo ID				

3 Site exposition:
3a Flat direction of slope 3b Inclination: Incl. classes 0 1 2 3 4

4 Site moisture:
wet moist mesic semi-dry dry mixed

5 Coverage: 5a crop: _____ % wild plants _____ % bare soil, rock, stones _____ %
Crop: 5b Height of crop: _____ cm 5c Growth stage of crop:
0 1 2 3 4 6 7 8 9

6 Management type: _____
Tillage direct drilling fallow other undear

7 Flowering forbs: 7a _____
number 1-10 > 10 > 15 > 20 7b Flower:
density very few few medium dense very dense none

8 Flowering colours:
Green Brown White Yellow Red Purple Blue Mixed none

9 Remarks: _____

10	Key species for species richness:	10a	
	Adonis spec. <input type="checkbox"/> __	Lapsana communis <input type="checkbox"/> __	Thlaspi arvense <input type="checkbox"/> __
	Anagallis spec. <input type="checkbox"/> __	Lathyrus spec. <input type="checkbox"/> __	Torilis arvensis <input type="checkbox"/> __
	Anthemis spec. <input type="checkbox"/> __	Legousia spec. <input type="checkbox"/> __	Trifolium spec. <input type="checkbox"/> __
	Calendula arvensis <input type="checkbox"/> __	Linaria spec. <input type="checkbox"/> __	Valeriana spec. <input type="checkbox"/> __
	Carduus pycnocephalus <input type="checkbox"/> __	Lithospermum arvense <input type="checkbox"/> __	Viola spec. <input type="checkbox"/> __
	Centaurea spec. <input type="checkbox"/> __	Lythrum spec. <input type="checkbox"/> __	
	Chrysanthemum spec. <input type="checkbox"/> __	Matricaria spec. <input type="checkbox"/> __	10b Dominant or problematic* species:
	Consolida spec. <input type="checkbox"/> __	Medicago spec. <input type="checkbox"/> __	Example:
	Epilobium spec. <input type="checkbox"/> __	Mentha arvensis <input type="checkbox"/> __	Cirsium arvense <input type="checkbox"/> ___ %
	Erodium cicutarium <input type="checkbox"/> __	Mysostis spec. <input type="checkbox"/> __	<input type="checkbox"/> ___ %
	Eryngium campestre <input type="checkbox"/> __	Ornithogalum spec. <input type="checkbox"/> __	<input type="checkbox"/> ___ %
	Euphorbia spec. <input type="checkbox"/> __	Papaver spec. <input type="checkbox"/> __	<input type="checkbox"/> ___ %
	Filago spec. <input type="checkbox"/> __	Ranunculus spec. <input type="checkbox"/> __	<input type="checkbox"/> ___ %
	Fumaria spec. <input type="checkbox"/> __	Rumex spec. <input type="checkbox"/> __	
	Galeopsis spec. <input type="checkbox"/> __	Silene spec. <input type="checkbox"/> __	
	Geranium spec. <input type="checkbox"/> __	Spergula arvensis <input type="checkbox"/> __	
	Lamium spec. <input type="checkbox"/> __	Stachys spec. <input type="checkbox"/> __	
10c	Remarks / further species:		
10d	Sum of key species: _____	10e Dominant species: _____	% (Photo)

*Please add, if certain weed species are dominant or problematic.