

# Common Crop Type List for CAP Monitoring

## Executive summary

Monitoring on Common Agricultural Policy concerns the activities the farmer is carrying out on his parcel. An important aspect are the cultivated crops and their rotation over the years, as specific crops and specific rotations have a different impact on farm income, environment, climate and biodiversity. In order to efficiently monitor crop cultivation and to allow for sharing and re-use of monitoring data, the consistency in crop type nomenclature becomes vital to provide a multi-annual and geographically consistent perspective. There is general agreement that crop type is related to classification of cultivated plants. Existing crop type classifications are often including various defining characteristics, such as the plant species and possibly variety, the cultivation method, the land tenure, the crop use, etc. This variety of defining characteristics is reflected in the practices of the Paying Agencies and in existing standards about crop types, making the crop types difficult to link across years and across geographical boundaries.

For the purpose of monitoring and creating useful insights in land use and land use changes, the use of standardised crop type lists must be encouraged in the agricultural community as it would ensure common understanding and so facilitate exchange between IACS systems and other systems and more generally among all the agricultural stakeholders.

A first step of harmonisation can be achieved by the use of standardised crop type lists based on botanical concepts. These lists are providing hierarchical classifications according to the same principles and some of them are already frequently used by public bodies in Europe. Use of standardised and relatively simple botanical lists would be especially useful for exporting data from monitoring systems for the CAP towards a wide community of users.

A higher level of harmonisation would consist in developing a crop type list combining in a consistent way the concepts of plant species and of agricultural product. This solution is more farmer-oriented as it would enable farmer to use the same standard for exchanges with Paying Agencies but also with all the stakeholders of the agro-food production chain. However, this would require significant efforts first for adapting the standard to a wider geographic area but above all for having it known and adopted by concerned stakeholders.

## Developments that require a common crop type lists?

- **IACS data publication**

Agriculture is a key sector having a strong impact on society, as evidenced by role of agriculture across several Sustainable Development Goals, at least SDG 2 (no hunger), SDG 13 (climate action) and SDG 15 (life on land). Also, a set of 9 Policy Objectives has been set by the EU in relation to the Common Agricultural Policy, which reflect a wide range of sustainability ambitions.





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Opening data on agriculture helps to increase the strategic assessment of different policy options, to provide private sector actors including farmers data driven advisory services, and to provide an attractive sector for increasing employment and new business activity, as explained in the Open Data Institute/GODAN discussion paper on Impacts of Open Data in Agriculture and Nutrition.<sup>1</sup>

An important data source on the agricultural cultivated land in the EU are the Member States' Integrated Application and Control Systems (IACSs). As part of the IACS data, agricultural parcels and their declared crop are acquired and stored annually. This dataset is underused for monitoring purposes, despite the fact that it is actual and accurate valuable information. Because its current user community only concerns the national level, they focus and control of crop-type lists was an internal national affair. By opening up this valuable data it could also be useful to users working at European or even global levels or on cross-border areas, who would benefit significantly from a standardised crop type list.

In practice, IACS data is, among others, expected through the INSPIRE Directive and by the statistical community. DG AGRI is preparing guidelines for IACS data delivery according to INSPIRE.

- **Preparing new CAP in an harmonised way**

The new CAP will give more flexibility to Member States' policy makers through the national strategic plans. The new CAP is pushing some common technological developments to allow the move from compliance to conformity, such as the new Area Monitoring System.

These developments are considered in the NIVA project through several of its Use Cases (<https://www.niva4cap.eu/use-cases>):

- Use Case '*EO monitoring and traffic lights*' is using crop classification or event detection to decide on the validity of farmer declaration. This crop classification might be done using any crop type list, implicitly provided by training data. However, a common standardised crop type list would be useful to publish results in a comparable way and to enable benchmarking of various methods and algorithms.
- Use Case '*Agro-environmental monitoring*' applies scientific methods based on specific sets of crops to compute indicators on carbon storage, nitrate lixiviation or biodiversity. Standardised crop type lists are necessary to capture multi-annual aspects such as soil carbon changes and demonstrate the positive or negative impacts of agricultural activities in a consistent way across European regions

Use Case '*Farm Registry*' is setting up the specifications of a database necessary for the future claims by farmers with little administrative burden. The specifications consist of a reference data model, including a common crop type list, which will enable Paying Agencies to provide comparable statistics to Europe.

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<sup>1</sup> Carolan, L, et al. (2015) How can we improve agriculture, food and nutrition with open data?, Open Data Institute 2015



### Practices in Paying Agencies

An investigation was conducted in the practices of Paying Agencies, which are government bodies managing the IACS systems to conduct CAP monitoring. Two main sources are used in this investigation: answers from Paying Agencies to a questionnaire about semantic interoperability and a comparison exercise between the crop types used by the 7 pilot countries of the Sen4CAP project<sup>2</sup> (and kindly provided by the Sen4CAP project).

- **How many crop types do you register in your country?**

	Denmark	Estonia	France	Greece	Ireland	Italy	Lithuania	Netherlands	Spain	Finland	Sweden	Saxony (Germany)	Cataluña (Spain)
number	322 main crops, 29 catch crop codes	502	around 300	45 crop types, 3326 varieties	191 (including 37 non eligible)	about 500	156	375	322 (in 2019)	150	99- ish or almost 200	185	around 200

- **Comparison exercise (from Sen4CAP tables)**

CT	LC	CZE	ESP	FRA	ITA	LTU	NLD	ROM
GALEGA	1	Galega			GALEGA			
garlic (spring)	1	garlic (spring)						
garlic (winter)	1	garlic (winter)						
Garlic	1			Garlic	GARLIC	Garlic	Garlic	
Geranium	1			Geranium				
GERBERA	1				GERBERA			
Gesse	1			Gesse				
ginger	1				ginger			
GINKGO BILOBA	0				GINKGO BILOBA			
GIUGGIOLO	2				GIUGGIOLO			
Gladiol other flower nursery plants	1						Gladiol other flower nursery plants	

Extract of the comparative-aggregative table

The comparison exercise has shown limited number of common values (only around 20% of the total number). This small rate of common values is due to various factors: some minor spelling discrepancies (e.g. lentil/lentils) but above all, various granularities (especially in the species description) and mixture of several concepts (botanical species or groups of species, use of the crop, agricultural practice, land tenure, eligibility rule, etc)

### Existing standards on crop types

An investigation of several standards (see table below) related to crop types has shown that the main characteristics of a crop type list are the following ones:

<sup>2</sup> Include a reference to the webpage of SEN4CAP



- **Definition & Concepts**

Several defining characteristics are often embedded in the current crop type lists, such as the growing cycle, crop species, crop variety, season, land type, crop use cultivation methods, etc. However, the survey has shown that “crop type” is considered from two main points of view:

- Land cover: Botanical classification aiming to identify the cultivated plant, the “species”
- Land use: Product classification aiming to identify the expected product.

The botanical crop classification refers to which crops are grown, whereas the product classification refers to the product(s) generated from that crop.

- **Scope & level of detail**

This topic is related to the number of possible values in the crop type list. This number depends on the standard scope (Does the standard include all types of crops? Does the standard include items other than crop types?) and on the level of detail. Most standards have a hierarchical structure enabling to get information both in aggregated or detailed ways.

- **Community of use**

A standard is a common agreement between various stakeholders of a community, aiming to ensure interoperability between the data and/or the tools used by these stakeholders.

Therefore, a key characteristic of a standard is its related community. The real community of use is not always easy to be known, e.g. because only part of a targeted community is using the standard, or because stakeholders outside the target community have adopted the standard, but the community who elaborated the standard provides a good proxy: is the standard coming from public institutions or for private companies? is it a global standard or a regional one (e.g. at European level)? The table below proposes a summary of the standard assessment conducted in NIVA according to the 3 criteria explained above.

Name	Defining characteristics	Level of detail & completeness	Community of use
Common catalogues of varieties of agricultural plant species and varieties of vegetable species	Botanical classification (plants that can be officially marketed in the EU)	Detailed (up to variety) Some missing crop types (e.g. permanent crops)	EU catalogue
Farm Structure Survey (FSS)	Mixture of concepts	Aggregated ( $\approx$ 150 values)	Previous Eurostat classification
Integrated Farm Statistics (IFS)	Mixture of concepts	Aggregated ( $\approx$ 100 values)	Current Eurostat crop classification
AGRIPROD	Botanical classification (species)	Scope wider than crop Detailed ( $\approx$ 1000 values)	Eurostat
LUCAS	Botanical classification	Scope wider than crops (Land Cover) Aggregated ( $\approx$ 150 values for crop types)	Eurostat



Indicative Crop Classification	Some mixture of concepts	Aggregated ( $\approx$ 150 values)	Global (FAO)
LCCS crop type list	Product-oriented classification.	Aggregated (200 values)	Global classification (FAO)
European and Mediterranean Plant Protection Organisation (EPPO)	Botanical oriented (for plants)	Scope wider than crops or even plants Detailed classification ( $>$ 5000 item)	Widely used by agrobusiness
Farm Accountancy Data Network (FADN)	Mixed concepts (rather product - Land Use oriented) Addressing farm holding classification more than crop types themselves	Aggregated ( $\approx$ 60 values for crop types)	Grouping of crops is widely used across EU
GPC (Global Product Classification)	Product-oriented	Scope wider than crops Looks rather detailed ( $\approx$ 850 values)	Global (GS1 - business standardization)
AgroConnect	Combination of botanical classification (EPPO) and product classification (GPC)	Detailed (2660 values)	Dutch standard

The standards dealing with crop species are based on same principles of botanical classification, there are lots of similarities and matching between them is feasible and possible.

EPPO	LCCS	LUCAS	FADN
Hordeum vulgare	1.1.4 Barley	B13 Barley	SE140 – Cereals
Winter barley	1.1.4.1 Winter Barley		
Spring barley	1.1.4.2 Spring Barley		

### Crop type matching between various standards

NOTE: This matching has been done in a systematic way by the Open IACS project, between LUCAS, EPPO, LCCS (from FAO), FADN, AGRIPROD and the common catalogues of varieties of agricultural plants and varieties of vegetables:

- Virtuoso SPARQL endpoint with data of crops lists : <https://lod.open-iacs.eu/spargl/>
- Ontology to represent the knowledge: <https://webapps.open-iacs.com/Cropslist/>
- Application available for querying the crops lists: <https://webapps.open-iacs.com/spring-open-iacs/crops-page>



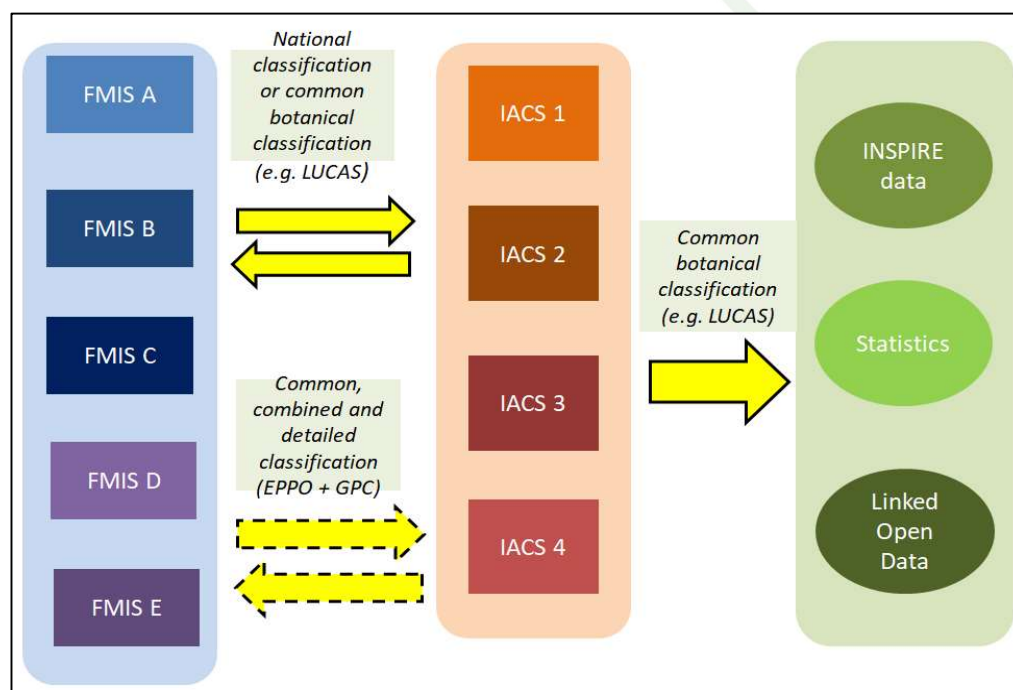
### Using crop types lists in applications

For Paying Agencies, there are two modalities to adopt a common crop type list, 1. for data exchange and data sharing with external parties and registries or 2. for native adoption as the crop type lists to underpin the IACS system. The survey among PA has shown some reluctance for the second option that would force them to change their whole system instead of adapting only their data delivery process. Therefore, the following approach might be envisaged.

The short term solution will probably consist in Paying Agencies keeping their national crop types list and using botanical-based classifications for data exchange, e.g. to import or export data with farmers or to publish data for external stakeholders. A priori, a simple classification with limited number of possible values across existing standards would be best solutions.

A longer term solution would consist in Paying Agencies natively adopting a harmonized crop type list across standards, including both the botanical and the product-based approach and supported by the related international standards EPPO and GPC that are widely used in the agro-business. This would make life easier for farmers (as using same standard for various purposes) and it would enable Paying Agencies to get data from FMIS without losing or degrading information. This approach could require intensive discussion between involved stakeholders in each Member State, as for any standard adoption.

The data publication must still be done using a simple botanical-based classification. This derivation could be facilitated by common matching rules between the rich and detailed and the simple botanical classification (e.g. LUCAS).



Overview of potential data flows using common crop type lists (Farm Management Information System (FMIS) is mentioned here as a broader group of applications used by farmers)



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### Methodology

The investigation has been conducted in the NIVA project by making first a state-of-play based on the identification of current practices, existing standards and requirements before making proposals and recommendations. Ideally, the main drivers should be the user requirements; in practice, it is often difficult to collect them from scratch with enough detail and reliability, as for many stakeholders it is difficult to oversee the implications in changes in the crop type list.

The investigation has been conducted in two main steps:

- A first version of a discussion paper was elaborated based on a survey of existing practices in Paying Agencies and on existing standards. Through the survey analysis, it has been possible to identify the main characteristics of crop type lists.
- A questionnaire has been launched towards NIVA Use Case leaders and Paying Agencies, asking them their requirements for a common crop type list. The questionnaire had to be filled using as much as possible the concepts identified in the discussion paper. In this way, it was possible to collect requirements using, more or less, the same vocabulary and with relevant level of detail.

The method was iterative, including several presentations during NIVA events (physical or virtual meetings) that have been good opportunities to clarify proposals, to raise discussion and to collect feed-back.

### Background on NIVA

Modernisation of the Common Agricultural Policy depends in no small part on ongoing digitisation of the Agricultural sector. The Integrated Administration and Control System (IACS) is the key instrument for CAP governance in each member state. Currently, implementations of IACS vary greatly between member states. New IACS Vision in Action (NIVA) delivers a suite of digital solutions, e-tools and good practices for e-governance and initiates an innovation ecosystem to support further development of IACS and to facilitate data and information flows. In NIVA a consortium of paying agencies, research institutes and private sector organisations collaborate to build the next level CAP governance tools. The project is designed to absorb the latest e-tools and digitisation trends to simplify the CAP governance, to reduce administrative burden to farmers and to close the gap between IACS data use and potential broader use.

The NIVA project works in 9 use cases, each focusing on a particular aspect of the CAP governing tools. As information about crop types is key for IACS systems and CAP monitoring it plays a role in all use cases. For several use cases the semantics of crop typologies play an essential role in the implementation and their linkage with other subsystems.



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