

ICS 27.160; 65.020.01

**Agri-photovoltaic systems –
Requirements for primary agricultural use
English translation of DIN SPEC 91434:2021-05**

Agri-Photovoltaik-Anlagen –
Anforderungen an die landwirtschaftliche Hauptnutzung
Englische Übersetzung von DIN SPEC 91434:2021-05

Systèmes agrovoltaiques –
Exigences relatives à l'utilisation agricole primaire
Traduction anglaise de DIN SPEC 91434:2021-05

Document comprises 25 pages

This document has been developed and approved by the authors named in the foreword.

DIN-Sprachendienst

A comma is used as the decimal marker.

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Foreword

This DIN SPEC has been developed according to the PAS procedure. The development of a DIN SPEC according to the PAS procedure is carried out in DIN SPEC (PAS)-consortia and does not require the participation of all stakeholders.

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¹ The masculine form of gender-related terms chosen in this document applies to persons of all genders. The masculine form was chosen only for the sake of better comprehensibility of the text.

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Introduction

Agricultural photovoltaics (agrivoltaics) is the combined use of one and the same area of land for agricultural production as the primary use, and for electricity production by means of a PV system as a secondary use. The dual use of the land not only leads to increased ecological and economic land use efficiency, but in practice can also lead to positive synergy effects between agricultural production and the agrivoltaic system. Depending on the design of the system, the construction can take on important protective functions (e.g. hail protection), as well as contribute to rainwater harvesting with appropriate devices. Especially in warmer years and dry regions, reduced soil water evaporation can also be expected in the system due to shading. In view of climate change, this aspect will become even more important in the future.

Agrivoltaic systems technology has evolved over the past decades from an idea (1981), to an invention (2016) and further to an innovation (2019). Research and demonstration projects in Germany and worldwide have proven the viability of the technology. The next necessary step in the agrivoltaics innovation process is the implementation of a small-scale agrivoltaics series in Germany. The small-scale agrivoltaics series, e.g. a 40-agrivoltaic field programme within the framework of an 80 MWp (megawatt peak) agrivoltaics auction, should be scientifically accompanied by a measurement and evaluation programme so that the different technological, economic and plant-physiological approaches of the individual agrivoltaic projects implemented by the industry can be compared, evaluated and published.

The aim of this document is to prepare a test method for agrivoltaic systems that provides a standard with regard to agrivoltaic measurement figures for reporting and project documentation vis-à-vis the legislative and funding bodies and the approval authorities, as well as for the post-testing and certification of agrivoltaic systems by experts and certification organizations. This should significantly reduce the technical risk for all project participants. This applies in particular to the farmer as the land user under the agrivoltaic system, the EPC contractor (Engineering, Procurement and Construction) as the installer and marketer of the agrivoltaic system, and the local administration in its role as the approval authority. The publication of information on agrivoltaic project documentation is intended to enable experts and testing and certification organizations to ensure the long-term operation of agrivoltaic systems vis-à-vis the legislative and funding body, investors and insurance companies. This document is intended to lead to standardized project documentation, to standardize the reporting of agrivoltaic systems, to support operational management and maintenance in the event of a change of operator and thus to have an overall quality-promoting effect.

An important aspect is also that this document should help to minimize the risk of improper agrivoltaic systems and associated deadweight losses as well as agrivoltaic acceptance losses among the population by defining the requirements for agrivoltaic systems.

1 Scope

This document specifies requirements for the main agricultural use in the field of Agri-Photovoltaics (agrivoltaics). In this context, requirements for planning, operation, documentation and operational monitoring, as well as measurement indicators for the test procedure for quality assurance of agrivoltaic systems are defined.

All requirements and key figures relate to agricultural use. Requirements of the main agricultural use are, for example, the light intensity and light distribution under the agrivoltaic system, which are also adapted to the needs of the respective crop.

This document is not applicable to classic ground-mounted photovoltaic systems, as corresponding standards already exist for this. Wherever reference is made to existing electrotechnical parameters as well as technical specifications and requirements for electrical installation, the existing standards and regulations apply.

The combination of greenhouses and solar modules, as well as the concept of vertical farming, are not the subject of this document.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

DIN VDE 0100-520 (VDE 0100-520), *Low-voltage electrical installations — Part 5-52: Selection and erection of electrical equipment — Wiring systems*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

DIN and DKE provide terminology databases for use in standardization at the following addresses:

- DIN-TERMinology Portal: available at <https://www.din.de/en/services/din-term>
- DKE-IEV: available at <http://www.dke.de/DKE-IEV>

ISO and IEC provide terminology databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

3.1

agricultural photovoltaics

agrivoltaics

APV

combined use of one and the same land area for agricultural production as the primary use, and for electricity production by means of a PV system as a secondary use

3.2

agricultural area

area taken up by arable land, permanent grassland and permanent pasture, or permanent crops

[SOURCE: EU Regulation No 1307/2013, Article 4(1)(e) [1]]

3.3

total project area

agricultural area before the construction of the agrivoltaics system, on which, after the construction of the system, agricultural use and use for electricity generation are conducted simultaneously

Note 1 to entry: Marginal areas, such as headlands, are included here.

Note 2 to entry: After the construction of the agrivoltaic system, a distinction is made between land that can be used for agricultural purposes and land that cannot be used for agricultural purposes.

3.4

agriculturally usable area

portion of the area of the field that can continue to be used for agricultural purposes without structural measures and technical restrictions after the construction of the agrivoltaic system

3.5

agriculturally unusable area

portion of the area of the field that was farmed before the construction of the agrivoltaic system but is no longer available for agricultural use after the construction

EXAMPLE The definition here includes areas that are no longer available, e.g. due to installation or impact protection, or that can no longer be reached by common agricultural machinery.

3.6

agricultural products

products produced by agricultural activity, marketed or for own consumption

3.7

light availability

global radiation minus proven shading and plus artificial light sources on the agriculturally usable area

Note 1 to entry: Global radiation is given in kWh/m².

3.8

light homogeneity

uniform distribution of the incident light over the agriculturally usable area, taking into account the shading provided by the agrivoltaic system

3.9

clear height

clear vertical area between the base of the agricultural land and the lower edge of the lowest structural element under self-weight deformation

3.10

clearance profile

ensuring the space kept free for the unrestricted passage of vehicles or passage of persons with certain characteristics and dimensions

3.11

BOS components

Balance of System Components

all components of a photovoltaic system, with the exception of photovoltaic modules

4 Categorization of agrivoltaic systems

For the purposes of this document, agrivoltaic systems are defined for two categories: agrivoltaic systems with a clear height installation (Category I) and agrivoltaic systems with a ground level installation (Category II).

On the basis of the specifications for eligible agricultural land, agrivoltaic systems of both categories can be divided into four use categories: (A) permanent and perennial crops, (B) annual and multi-year crops, (C) permanent grassland for mowing and (D) permanent grassland used as pasture (according to Table 1).

Permanent crops include crops that are not integrated into crop rotation, remain on the land for at least five years and provide recurring yields.

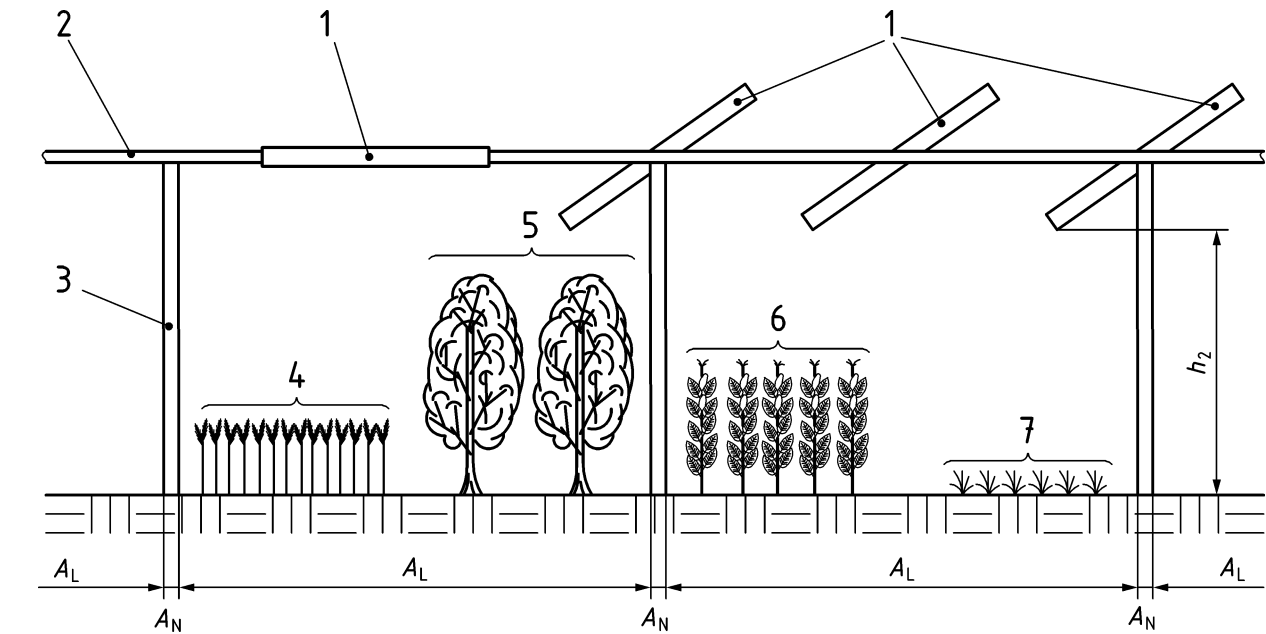
In addition to permanent crops, permanent pasture is also land that is not part of the crop rotation for at least five years and is used to grow grass or other herbaceous forage. Requirements for animal husbandry in agrivoltaic systems with pasture use of permanent grassland (categories 1D and 2D) are not the subject of this document.

In principle, the land of the agrivoltaic system is to be used for an agricultural activity (see 5.1). The agricultural activity includes the production or cultivation of agricultural products or the maintenance of land in a good agricultural (and ecological) condition as laid down in the cross compliance rules of the European Union [2] and the respective national rules. More detailed explanations of the agricultural activity on the agrivoltaic areas are to be recorded in an agricultural cultivation proposal, which is to be prepared in the planning phase prior to construction of the agrivoltaic system (5.2). Deviations from the above categories (e.g. a combination of both categories) are possible, but shall still comply with the requirements of the agricultural cultivation proposal.

Table 1 — Representation of the agricultural use options in agrivoltaic systems of category I (installation with clear height) and category II (installation close to the ground)

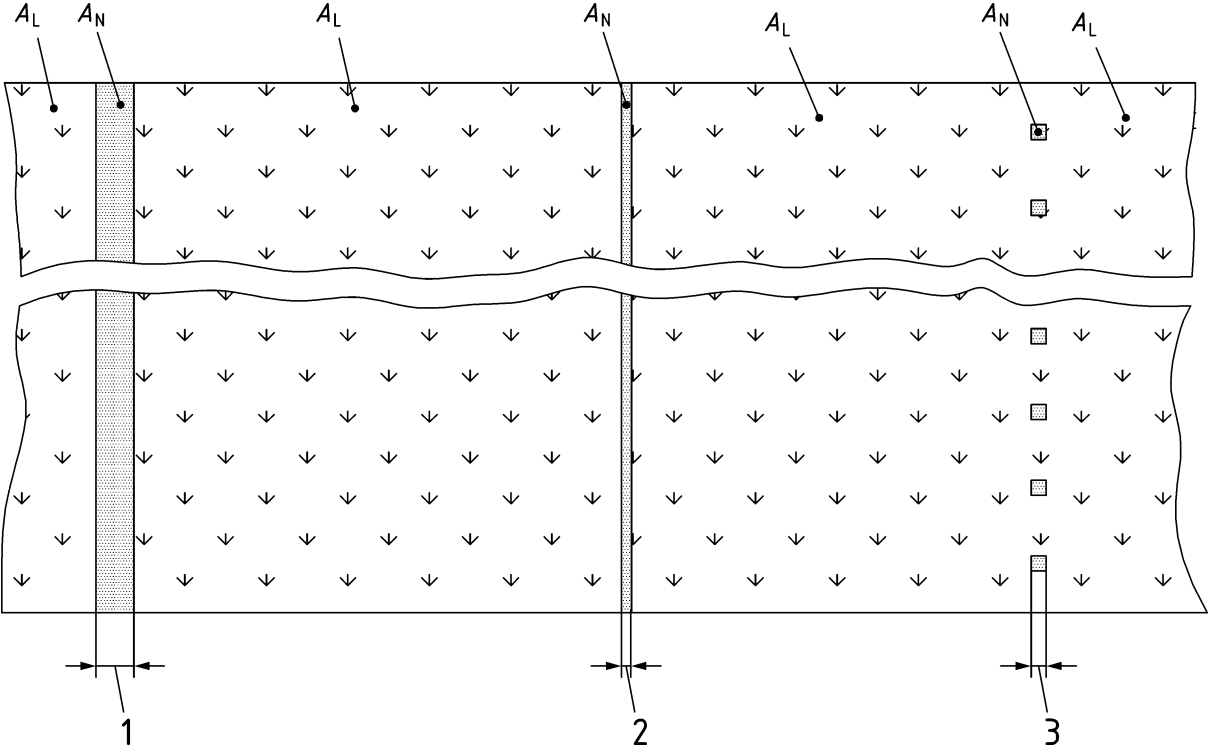
Agrivoltaic systems	Usage	Examples
Category I: Installation with clear height Farming <u>under</u> the agrivoltaic system (Figure 1)	1A: Permanent and perennial crops	Fruit growing, soft fruit growing, viticulture, hops
	1B: Annual and multi-year crops	Arable crops, vegetable crops, temporary grassland, arable forage
	1C: Permanent grassland for mowing	Intensive farm grassland, extensively used grassland
	1D: Permanent grassland used as pasture	Permanent pasture, portion pasture (e.g. cattle, poultry, sheep, pigs and goats)
Category II: Ground level installation Farming <u>between</u> the agrivoltaic system rows (Figure 3 and Figure 4)	2A: Permanent and perennial crops	Fruit growing, soft fruit growing, viticulture, hops
	2B: Annual and multi-year crops	Arable crops, vegetable crops, temporary grassland, arable forage
	2C: Permanent grassland for mowing	Intensive farm grassland, extensively used grassland
	2D: Permanent grassland used as pasture	Permanent pasture, portion pasture (e.g. cattle, poultry, sheep, pigs and goats)

An agrivoltaic system according to category I (Figure 1) is characterized by an installation with clear height (at least 2,10 m) and agricultural use under the system (Figure 1). The solar modules can be mounted at different angles and positions and can partially or completely cover the agriculturally usable area (A_L). The agriculturally unusable area (A_N) is limited to the area of the installation and areas that are no longer available for conventional agriculture in the course of farming the field, in accordance with the agricultural cultivation proposal (5.2). Figure 2 shows the view of various agrivoltaic systems from above.



- Key**
- A_L agriculturally usable area
 - A_N agriculturally unusable area
 - h_2 clear height over 2,10 m
 - 1 examples of solar modules
 - 2 strut
 - 3 mounting structure
 - 4 to 7 examples of agricultural crops

Figure 1 — Representation for category I

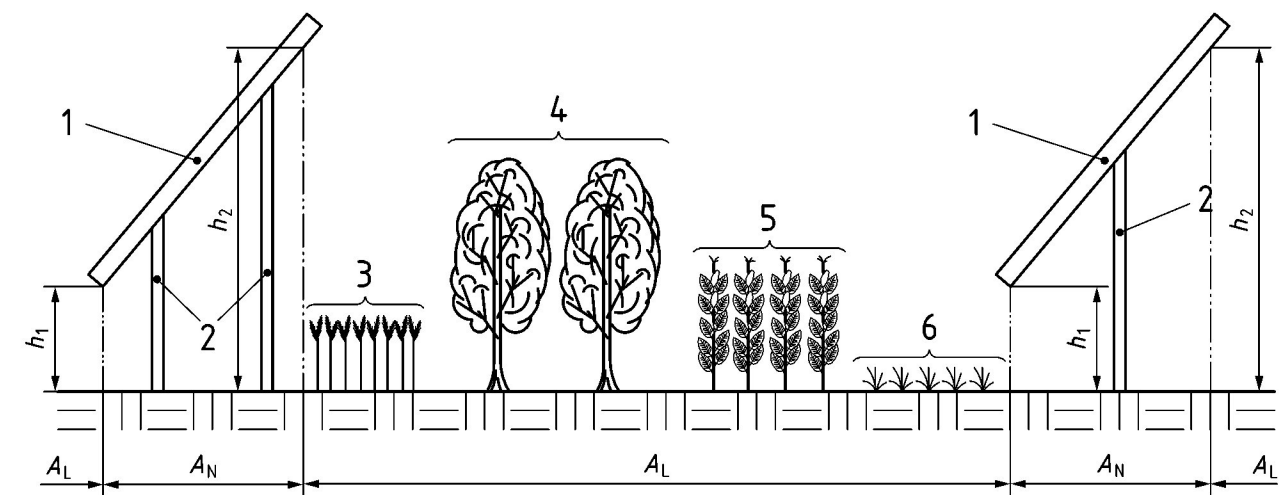


Key

- A_L agriculturally usable area
- A_N agriculturally unusable area
- 1 and 2 near-ground installations (category II) or highly elevated installations (category I) with different widths and only one processing direction
- 3 highly elevated installations (category I) with workability in all directions

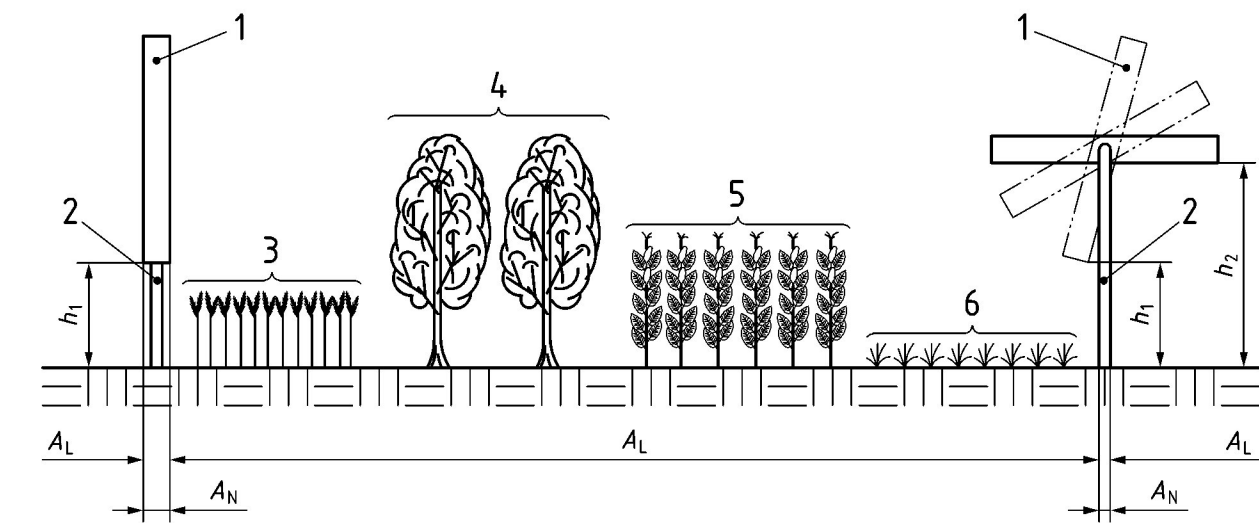
Figure 2 — View of various agrivoltaics systems from above

Category II agrivoltaic systems are ground-mounted systems in which the area between the rows of systems (Figure 3 and Figure 4) is used for agriculture. A distinction is made here between agrivoltaic systems in which the solar modules are permanently installed at a certain angle on one or two stilts (Figure 3, variant 1), and agrivoltaic systems in which the solar modules are mounted vertically or adjustably (tracking) on a stilt (Figure 4, variant 2). In principle, the area under modules with a clear height of less than 2,10 m is to be considered as land unusable for agriculture (A_N). If it is defined in the agricultural cultivation proposal (5.2) that the area under a clear height of 2,10 m is also used for agriculture and a yield of 66 % is achieved under this area, then A_N is reduced accordingly. All other necessary requirements under 5.2 for agricultural usability shall also be met on this area under the modules. If the technical conditions are satisfied, farming can be carried out up to the supporting structure. The agricultural cultivation proposal (5.2) shall set out how the area will be cultivated.



- Key**
- A_L agriculturally usable area
 - A_N agriculturally unusable area
 - h_1 clear height under 2,10 m
 - h_2 clear height over 2,10 m
 - 1 examples of solar modules
 - 2 mounting structure
 - 3 to 6 examples of agricultural crops

Figure 3 — Representation for category II, variant 1



- Key**
- A_L agriculturally usable area
 - A_N agriculturally unusable area
 - h_1 clear height under 2,10 m
 - h_2 clear height over 2,10 m
 - 1 examples of solar modules
 - 2 mounting structure
 - 3 to 6 examples of agricultural crops

Figure 4 — Representation for category II, variant 2

5 Criteria and requirements for the main agricultural use

5.1 Agricultural usability of the area

The previous agricultural usability of the area shall be maintained, taking into account the loss of land. The planned form of land use and crop production shall be set out in an agricultural cultivation proposal covering the next 3 years or a crop rotation cycle (5.2). The possibilities for cultivating the area shall be adapted to the crops and listed accordingly in the agricultural cultivation proposal (5.2). A change in the type of use at the same time as the construction of the agrivoltaic system is possible, but not a change from 1A and 1B, or 2A and 2B, to 1C and 1D, or 2C and 2D (Clause 4). If the agricultural use on the overall project area is optimized as a result, it is possible to change between categories 1A, 1B, 2A, 2B, 1C, 1D, 2C and 2D as long as the area taken up by each type of use on the overall project area is the same as in the previous use.

The continuous agricultural usability of the area can be checked via the field index or in the context of other controls.

5.2 Requirements for the agricultural cultivation proposal

5.2.1 General

In order to be able to ensure the use of the agriculturally usable area after installation of the agrivoltaic system, a proposal for the agricultural cultivation of the area shall be developed during the planning of the system. The agricultural cultivation proposal shall contain the information and be structured according to the form in Annex A. The agricultural cultivation proposal is prepared (drawn) jointly by the land user (farmer, tenant) and the EPC contractor (agrivoltaic installer) and shall be attached to the project documentation. In addition to general information on the agricultural holding (e.g. ownership structure, size of holding and current production), a utilization plan shall also be submitted within this proposal, which describes in detail how the land will be used in the three years following the construction of the agrivoltaic system, or within a crop rotation cycle. The proposal shall pay special attention shall be paid to the following points:

- installation,
- land loss,
- tillage workability,
- light availability and homogeneity,
- water availability,
- soil erosion,
- residue-free assembly and disassembly,
- calculation of economic efficiency,
- land use efficiency.

Details on the respective requirements can be found in the following clauses.

5.2.2 Installation

The PV modules of systems of both categories shall be installed and distributed evenly over the total project area so that the previous use of the area remains possible. The distance between the individual stilts relative to the direction of cultivation shall be large enough so that the previous land use and crop production can be maintained.

The clear height for category I agrivoltaic systems shall comply with occupational health and safety legislation. For category II agrivoltaic systems, no installation with a clear height is required.

The type of installation shall ensure the tillage workability of the surface.

5.2.3 Land loss

The loss of agriculturally usable land due to superstructures and substructures shall not exceed 10 % of the total project area for category I and shall not exceed 15 % for category II.

5.2.4 Tillage workability

The workability of the area for tillage shall be ensured so that the entire agriculturally usable area can be cultivated and, if necessary, driven over.

5.2.5 Light availability and homogeneity

There should be the highest possible light homogeneity and adequate light availability to ensure plant growth in general, retention of the same harvesting times and good agricultural practice.

The light intensity or shading and the light homogeneity, as well as edge effects, shall be checked and adapted to the respective needs of the agricultural products.

If these requirement criteria are not met, the agricultural cultivation proposal shall prove that agricultural use is nevertheless ensured.

5.2.6 Water availability

The water availability in the agrivoltaic system shall be adapted to the growing conditions of the crop. Care shall be taken to ensure a homogeneous distribution of rainwater to the crop under the agrivoltaic system.

In order to check the water availability for the agriculturally usable area and the planned construction type of the agrivoltaic system, the following approaches can be used:

- the existence of a technical irrigation system that ensures sufficient irrigation of the agriculturally usable area;
- a system design and crop-related case-by-case assessment, according to which the water demand of the crop can be met under the usual climatic conditions of the location (Typical Meteorological Year, TMY).

5.2.7 Soil erosion and silting of the topsoil

Dripping of water from the modules can cause a drip edge and associated washing away of the soil. In all agrivoltaic systems, the occurrence of erosion and silting due to water drip edges shall be minimized by the system design. Rainwater catchment systems adapted to suit the crop, rainwater distributors or similar suitable constructions can be used.

5.2.8 Residue-free assembly and disassembly

It shall be ensured that the agrivoltaic system, in particular its foundations and anchoring, is suitable for disassembly so that the land retains its original usability after the system has been dismantled.

If the soil structure deteriorates during the construction and/or dismantling of the system, appropriate measures should subsequently be taken to restore the original soil structure.

5.2.9 Calculation of economic efficiency

An economically viable concept for agricultural use from the farmer's perspective shall be presented as part of the proposal for agricultural cultivation.

5.2.10 Land use efficiency

It shall be ensured that the yield from the crop(s) on the total project area after construction of the agrivoltaic system is at least 66 % of the reference yield. The reduction in yield from the agricultural crops results from the loss of agriculturally usable land due to the superstructure/substructure of the agrivoltaic system and from the reduction of the yield due to shading, reduced water availability, etc.

5.2.11 Determination of the reference yield

The reduction in yield shall be recorded in the agricultural cultivation proposal. For this purpose, the reference yield shall be determined. This can be done as follows:

- a) Crop/cultivars have already been cultivated on the total project area or on other areas of the holding: For permanent crops and grassland, the yield of the last 3 years is averaged. In arable crop rotations, the yield of the individual crops is to be averaged over 3 crop rotation cycles.
- b) Crop/cultivars have not yet been cultivated on the farm: Average yields of the last three years taken from relevant publications (e.g. Federal Office of Statistics, agricultural statistics of the federal states) are set as reference yields.

5.2.12 Determination of the yield reduction of the crops grown on the total project area

The maximum yield reduction of one-third of the reference yield is calculated from the loss of area due to the installation and from an estimate of the yield loss caused by shading, uneven water distribution, changes in the microclimate and other environmental effects generated by the agrivoltaic system that impact on the yield. The estimation of the reduction in yield can be done by qualified personnel.

6 Planning and technical requirements for agrivoltaic systems

6.1 Light availability and homogeneity

The availability and homogeneity of light shall be taken into account at all system planning stages and checked according to the agricultural cultivation proposal. The verification shall take into account all parts of the photovoltaic modules and supporting structure that significantly influence the light availability.

To reduce the complexity of the calculation, glazing and encapsulation materials between PV cells can be defined as a cell-free space with a transmittance of 100 %.

6.2 Requirements for the supporting structure and the stability of the installation

In Germany, load-bearing structures are to be designed according to the semi-probabilistic safety concept of the Eurocodes. In this case, the category of use and the service life can be adjusted in order to achieve an economic safety level appropriate to the use of the structures, which takes into account a shorter service life and, in particular, the low consequences of damage.

6.3 Requirements for PV module technology

Various PV module technologies and designs can be used in agrivoltaic systems. However, the planning of the module technology, cell gaps and encapsulation materials, as well as the orientation of the modules shall be adapted to the light availability and thus to the agricultural use of the land. The modules shall be distributed evenly over the agricultural land to ensure the highest possible light homogeneity (5.2.5).

6.4 Requirements for the installation

6.4.1 General

Regardless of the type of installation of the agrivoltaic system, different construction techniques, designs and materials may be used.

6.4.2 Dimensions for high-mounted systems

The size and height of Category I systems should be adapted to the type of farming of the agricultural land.

A clear height of at least 2,10 m above the area used for agriculture shall be ensured so that the previous use of the area remains unaffected. The clear height is defined as the free vertical area between the base of the agricultural land and the lower edge of the lowest structural element under self-weight deformation. In the case of movable structural elements, the lowest bottom edge shall be measured where the clear height is at a maximum.

The area that is no longer agriculturally usable shall be less than 10 % of the total area after the agrivoltaic system has been installed (5.2).

When planning the system, the clearance profile shall be taken into account so that workers or machines are able to work without danger. When planning mechanical working, the headland shall also be taken into account to ensure that agricultural machinery can turn around.

6.4.3 Dimensions for ground level systems

The size and height of Category II systems should be adapted to the type of farming of the agricultural land.

The area that is no longer agriculturally usable shall be less than 15 % of the total area after the agrivoltaic system has been installed.

6.4.4 Module rows

The alignment of and distances between the module rows are not specified. However, these shall be planned and aligned according to light availability and homogeneity.

The distances should be chosen in such a way that the techno-ecological synergy effects achieved through shading and light homogeneity are as high as possible and negative effects on plant growth are avoided.

6.4.5 Protection of the main supporting structure of the agrivoltaic systems against mechanical damage

Mechanical damage to the main supporting structure of the agrivoltaic system by agricultural machinery should be prevented. This can be done, for example, by installing impact protection around the stilts. However, this should be fixed in the ground independently of the stilts.

6.5 Requirements for further BOS components

BOS components shall not interfere with agricultural use. This applies in particular to the location of generator junction boxes and inverters.

Cables shall be buried to a minimum depth according to DIN VDE 0100-520 (VDE 0100-520) so that they are safe from the plough and other agricultural machinery.

7 Requirements for installation, operation and maintenance

7.1 Installation requirements specific to agrivoltaics

To ensure that the main agricultural use of the land remains long term, special requirements shall be observed when installing the agrivoltaic system.

During construction and dismantling of the system, there should be no degradation of the soil due to compaction. There should be no restriction of use due to residues of the agrivoltaic system.

Due to the agricultural use, special attention shall be paid to protecting against leakage of operating materials.

It is recommended to use special tyres or machines and/or mobile roads that reduce soil compaction when constructing and dismantling the system. In addition, the time of system construction should be chosen in such a way (e.g. dry soil) that damage to soil is avoided.

7.2 Acceptance and commissioning of agrivoltaic system

For the application of this document, the existing electrotechnical and structural rules and regulations apply, as well as the appropriate test requirements in respect of photovoltaic systems (see Bibliography) that are also relevant for agricultural photovoltaic systems.

The following points shall be particularly observed and documented when erecting agrivoltaic systems:

- compliance with the agricultural cultivation proposal;
- laying of cables and lines at a depth safe from the plough and other agricultural machinery;
- maximum loss of area due to construction;
- mounting height of the modules with clear height;
- safety of the supporting structure.

7.3 Requirements for the operation and maintenance of agrivoltaic systems

7.3.1 General

The necessary maintenance work shall be recorded by the installer of the system in the operating manual and observed by the operator. Special care shall be taken when maintaining agrivoltaic systems, as people work on the area and (intensive) agricultural use may take place, which increases the risk of damage and soiling.

A number of regulations shall be observed regarding the maintenance of all photovoltaic systems. It is recommended that the checked parameters be recorded in a system-specific operating log.

During extreme weather events such as icing and icicle formation, and where there are extreme wind and snow loads, work should not be carried out under the system for safety reasons. Icicle formation can be prevented by rainwater distribution systems.

7.3.2 Cleaning requirements

The agrivoltaic system or the PV modules should be cleaned if they are heavily soiled with dirt, in order to minimize yield losses. Agricultural cultivation and the application of pesticides can cause such soiling, which is why a system-specific, regular check of cleanliness is recommended. In general, cleaning should only be done when really necessary to avoid unnecessary burden on the PV system or accidental damage to it. If a cleaning agent is used, food, feed and pharmaceutical regulations shall be observed.

Annex A (normative)

Form for an agricultural cultivation proposal

NOTE The clause numbers listed in brackets below and the named designations of the categories of agrivoltaic systems refer to DIN SPEC 91434.

1. General operating information

Name and address of the company: _____

Name and address of the contact person: _____

Please mark where applicable: ☐ Owner

☐ Tenant

Farm type according to agricultural structure survey (multiple answers possible):

☐ Arable farm

☐ Vegetable farm

☐ Permanent cultivation

☐ Forage farm

☐ Grafting farm

☐ Mixed farm

☐ Other

Farm size: _____

2. Information on the agrivoltaic system

Name and address of the owner (if not owner of the agricultural holding): _____

Name and address of the operator of the agrivoltaic system: _____

Category of agrivoltaic system (installation and use, see Clause 4): _____

Clear height of the agrivoltaic system (5.2.2): _____

Specific PV power in (kWp DC): _____

3. Information on the total project area

Size of the total project area (location, size, field number) (see definition 3.3): _____

Expected loss of land due to construction of the agrivoltaics system (5.2.3): _____

Size of the arable land (see definition 3.4): _____

4. Use plan for the agricultural area with agrivoltaic system

(for three years or one crop rotation cycle)

To be completed for agricultural use according to category 1A, 1B, 1C, 1D or 2A, 2B, 2C, 2D:

List of planned crop rotation or permanent crop(s) and their sowing/harvesting dates:

List of the planned crop protection measures (taking into account possible damage to the agrivoltaic system due to e.g. corrosion):

Planned machine and working widths (taking into account the turning circle/headland and working heights) (5.2.4):

Is tillage with the required machines ensured in relation to the system design? (5.2.4)

Light requirements of crops (5.2.5):

Is the light requirement of the crop plants ensured in the system design (5.2.5)? Add explanations

Water requirements of crops (5.2.6):

Is optimal water supply ensured in the system design (5.2.6)? Add explanations

To be completed additionally for agricultural use according to category 1D or 2D:

Animal species and use: _____

Area and period of pasture use: _____

Specific requirements for animal husbandry (fencing, shelter, etc.):

5. Soil erosion and silting of the topsoil

Measures to reduce soil erosion and topsoil siltation (5.2.7):

6. Residue-free assembly and disassembly

Measures to reduce permanent damage to agricultural land (5.2.8):

7. Calculation of economic efficiency (5.2.9)

Reference yield (dt/ha): _____

Forecast of crop yield (dt/ha): _____

Forecast of electricity yield (kWh/ha): _____

Explanations of the forecasts (e.g. quality reductions/quality increases):

Profitability from the farmer's point of view:

8. Land use efficiency (5.2.10)

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