Study on CAP Measures and Instruments Promoting Animal Welfare and Reduction of Antimicrobials Use

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This study is conducted by the European Economic Interest Group:

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Groupement Européen d'Intérêt Economique

The study was coordinated by Alice Devot (Oréade-Brèche) assisted by Juliane Papuchon (Oréade-Brèche), with main contributions from Alexia Tenaud (Oréade-Brèche), Adrien de Pierrepont (Oréade-Brèche), Laurence Menet, Juliette Augier (Oréade-Brèche), Thierry Clément (Oréade-Brèche), Vincent Ayral (Oréade-Brèche) and Otto Schmid (FiBL). Other contributors to this study were Léa Magnant and Océane Espin.

The case studies were conducted by: Bettina Rafaelsen (COWI) for Denmark; Nora Simons and Dr Johannes Simons for Germany-Lower Saxony-Bremen, North Rhine-Westphalia, Baden-Württemberg and Mecklenburg- Western Pomerania; Romualdas Zemeckis for Estonia; Juliane Papuchon and Vincent Ayral (Oréade-Brèche) for Spain-Catalonia and Castilla la Mancha; Alice Devot and Adrien de Pierrepont (Oréade-Brèche) for France–Brittany, Pays de la Loire, Midi-Pyrénées and Alsace, Maria Carmela Macrì and Manuela Scornaienghi (COGEA) for Italy-Lombardy, Friuli- Venezia Giulia, Emilia-Romagna and Veneto; Juliette Augier and Alexia Tenaud (Oréade-Brèche) for the Netherlands, Marvin Hirth and Christoph Winckler (University of Natural Resources and Life Sciences of Vienna) for Austria, Wieslaw Lopaciuk (Institute of Agricultural and Food Economy) for Poland, Marius Olariu (ProSupport Consulting) for Romania, Lena Lidfors, Elina Åsbjer, and Elin Spangenberg (SLU Swedish Centre for Animal Welfare, Swedish University of Agricultural Sciences) for Sweden.

EEIG Agrosynergie includes the following two partners:

ORÉADE-BRÈCHE Sarl
2480 L'Occitane, Regent 1 -
31670 Labège FRANCE
Tel.: + 33 5 61 73 62 62
Fax: + 33 5 61 73 62 90
e-mail : t.clement@oreade-breche.fr
Represented by Thierry CLEMENT

And

COGEA S.r.l.
Via Po 102 - 00198 Roma ITALY
Tel.: + 39 6 853 73 518
Fax: + 39 6 855 78 65
e-mail: fantilici@cogea.it
Represented by Francesca ANTILICI

ORÉADE-BRÈCHE
Ingénierie de l'Environnement et du Développement

COGEA
Consulenti per la Gestione Aziendale

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF BOXES

LIST OF MAPS

LIST OF ABBREVIATIONS

AECM	Agri-environment-climate measure
AMU	Antimicrobial use
AW	Animal welfare
CAP	Common Agricultural Policy
CMO	Common Market Organisation
EAFRD	European Agricultural Fund for Rural Development
EC	European Commission
ECA	European Court of Auditors
EU	European Union
FADN	Farm Accountancy Data Network
FNVA	Farm Net Value Added
HPCIA	Highest Priority Critically Important Antimicrobials
LSU	Livestock unit
MA	Managing Authority
MS	Member State
NGO	Non-Governmental Organisation
PCU	Population Correction Unit
RD	Rural Development
RDP	Rural Development Programme
SQ	Study Question
TO	Type of Operations
UAA	Utilised Agricultural Area
VCS	Voluntary Coupled Support

1. ABSTRACT

Study of the CAP measures and instruments promoting animal welfare and reduction of antimicrobial use

The study examines the effects of the CAP instruments and measures on animal welfare and antimicrobial use. For this purpose, the role played by the overall CAP framework on the implementation of farming practices and corresponding effects on animal welfare and antimicrobial use in various animal-husbandry sectors (i.e. cattle, pigs, sheep/goats, poultry including laying hens, and rabbits) were considered.

The analysis focuses on the 2014-2020 programming period and relies on information collected from 17 case studies throughout the EU, interviews with key stakeholders, data analysis and literature review. Six additional questionnaires were sent to Managing Authorities of rural development programmes (RDPs) with far-reaching implementation of the measure dedicated to animal welfare.

Its shows which CAP instruments and measures contributed to the implementation of animal welfare practices, e.g. increased space allowance, outdoor access, etc. and their expected impact on antimicrobial use. The efficiency and relevance of the measures on the current issues in the various sectors are also considered. The study also investigates which indicators and targets were implemented at national/regional level to document CAP contribution to animal welfare and to antimicrobial use reduction.

2. RÉSUMÉ

Étude des mesures et des instruments de la PAC promouvant le bien-être animal et la réduction de l'utilisation des antimicrobiens

L'étude analyse les effets des instruments et des mesures de la PAC sur le bien-être animal et l'utilisation des antimicrobiens. À cette fin, ont été examinés le rôle du cadre global de la PAC sur la mise en œuvre des pratiques agricoles et les effets correspondants sur le bien-être animal et l'utilisation des antimicrobiens dans divers secteurs d'élevage (bovin, porcin, ovin, caprin, avicoles, y compris les poules pondeuses et lapin).

L'analyse se concentre sur la période de programmation 2014-2020 et s'appuie sur des informations recueillies à partir de 17 études de cas dans l'ensemble de l'UE, des entretiens avec des parties prenantes clés, une analyse des données et une revue de la littérature. Six questionnaires supplémentaires ont été envoyés à des autorités de gestion des programmes de développement rural (PDR) avec une mise en œuvre avancée de la mesure dédiée au bien-être animal.

L'analyse montre quels instruments et mesures de la PAC ont contribué à la mise en œuvre de pratiques en matière de bien-être animal (par exemple l'augmentation de l'espace alloué par animal, de leur accès à l'extérieur, etc.) et quel est l'impact attendu de ces instruments et mesures sur l'utilisation des antimicrobiens. L'efficacité et la pertinence des mesures de la PAC face aux enjeux actuels auxquels sont confrontés les différents secteurs sont également prises en compte. L'étude examine également quels indicateurs et objectifs ont été mis en place au niveau national/régional pour documenter la contribution de la PAC au bien-être animal et à la réduction de l'utilisation des antimicrobiens.

3. INTRODUCTION - OBJECTIVES AND SCOPE OF THE STUDY

This study examines the effects of the CAP measures and instruments[1] on animal welfare and the reduction of antimicrobial use. These two topics are set out and addressed by the European Commission in its legislation.

As highlighted on the EC website[2], the European Commission has been promoting the welfare of animals kept for farming purpose for 40 years and has set general rules[3] based on the European Convention for the Protection of Animals kept for Farming Purposes, which reflect the so-called Five Freedoms:

- Freedom from hunger and thirst
- Freedom from discomfort
- Freedom from pain, injury and disease
- Freedom to express normal behaviour
- Freedom from fear and distress.

Regarding the use of antimicrobials in animal production, Regulation (EU) 2019/6 on veterinary medicinal products defines antimicrobials as 'any substance with a direct action on micro-organisms used for treatment or prevention of infections or infectious diseases, including antibiotics, antivirals, antifungals and anti-protozoals'.

Furthermore, antimicrobials are defined by the European Commission[4] as 'active substances of synthetic or natural origin which kill or inhibit the growth of microorganisms. Antimicrobials include antibiotics, antifungals and antiprotozoals.'

Animal welfare and antimicrobial use are interrelated with the implementation on-farm of biosecurity measures to 'keep diseases out of populations, herds, or groups of animals where they do not currently exist or to limit the spread of disease within the herd'[5].

3.1 Production systems to be covered

The study covers the following animal husbandry production systems: dairy cattle, beef-cattle breeding and fattening, veal, pig breeding and fattening, dairy sheep/goats, meat sheep/goats, laying hens, poultry meat and rabbits.

3.2 Measures and instruments to be covered

The following measures/instruments are considered in this study:

- Instruments under the direct payments regulation, including aspects of voluntary coupled payment schemes
- Instruments under the CMO regulation, such as marketing standards, and EU quality schemes
- Instruments under the CAP horizontal regulation, such as the cross-compliance scheme (i.e. Statutory Management Requirements (SMR) 11, 12 and 13)
- Measures under the Rural Development regulation (in particular M04-Investments, M14-Animal welfare, M11-Organic farming, M01-Knowledge transfer, M02-Advisory services, M03-Quality schemes, M09-Producer groups, M16-Cooperation (notably EIP)).

[1] Measures in this study are mainly those of Pillar II (e.g. M4, M14, etc.), whereas instruments are those of Pillar I, horizontal regulation (e.g. cross compliance, etc) and CMO regulation.

[2] https://ec.europa.eu/food/animals/animal-welfare_en

[3] Introduced in 1998 by the Council Directive 98/58/EC.

4 https://ec.europa.eu/health/sites/health/files/antimicrobial_resistance/docs/amr_2017_action-plan.pdf

[5] A new Animal Health Strategy for the European Union (2007-2013) where 'Prevention is better than cure' (2007): https://ec.europa.eu/food/sites/food/files/animals/docs/ah_policy_strategy_2007-13_en.pdf.

3.3 Examination period

The analysis considers the period following the implementation of the 2013 CAP reform, notably from 1 January 2014 onwards.

3.4 Geographical coverage

The study covers the entire European Union[6]. In-depth analyses of specific sectors and the practices implemented by farmers were carried out in 11 case-study Member States: Denmark, Germany, Estonia, Spain, France, Italy, the Netherlands, Austria, Poland, Romania and Sweden.

[6] The ultra-peripheral regions, even if included in this geographical coverage, won't be studied in detail.

4. DESCRIPTIVE PART

4.1 List of practices and issues studied

In this study, specific attention is granted to the different practices that have impact on animal welfare and antimicrobial use. The list of practices considered for their effect on animal welfare and antimicrobial use are detailed in this report based on a thorough literature review (see SQ1). Considering that some practices and housing conditions managed together may have a different influence on animal welfare and the use of antimicrobials, the analysis was conducted at different levels:

- **Farming practices** are the most precise aspects of farming management and refer to individual intervention. These involve:
  - **feed and water** practices (feed restriction, force-feeding, good nutritional balance management, high fibre intake, feed diversity and choice, appropriate supply of feed additives, feed safety management, water safety management);
  - **housing conditions and designs** (increased space allowance[7]: area per animal, group size; provision of enrichment; litter and indoor flooring: with or without vegetal litter; microclimate control: air cleaner, humidity control, temperature control; proper light management; methods to keep animals indoors: phasing out of tethering and of cage individual housing; outdoor access and grazing);
  - **practices enhancing the natural behaviour** (promotion of maternal behaviour: mother's milk consumption and later weaning, maintenance of stable groups);
  - **practices influencing the health of animals** (hygiene management: holding and gear hygiene, quarantine and avoiding infections from the outside; treatment management: prophylaxis and alternative treatment, targeted curative treatment with antimicrobial use or curative treatment avoiding Highest Priority Critically Important Antimicrobials (HPCIA); genetic selection and issues related to mutilations: dehorning, tail docking, teeth resection, beak trimming, castration);
  - **practices enhancing animal welfare when killing on-site** (improving/phasing out culling of male chicks, improving animal welfare conditions when killing unproductive animals on-site, reversed electrical stunning of poultry).
- **Pools of practices** relate to combination of practices, inducing synergies between farming practices. Some practices and housing designs may have a different influence on either animals' bodies (body functioning or diseases) or animals' mental health (emotional state, behaviour, pain, comfort etc.) when managed together than when applied individually. Thus, some practices listed in the terms of references are considered as 'pools of practices and described in a second step. These include:
  - biosecurity,
  - body and metabolic functioning,
  - microclimate control (air cleaners, humidity, temperature), and
  - on-site killing practices.
- **Systemic approaches** involve the global understanding of farming practices implemented, associated with the conception of the farming system, before specific interventions on animals. These encompass:
  - indoor climate management, with the implementation of a set of housing conditions;
  - biosecurity, to avoid the introduction of pathogens in a herd and prevent animals from contaminating each other;
  - animal-friendly stable design beneficial for all animal welfare issues;
  - practices increasing animal robustness, longevity and adaptability (e.g. promotion of reduction of turnover and improvement of resilience of animals to achieve appropriate lifespan of dairy cows, including milking only once a day).

[7] In other words, lower density.

4.2 Policy context

In 1998, based on the European Convention for the Protection of Animals kept for Farming Purposes, the Council of the EU adopted Directive 98/58/EC on the protection of animals kept for farming purposes. It set general rules for the protection of animals of all species kept for the production of food, wool, skin or fur or for other farming purposes[8].

In 2009, the Treaty of Lisbon introduced the recognition of animals as sentient beings. Article 13 of Title II states that 'in formulating and implementing the Union's agriculture, fisheries, transport, internal market, research and technological development and space policies, the Union and the Member States shall, since animals are sentient beings, pay full regard to the welfare requirements of animals, while respecting the legislative or administrative provisions and customs of the EU countries relating in particular to religious rites, cultural traditions and regional heritage. National governments may adopt more stringent rules provided they are compatible with the Treaty but European legislation on the welfare conditions of farm animals lays down minimum standards.'

In the EU, antimicrobials are used for farming purpose to prevent and cure diseases and ensure animal health and welfare. The use of antibiotics as growth promoters was definitively prohibited in the EU in January 1, 2006[9]. According to the World Health Organization (WHO), antimicrobial resistance is a serious challenge in the EU and globally[10]. Antimicrobial resistance occurs when a microorganism (bacteria, virus, fungus or parasite) 'change over time and no longer respond to medicines making infections harder to treat' (WHO, 2014). The box below gives a snapshot of the regulations on veterinary medicines in the EU in the past decade. These constitute the European framework on veterinary medicine but are included in the CAP measures and instruments. Under cross-compliance in particular, farmers must use feed additives and veterinary medicinal products correctly, as required by the relevant legislation and to keep records on veterinary medicinal products or other treatments administered to animals, dates of administration and withdrawal periods.

Box 1: EU regulation framework addressing antimicrobial resistance

Recently, Regulation (EU) 2019/6 repealed Directive 2001/82/EC and amended the provisions of Regulation (EU) 726/2004. It provides new rules on the authorisation and use of veterinary medicines, applicable on 28 January 2022, and enhances EU action against antimicrobial resistance. Directive 2001/82/EC already mentioned antimicrobial resistance in the framework of pre-clinical and clinical testing in which data on the emergence of resistant organisms are necessary. No mention of antimicrobial use, awareness or reduction was made. Regulation (EU) 726/2004 is a reminder of the role of the European Medicines Agency in 'providing scientific advice on the use of antibiotics in food-producing animals in order to minimise the occurrence of bacterial resistance in the Community; this advice shall be updated when needed'.

Source: Agrosynergie, based on EU regulation

4.3 Presentation of the evaluated measures

The 2014-2020 CAP has three general objectives:

- viable food production, with a focus on agricultural income, agricultural productivity and price stability;
- sustainable management of natural resources and climate action, with a focus on greenhouse gas emissions, biodiversity, soil and water;
- balanced territorial development, with a focus on rural employment, growth and poverty in rural areas.

Several CAP instruments and measures contributing to the viable food objective specifically address animal welfare and/or the reduction of antimicrobial use. The following sections present the CAP measures and instruments to be evaluated, review their potential effects on animal welfare and antimicrobial use and analyse theoretically their expected effects in addressing animal welfare and the reduction of antimicrobial use.

[8] https://ec.europa.eu/food/animals/welfare_en

[9] Regulation 1831/2003/EC on additives for use in animal nutrition, replacing Directive 70/524/EEC on additives in feeding-stuffs.

[10] World Health Organization, Antimicrobial resistance: global report on surveillance (who.int).

4.3.1 Horizontal regulation, introducing rules of cross-compliance

A horizontal regulation[11] determines the **cross-compliance system** that incorporates basic standards on animal health and animal welfare into the CAP.

Cross-compliance links the granting of most CAP support to compliance with basic rules, which address public expectations on the environment, public health and animal welfare. Cross-compliance covers two main categories of standards: Standards of Good Agricultural and Environmental Condition (GAEC), which do not have an effect on animal welfare or antimicrobial use and **Statutory Management Requirements (SMRs)**, which refer to certain provisions of 13 legislative standards (including regulations and directives) that exist independently of the CAP and apply to all farmers (even those not receiving EU support). According to Annex II of Regulation (EU) 1306/2013, **four Statutory Management Requirements target animal welfare management or impact antimicrobial use** (SMR4[12], SMR11[13], SMR12[14] and SMR13[15]; see table below). Those SMR, applied to all farmers, set requirements for the wellbeing of farmed animals from the pathological, zootechnical, physiological and behavioural point of view, as described in the table below. Those standards concern holdings conditions (e.g. cleanliness, lighting, size of the boxes, etc.), diet and surgical intervention (e.g. castration, docking), etc. In each Member State compliance with the SMRs is checked by the competent authorities.

Table 1 : Statutory Management Requirements on animal welfare (AW) and/or antimicrobial use (AMU)

	Requirements related to AW	Requirements related to reduction of AMU
SMR4	No requirements related to this issue	Requirements on correct use of feed additives veterinary medicinal products, record keeping of veterinary medicinal products, promotion of prophylactic measures, no exceeding of maximum residue limit in sample analysis
SMR11	Requirements on minimum standards for the protection of calves confined for rearing and fattening (ventilation, appropriate care of animals, appropriate feed and water supply, space allowance, etc.)	No requirements related to this issue
SMR12	Minimum standards for the protection of pigs confined for rearing and fattening (buildings, diet, size of individual pens, cleaning and disinfection, flooring, access to water, provision of enrichment material etc.)	No requirements related to this issue
SMR13	Requirements and standards for the protection of animals kept for farming purposes (appropriate care of animals, microclimate, space allowance etc.)	Record keeping of 'any medicinal treatment given' and of the 'number of deaths found when the animals are inspected'

Source: Agrosynergie, based on EU regulation

4.3.2 Pillar I

- **Direct Payments Regulation**: The 2013 reform introduced a new Basic Payment Scheme, complemented by a series of other direct payment support schemes, targeting specific objectives or types of farmers: young farmers, small farmers, areas with natural constraints, Voluntary Coupled Support, redistributive payment and Greening payment. In Pillar I architecture, Basic Payment, Green Payment and the Young Farmer payment scheme are compulsory. Other direct payments such as the Voluntary Coupled Support (VCS) are

[11] Regulation (EU) 1306/2013.

[12] Stated in Regulation (EC) No 178/2002 of the European Parliament and of the Council of 28 January 2002 laying down the general principles and requirements of food law, Articles 14 and 15, Article 17(1) and Articles 18, 19 and 20.

[13] Referring to Council Directive 2008/119/EC of 18 December 2008.

[14] Referring to Council Directive 2008/120/EC of 18 December 2008.

[15] Referring to Council Directive 98/58/EC of 20 July 1998.

optional.

The objectives of animal welfare and antimicrobial use are not mentioned in the direct payment regulation (Regulation (EU) No 1307/2013), and **they are not intended to address animal welfare issues**. However, direct payments are subject to cross-compliance, and **VCS can impact the welfare of animals**. VCS aims at supporting specific sectors or types of farming that are particularly important for economic, environmental or social reasons[16]. The list of the potentially eligible sectors encompasses beef and veal production, milk and milk products, sheep meat and goat meat. VCS is a production-limiting scheme that takes the form of an annual payment per animal (or hectare for area-related measures). It is based on a fixed number of animals (or hectares for area-related measures) and compliance with the financial ceiling fixed for each measure. This support offers a certain margin of manoeuvre to Member States to tailor-make their decisions according to the local needs.

- **The Common Market Organisation (CMO) Regulation[17]** is a set of rules which regulates agricultural markets in the European Union. Respect of animal welfare is intended, as the regulation mentions the EU animal welfare standards. The standards laid down in the CMO Regulation may apply to nine sectors and products, of which two are animal productions (eggs and poultry meat). In the case of **egg production,** specific marketing standards are defined in delegated acts[18]. They set out standards such as the mention of the egg production type and the minimum requirements for systems of production for the various egg farming methods which directly affect animal welfare.
- **The EU quality schemes**[19] are instruments which contribute to the viable food production objective by protecting and promoting high-quality European products compliant with stringent safety standards. Depending on the choices made in the definition of the quality scheme, this instrument may have effects on animal welfare and/or antimicrobial use.

4.3.3 Rural development measures (Pillar II)

Rural development objectives, set out in Regulation (EU) 1305/2013, are divided into six priorities among which **Priority 3** - Promoting food chain organisation, **animal welfare** and risk management in agriculture.

This section presents Rural Development Programme (RDP) measures which may have effects on animal welfare and antimicrobial use, as they are expected to contribute to Priority 3 (M01, M02, M03, M04, M11, M14 and M16) or because their objectives set out in the Regulation revealed that they may impact the two issues. We will see the measures' objectives regarding animal welfare and antimicrobial use and their theoretical effects on the issues. To receive this CAP support, the rural development (RD) measures propose actions that go beyond the baseline of compulsory rules. This baseline is composed of cross-compliance obligations and stricter national rules, the latter being known as 'minimum requirements'.

Measure M14, M04 and M11 are mainly expected to contribute to animal welfare.

- **M14-Animal welfare[20]** (providing support for higher standards of animal husbandry going beyond the relevant mandatory standards) **is the flagship measure on animal welfare**. This measure is intended and designed to support farmers who engaged, on a voluntary basis, in above-standard forms of animal breeding, which means they exceeded the cross-compliance rules established in Chapter I of Title VI of Regulation (EU) No 1306/2013 (i.e. beyond EU and national requirements as well as 'normal practices' – where no legal requirements exist). The support may compensate additional costs or income foregone. To benefit from the measure, farmers must carry out operations consisting in one or more animal-welfare commitments. Based on Article 10 of the Delegated Regulation (EU) 807/2014, commitments eligible to receive support concern

[16] Regulation (EU) 2017/2393 of the European Parliament and of the Council.

[17] Regulation (EU) No 1308/2013 and Implementing or Delegated Acts.

[18] Commission Regulation (EC) No 589/2008 laying down detailed rules for implementing Council Regulation (EC) No 1234/2007 on marketing standards for eggs.

Commission Regulation (EC) No 543/2008 laying down detailed rules for the application of Council Regulation (EC) No 1234/2007 on the marketing standards for poultry meat.

[19] Regulation (EU) No 1151/2012.

[20] Article 33 of Regulation (EU) 1305/2013.

improvements of the following areas:

- water, feed and animal care according to the natural needs of animal husbandry;
- housing conditions, such as increased space allowances, flooring surfaces, enrichment materials, natural light, outdoor access;
- practices which avoid mutilation and/or castration of animals, or in specific cases when mutilation or castration of animals is deemed necessary, provide for the use of anaesthetics, analgesia and anti-inflammatory medication or immunocastration.

Box 2: Changes in animal welfare measure M14 at EU level between the periods 2007-2013 and 2014-2020

During the 2007-2013 period, only a total compensation of the income foregone or of the additional costs was possible, whereas for the 2014-2020 period the animal welfare payment may compensate these costs partially or totally.

Another change from the previous period is the possibility of undertaking the commitment for a period of one year, renewable up to seven years, instead of directly committing to a five- to seven-year period. Since 2014, the beneficiary must be identified as an active farmer, as detailed in Article 9 of Regulation (EU) No 1307/2013.

Source: Agrosynergie, based on EU regulation

- **M04-Investments in physical assets**[21]: Even if this measure **does not explicitly target animal welfare issues**, M04 can be relevant to address Priority 3 and **can help improve conditions of farm animal**, for instance through investments in livestock buildings (M4.1) and investments in order to comply with EU standards (M4.2) which **can improve housing, health and feeding conditions for animals.**
- **M11-Organic farming**[22] supports conversion to organic farming[23] and maintenance of organic farming practices. This farming system promotes environmentally friendly practices and **high standards for animal welfare** that go beyond mandatory requirements and minimum standards. It also **contributes to reducing antimicrobial use** (permanent access to an open-air area whenever conditions permit it, lower animal density; longer breeding period; prohibition of chemically synthesised allopathic treatments and antibiotics except under specific conditions such as double withholding periods), prohibition of the use of growth promoters; minimum surgical actions). Among Pillar II measures, M11 on organic farming is the only one that mentions a ban on the use of antimicrobials, as it prohibits the use of 'chemically synthesised allopathic treatments and antibiotics'[24]. This has a direct intended effect on the use of antimicrobials. Nonetheless, the use of antimicrobials can be allowed in organic farming where necessary and under strict conditions, when authorised curative measures (phytotherapy, homeopathy, etc.) have proved ineffective.

The following additional RD measures can have an effect on the implementation of practices related to better animal welfare or reduction of antimicrobial use, with a more indirect expected effect:

- **M01-Knowledge transfer and M02-Advisory services**[25] mainly address Priority 1 'Fostering knowledge transfer and innovation in agriculture, forestry and rural areas'. However, both are cross-cutting measures which can also contribute to improving management practices beneficial to animal welfare issues and reduction of antimicrobial use (e.g. through supporting specific training, demonstration, exchanges or advisory services).
- **M03-Quality schemes**[26] for agricultural products, and foodstuffs seeks to promote the participation of farmers in quality schemes, which can encourage practices that go beyond standards in term of animal welfare and reduction of antimicrobial use.
- **M07-Basic services and village renewal in rural areas**[27] supports the maintenance, restoration and

[21] Article 17 of Regulation (EU) 1305/2013.

[22] Article 29 of Regulation (EU) 1305/2013.

[23] Regulation (EC) 834/2007 provides the basis for organic farming in the EU.

[24] Article 14(e)(ii) of Regulation (EC) 834/2007.

[25] Article 14 and Article 15 of Regulation (EU) 1305/2013.

[26] Article 16 of Regulation (EU) 1305/2013.

[27] Article 20 of Regulation (EU) 1305/2013.

upgrading of rural landscapes and high-value nature sites, including related socio-economic aspects, as well as environmental awareness actions. In doing so, they may support the maintenance and development of management practices beneficial for animal welfare within an approach of heritage enhancement (e.g. collective pastoralism, establishment of hedgerows in pastures). These measures are not expected to have an effect on the reduction of antimicrobial use.

- **M10-Agri-Environment-Climate**[28]: The agri-environment-climate measure (AECM) provides an economic incentive for land managers either to maintain or to change activities that are beneficial for the environment and adaptation/mitigation of climate change. The sub-measure 10.2 is focused on the conservation and sustainable use and development of genetic resources in agriculture and can thereby support the rearing of local breeds, which are expected to be well adapted to local conditions and which will consequently benefit from better welfare. This measure is not expected to have an effect on the reduction of antimicrobial use.
- **M16-Cooperation (EIP)**[29] does not refer to animal welfare or reduction of antimicrobial use; nevertheless, it can contribute to promoting cooperation and practices on animal welfare issues or to reducing antimicrobial use at farm level, through its sub-measures M16.1 on support to EIP groups and M16.2 on pilot projects.

4.3.4 Synthesis of CAP measures and instruments with direct and indirect effects on animal welfare and the reduction of antimicrobial use

The table below summarises the above theoretical analysis of the effects of the studied CAP measures on animal welfare and the reduction of antimicrobial use.

Table 3: CAP measures and instruments with direct and indirect effect on AW and reduction of AMU

	AW	Reduction of AMU
Direct effect	SMR11, SMR12, SMR13, M4, M11, M14 and Marketing standards (CMO)[30]	SMR4, M11, Regulation (EU) 2016/429
Possible indirect effect	VCS, M1, M2, M3, M7, M10, M16	M1, M2, M3, M4, M14, M16

Source: Agrosynergie, based on EU regulation

4.4 Models of CAP intervention logic on animal welfare and antimicrobial use

4.4.1 Theoretical foundation of the effects of the CAP instruments and measures on animal welfare and on reduction of antimicrobials use

The starting point for the development of the evaluation framework is the intervention logic for the evaluated measures, as described in Section 2.3. The intervention logic is used to identify the judgement criteria and related performance indicators upon which the study is primarily based. The following sections summarise the intended effects of the CAP instruments and measures on animal welfare and on reduction of antimicrobial use, according to our analysis of the CAP regulations.

Several CAP instruments and measures have very specific contents that make it possible to establish a causal link between their implementation by Member States and their expected outcomes on animal welfare/ antimicrobial use. Others are defined at national (or regional) level. This is the case for all Pillar II measures (with the exception of M11) and also for VCS that are designed at Member State level. For these measures, it is not possible to provide the same level of details in the intervention logic. Hence, we have detailed the intervention in the following specific diagrams:

- SMR 11, 12 and 13 and measure M11, on animal welfare,

[28] Article 28 of Regulation (EU) 1305/2013.

[29] Article 35 of Regulation (EU) 1305/2013.

[30] For eggs sector.

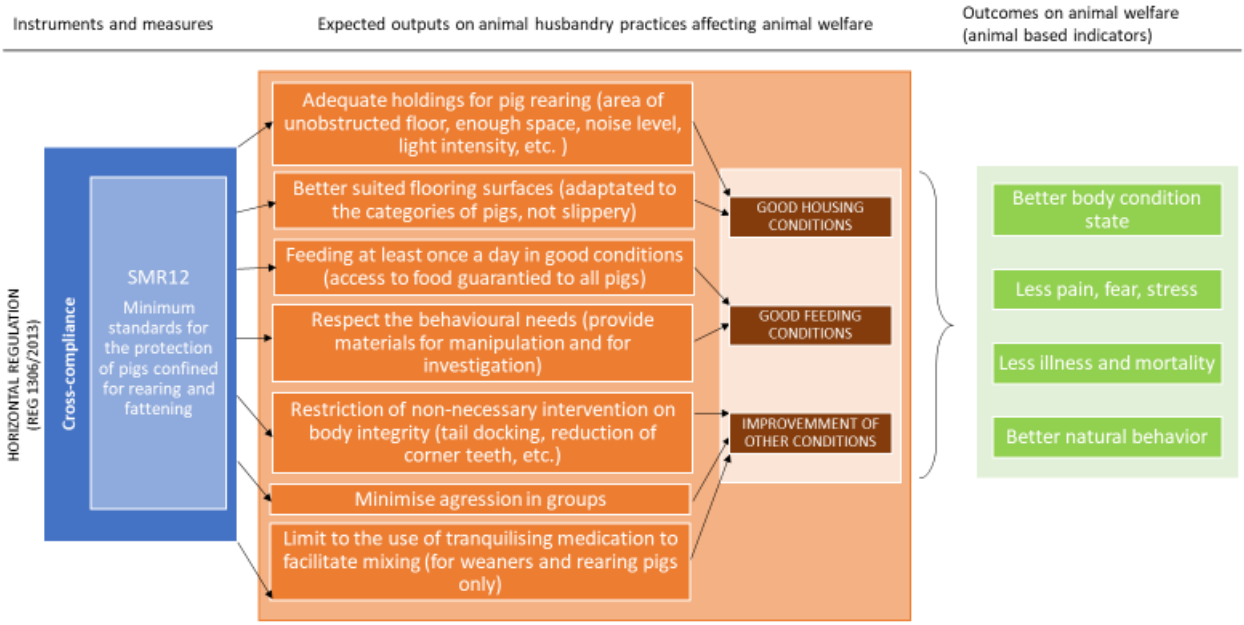
- SMR 4 and M11, on the reduction of antimicrobial use.

We then present a synthetic diagram for the entire set of measures. For clarity, the first section is devoted to the intervention logic linked to animal welfare and the second section to the reduction of antimicrobial use.

4.4.2 CAP intervention logic on animal welfare

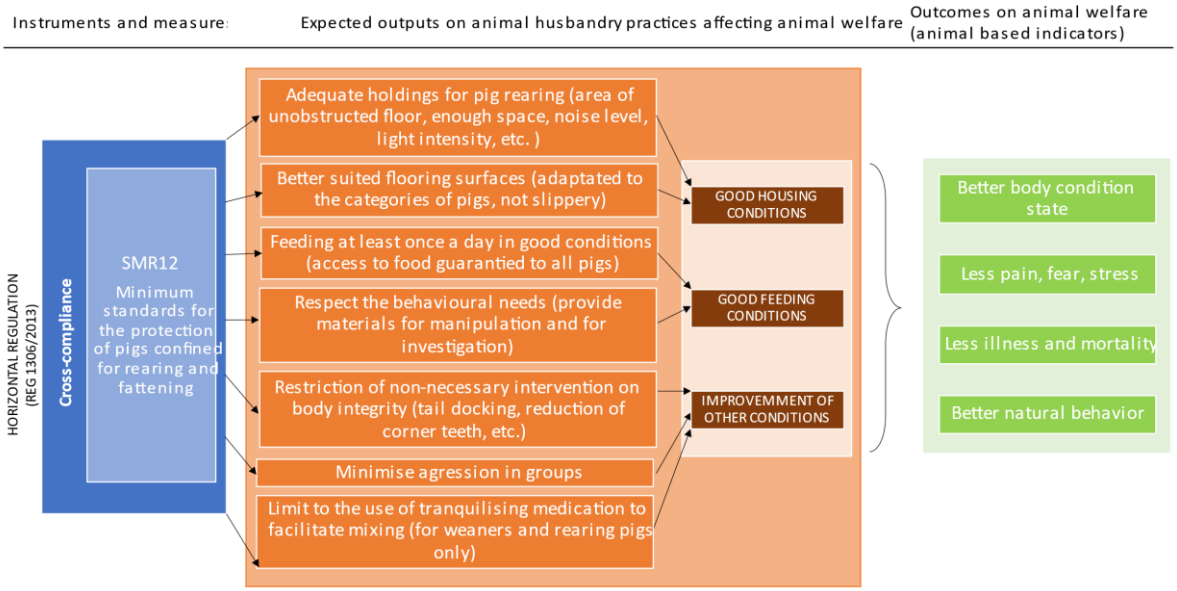
The CAP intervention logic on animal welfare is presented in the diagrams below.

Figure 1: Diagram of the SMR 11 intervention logic on calves, linked to AW



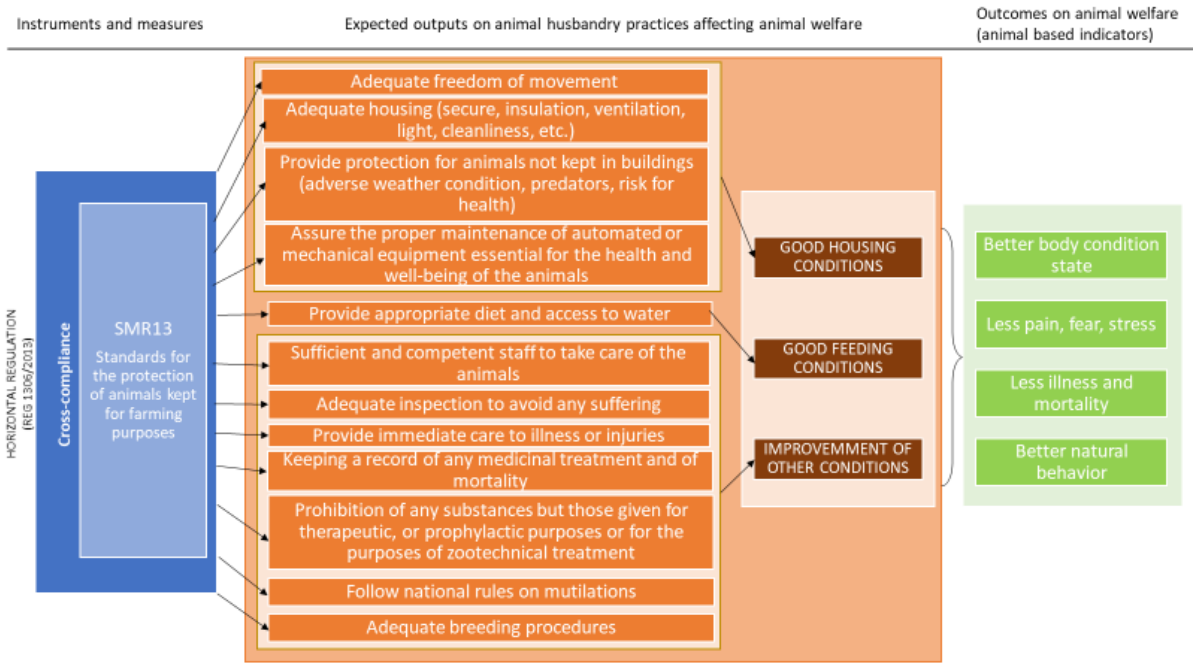
Source: Agrosynergie based on the cited regulation

Figure 2: Diagram of the SMR 12 intervention logic on pigs, linked to AW



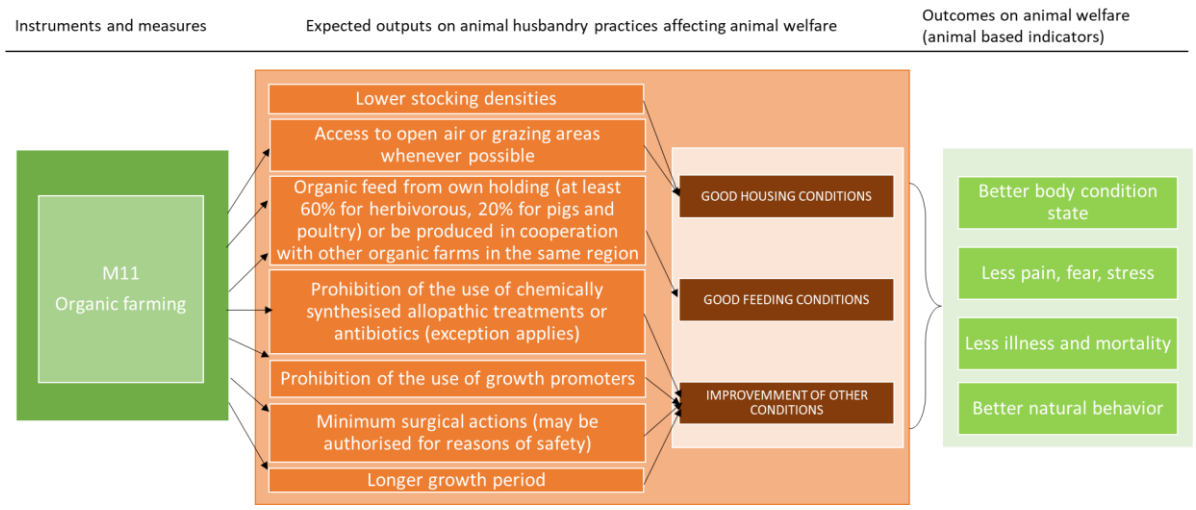
Source: Agrosynergie based on the regulation mentioned

Figure 3: Diagram of the SMR 13 intervention logic on all animals kept for farming purposes, linked to AW



Source: Agrosynergie, based on the regulation mentioned

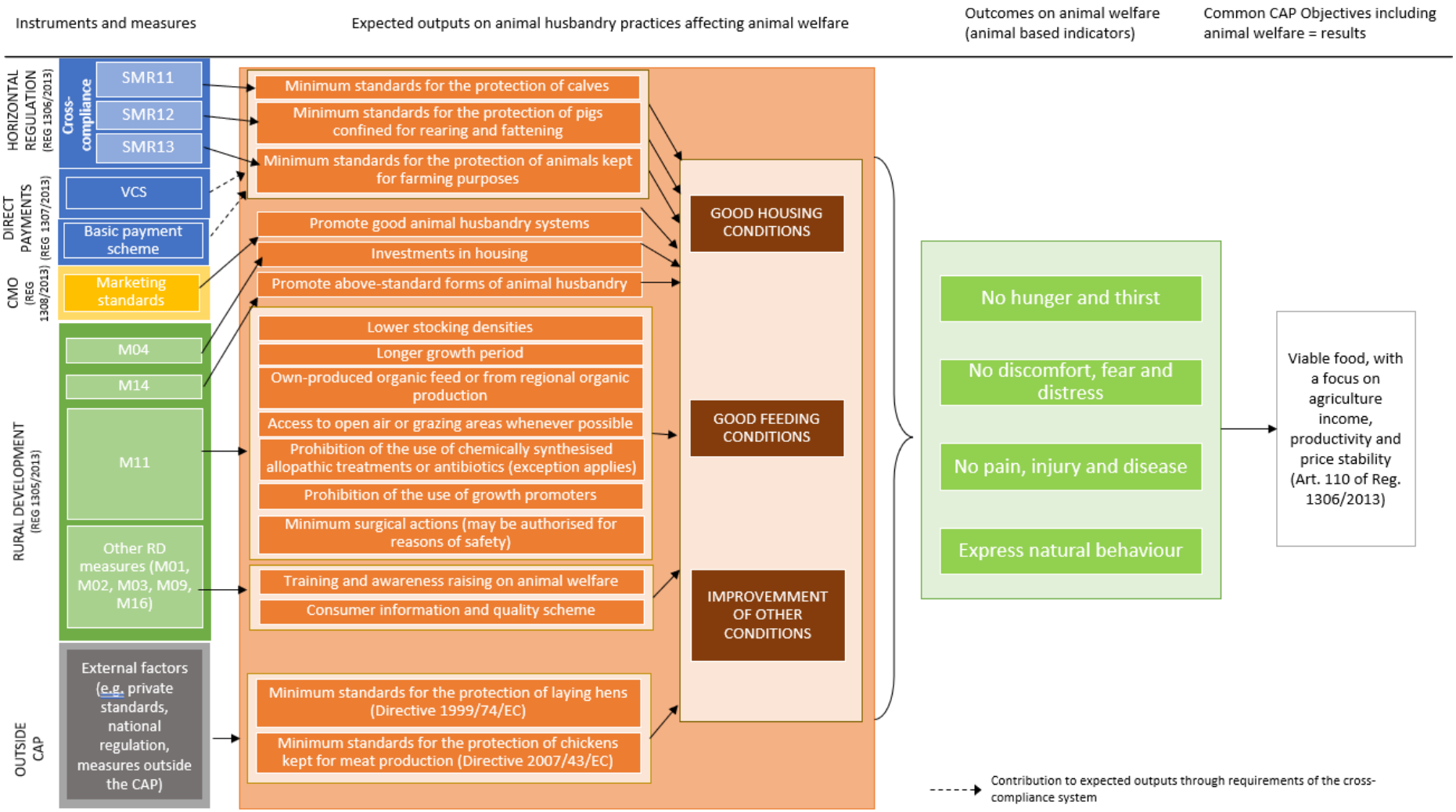
Figure 4: Diagram of the M11 intervention logic on organic farming linked to AW



Source: Agrosynergie based on the regulation mentioned

The diagram below summarises the expected output and intended effect of the CAP instruments and measures on animal welfare, putting altogether the detailed diagrams presented above and the other relevant CAP instruments and measures.

Figure 5: Diagram of the intervention logic of the set of regulations directly or indirectly linked to AW

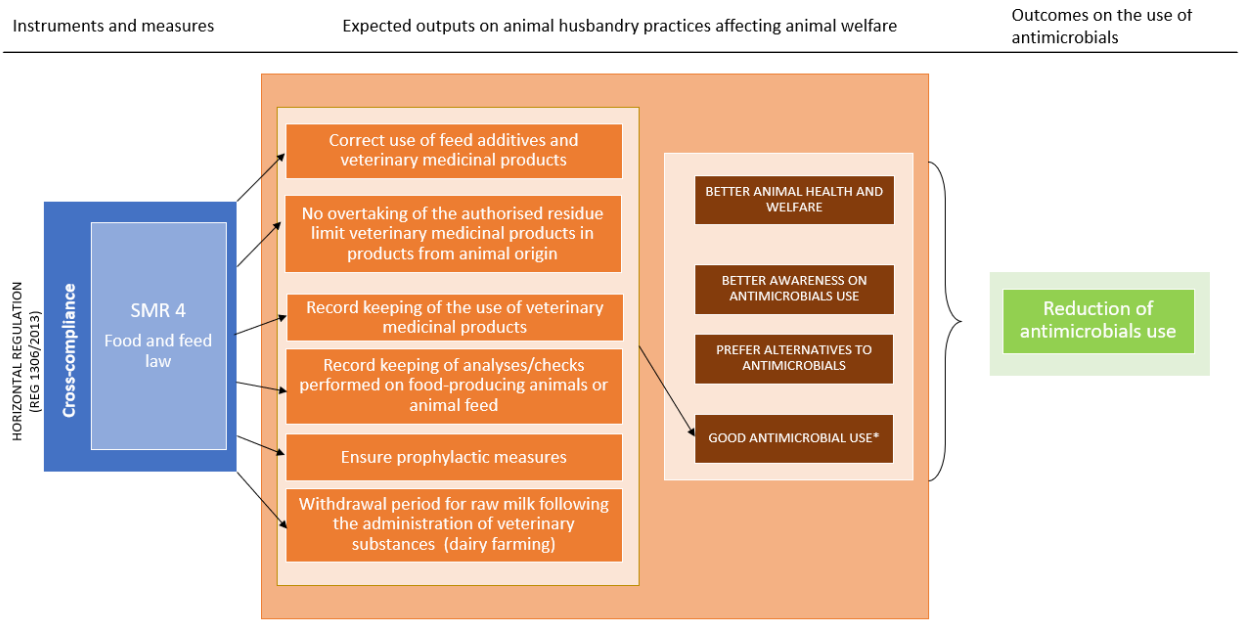


Source: Agrosynergie based on the regulations mentioned

4.4.3 CAP intervention logic on reduction of antimicrobial use

The CAP intervention logic on antimicrobial use is presented in the diagrams below.

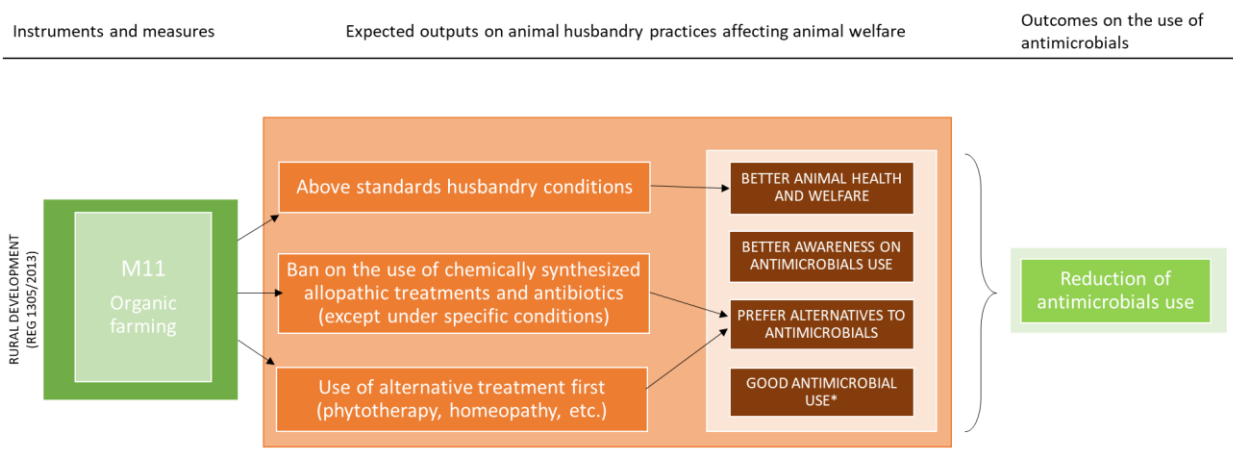
Figure 6: Diagram of the SMR 4 intervention logic on food and feed law, linked to the reduction of AMU



* Good antimicrobial use means: using the proper product, when necessary and at the right dose and keeping record of the treatment. Respecting withdrawal period for animal under treatment when it exist (for milking for instance) in order to avoid residues in food.

Source: Agrosynergie based on the regulations mentioned

Figure 7: Diagram of the M11 intervention logic on organic farming, linked to the reduction of AMU

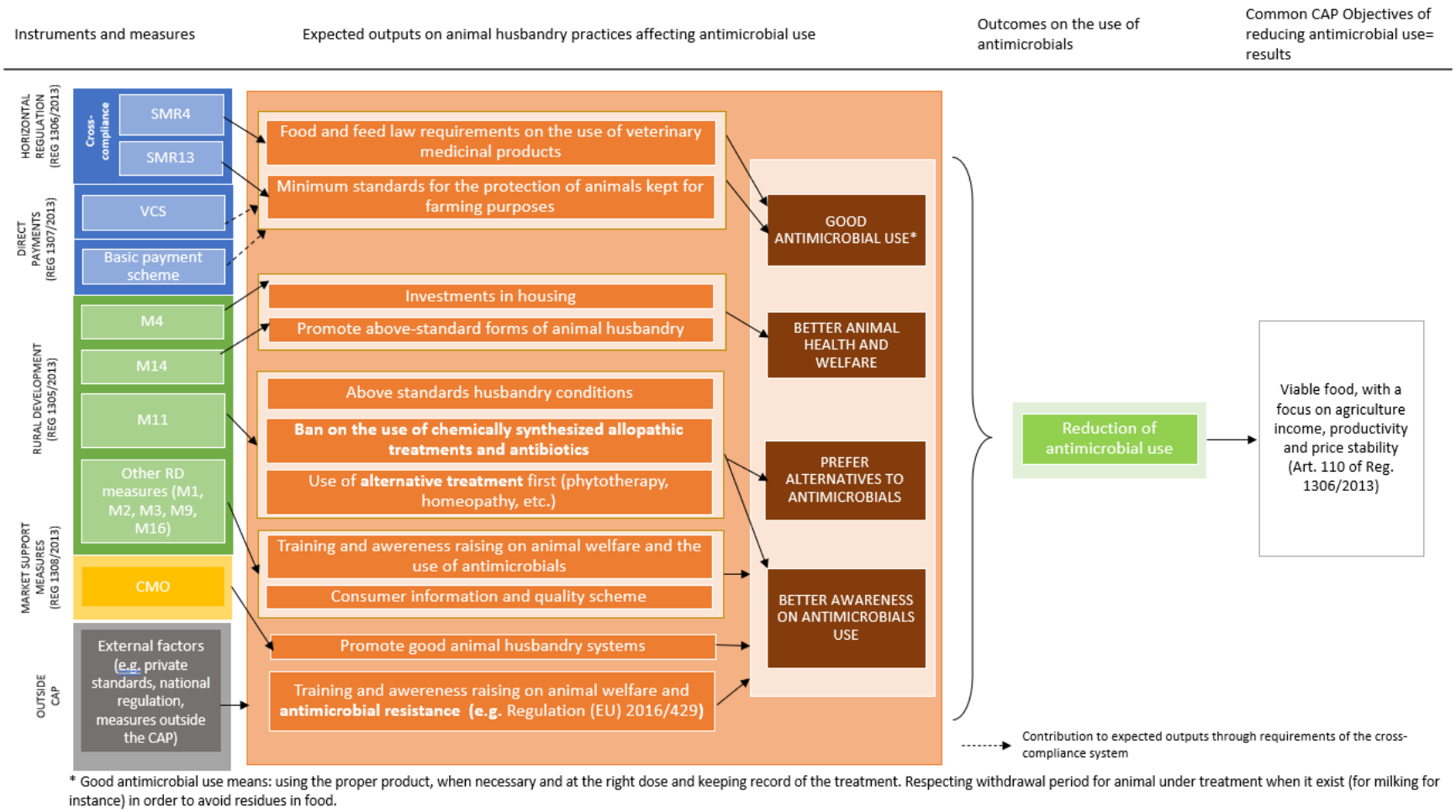


* Good antimicrobial use means: using the proper product, when necessary and at the right dose and keeping record of the treatment. Respecting withdrawal period for animal under treatment when it exist (for milking for instance) in order to avoid residues in food.

Source: Agrosynergie based on the regulations mentioned

The diagram below summarises the expected output and intended effect of the CAP instruments and measures on the reduction of antimicrobial use, combining the detailed diagrams presented above and the other relevant CAP instruments and measures.

Figure 8 : Diagram of the intervention logic of the set of regulations directly or indirectly linked to reduction of antimicrobial use



* Good antimicrobial use means: using the proper product, when necessary and at the right dose and keeping record of the treatment. Respecting withdrawal period for animal under treatment when it exist (for milking for instance) in order to avoid residues in food.

Source: Agrosynergie based on the cited regulations

5. DATA COLLECTION/SOURCES AND STUDY TOOLS

The methodological approach combines theoretical and empirical approaches and includes a variety of methods, both quantitative and qualitative, to address the different types of analysis that are required and are most suited to answer the Study Questions (SQ).

Where judgements relied on stakeholders' judgement, the consistency across multiple sources has been checked. In particular, information from case studies has been carefully analysed, taking into account its reliability and likely representativeness. In all answers to the SQ, the limitations of the available evidence are clearly indicated.

5.1 Methodological tools

This section presents the range of tools and methods used to carry out this study.

5.1.1 Information sources and analytical tools

For this study, several data sources were used. The following table summarises the data sources for each study question.

Table 2 : Data collection and analytical tools used for the study

Tool		Description	Type of tool	SQ concerned
Collection tools	**Documentary research, literature reviews**	The literature review was carried out to provide up-to-date knowledge on animal welfare and antimicrobial use. The main objective was to identify the effects of animal husbandry practices on animal welfare and on the reduction of antimicrobial use, as well as on the economic viability of farms.	Qualitative and quantitative	SQ 1 to 6 and SQs 8 and 9
	Databases	The data used in this report were extracted from: - databases providing context indicators (Eurostat, FAOStat); - CAP monitoring data available at EU level: indicators from the CAP common monitoring and evaluation framework (CMEF); - CAP detailed monitoring data collected from local authorities in the case-study areas; - data from the farm accountancy data network (FADN); - the European Medicine Agency database providing trends of antibiotics use on farmed animals in the EU	Quantitative	SQs 2, 3, 4, 6, 8 and 9
	Interviews at EU level	Interviews were carried out at EU level, with key organisations working on the topics of animal welfare and/or antimicrobial use and/or the CAP: - DGAGRI and DGSANTE units to clarify some aspects at EU level related to data, organisation, or the CAP; - a representative organisation of European veterinarians, to identify main challenges on animal welfare and antimicrobial use at EU level; - an organisation representing European farmers to have an overview of the sectors and their challenges; - an NGO representing civil society and working on the welfare of farmed animals.	Qualitative	SQ 1 and 3 to 9
	Case studies	Case studies were carried out in 11 relevant Member States/regions covering the variety of contexts across the EU. They enabled collection of primary and secondary information through the collection of literature, interviews with stakeholders, national regulation analysis and statistical data collection at national and regional level.	Qualitative and quantitative	SQ 1 to 9
	Questionnaire to additional Member States	To improve the representativeness of cases broached in the study, a questionnaire was addressed to six additional Member States (CZ, FI, HU, SK, IE and CY), selected for their ambitious strategy on animal welfare and antimicrobial use, notably through significant use of M14-Animal Welfare.	Qualitative and quantitative	SQ 4 to 6 and SQ8 to 9

	Tool	Description	Type of tool	SQ concerned
Analytical tools	**Statistical analysis**	Statistical analysis is the collection and interpretation of data in order to uncover patterns and trends. Descriptive statistics were used to describe different aspects of the statistical distribution of policy-relevant variables: frequencies and percentages, mean values, ratios, dispersion (e.g. standard deviation) and variability (e.g. coefficient of variation). Descriptive statistics are quite useful to describe or gauge problems as they are easy to implement and effective for conveying basic information and making elementary comparisons. This method was used to analyse CMEF data, additional RDP monitoring data collected in the case studies, data from the European Medicines Agency and FADN data.	Quantitative	SQ 2 to 6
	Matrix scoring	Comparison matrix and scoring are used to analyse the effect of management practices on animal welfare and the use of antimicrobials and of strategies implemented by Member States for measures addressing animal welfare and antimicrobial use, under the different regulations and/or their relevance to address their needs. The tool allows for a qualitative assessment to be made via budget comparison, number of measures implemented or uptake. Specific ratings/colours can be established to facilitate the interpretation of the tables.	Qualitative and quantitative	SQ 1 and 3 to 6
	Stakeholders' analysis	Stakeholder analysis was carried out at each step of the study, in order to prepare interviews with the relevant stakeholders and to analyse the information they provided in the light of their levels of participation, interests and influence on the CAP implementation.	Qualitative	SQs 1 to 9

Source: Agrosynergie

The Common Monitoring and Evaluation Framework (CMEF) includes a hierarchy of indicators, developed specifically for the monitoring and evaluation of the CAP as regards its general objectives[31].

It should be noted that, during the 2014-2020 period, very few output and result indicators targeted animal welfare and antimicrobial use. Because of their direct effect on animal welfare and antimicrobial use, specific attention was paid to Pillar II measures **M04-Investments, M11-Organic farming and M14-Animal welfare**, which support investments, organic farming and animal welfare respectively.

M14-Animal welfare specifically promotes above-standard animal welfare. Indicators on the number of beneficiaries, number of holdings, number of livestock units supported and on total expenditure are available in the CMEF database.

M11-Organic farming sets out above-standards for animal welfare and bans antimicrobial use. The CMEF database provides information on the areas supported and the number of certified registered organic operators.

The Member States' implementation of M14-Animal welfare, in terms of programmed amounts, actual expenditure and beneficiaries, are analysed based on their annual declaration to the European Commission for the 2014-2019 period. We also used data made available by the EC on the implementation of the measure M04-Investments in relation with animal welfare and antimicrobial use.

The case studies in 11 Member States provided complementary information on the CAP implementation. The types of operations of the measures impacting animal welfare and antimicrobial use, mainly M04-Investments and M14-Animal welfare, were described, as were the main drivers of Member States/regions and beneficiaries for implementing these measures.

The limitations of this data source are presented in **Chapter 3.3**.

[31] Article 110(2) of Regulation (EU) No 1306/2013.

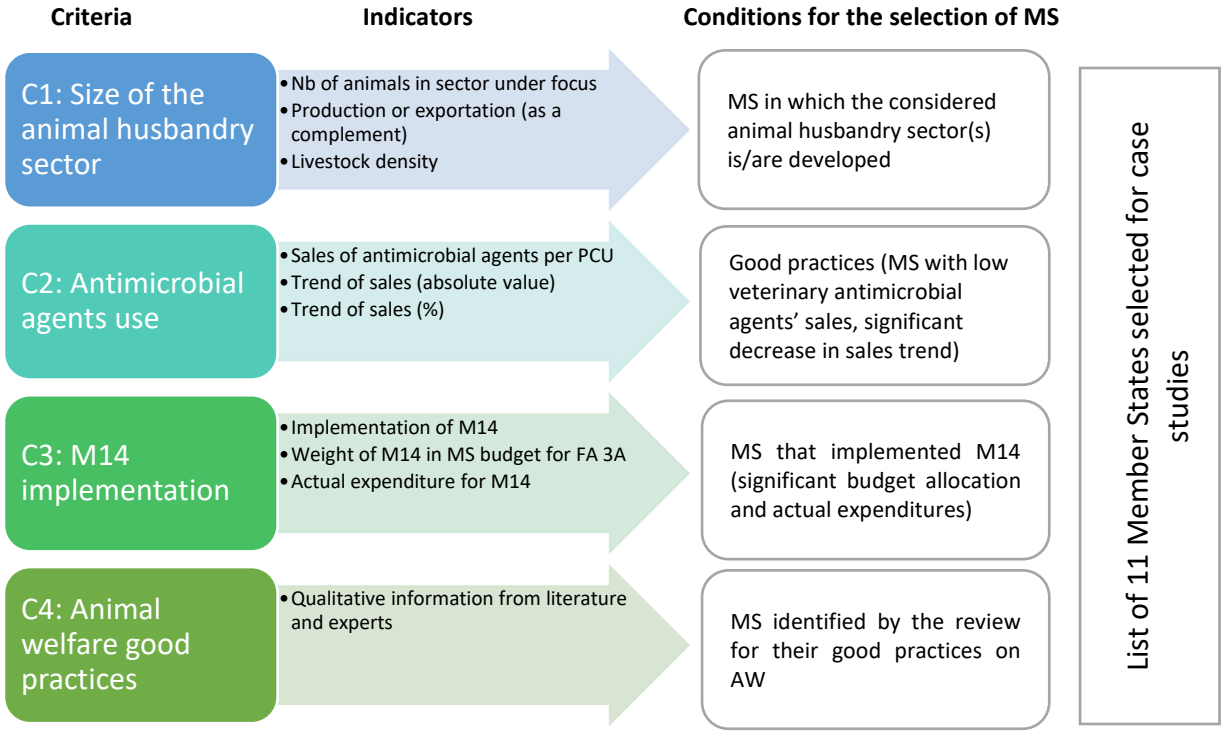
5.2 Method used to select and conduct the case studies

5.2.1 Methodology for selection of Member States and regions

In order to ensure coverage of the variety of situations across the EU and to comply with the Terms of Reference, selection of the case studies was based on four main criteria. The selection criteria corresponded to key aspects of the context that may determine implementation of the CAP on animal welfare and reduction of antimicrobial use.

The figure below shows the criteria and indicators that were considered.

Figure 9: Proposed criteria and indicators for case studies selection



Source: Agrosynergie

- C1: Size of the sector

  To assess the size of the sector in each Member State, the chosen indicators are the **number of animals** in each holding under consideration (e.g. number of live swine, number of dairy cows, number of laying hens). When not available or incomplete, **production or exportation** indicators were chosen, (i.e. quantity of ewe milk delivered to dairy, quantity of goat milk delivered to dairy, rabbit meat exportation). The **livestock density index** was added as an indicator, to take into account the utilised agricultural area (UAA) of each Member State, which is obviously a great influence on the number of animals and provides an insight into the intensity of production. The case studies focused on Member States and/or regions where the animal husbandry sector has a certain level of importance according to the above indicators.

- C2: Antimicrobial agents use

  The **quantity of veterinary antimicrobial agents for food-producing species sold per Population Correction Unit (PCU)** is the available indicator that gives the closest insight into use of antimicrobial agents across the EU. The analysis of this data over the period gives the **sales trend** as a possible indicator of the reduction (or not) of the use of antimicrobial agents.

- C3: Implementation of the CAP instruments and measures targeting animal welfare

  The case-study selection includes Member States or regions where the implementation of the CAP instruments and measures with an effect on animal welfare is significant. It aimed at bringing key material to the evaluation of the effectiveness and efficiency of those instruments and measures (SQs 2, 4-7). Member States / regions where these measures are not implemented were also considered in order to understand the reasons behind that choice and to a certain extent to help build a counterfactual situation. The chosen indicators are **implementation of M14-Animal welfare** in the Member State, **the budget the Member State has allocated to M14-Animal welfare**, and **the ranking of expenditures made in 2017 for M14-Animal welfare.**

- C4: Good practices on animal welfare

  'Practices' refers to actions taken at various scales by Member States, the private sector and farmers to improve animal welfare. The diversity in national regulation and private initiatives is sufficiently significant to be considered in the selection of the case studies, especially because they may impact the implementation choices and uptake of the CAP instruments and measures related to animal welfare (SQ 3).

  Qualitative information from experts and literature helped determine indicators or facts, e.g. on **organic farming development**, on **ambitious national laws and regulations**, on the existence of a **consistent set of measures** on the studied topics, on the existence of **well-established private standards with good performance** on animal welfare or reduction of antimicrobial use, and on the existence of **farmers' good practices** in the Member States.

5.2.2 The final case studies selection

Eleven Member States were chosen using the four previously mentioned criteria and according to the conditions for selection. Among those 11 Member States, five main sectors were divided into sub-sectors and studied. The case studies were carried out either on a national scale or a regional scale. The following table and map summarise the case-study final selection.

Table 3: Summary of the case studies selection

Selected MS	Focus sectors	Regions		RDP study
Denmark	Pigs	Whole MS		National
Germany	Pigs	Lower Saxony-Bremen, North Rhine-**Westphalia**		Both regions + Baden-Württemberg, Mecklenburg- **Western Pomerania**
	Cattle (Dairy, Beef)			
Estonia	Cattle (Dairy)	Whole MS		National
Spain	Pigs	Catalonia		Both regions + Cantabria, Andalusia
	Rabbits			
	Sheep/Goats	Castilla la Mancha		
France	Cattle (Dairy, Beef, Veal)	Brittany, Pays de la Loire		All 3 regions + Alsace
	Poultry			
	Sheep/Goats	Midi-Pyrénées		
Italy	Cattle (Beef, Veal)	Lombardy	Friuli- Venezia Giulia	All 3 regions + Emilia-Romagna
	Poultry	Veneto		
The Netherlands	Pigs	Whole MS		National
	Cattle (Veal)			
	Poultry			

Selected MS	Focus sectors	Regions	RDP study
	Rabbits		
Austria	Cattle (Dairy)	Whole MS	National
Poland	Cattle (Dairy, Beef)	Masovia	National
Romania	Poultry	South - Muntenia	National
Sweden	Pigs	West Sweden	National
	Cattle (Dairy)	East Middle Sweden West Sweden, Småland and the islands	
	Poultry	East Middle Sweden	

Source: Agrosynergie

5.2.3 Content of case studies

The same methodology was followed for all case studies. To ensure that the information provided was consistent, the core team delivered guidelines and templates to the geographical experts conducing the case studies. Case studies are composed of a national-framework-study part, which described in detail the implementation of the CAP instruments and measures in the studied Member States/regions and a sectorial-study part, which differed from one Member State to another depending on the sectors studied. A final part briefly covered the sectors not studied in detail in the sectorial part. This part identifies key information with regard to animal welfare and antimicrobial agents use; it focused particularly on good practices and initiatives.

5.3 Main limitations of the method used

The main limitations of the proposed method are:

- **Assessment of the effects on animal welfare**: The relationships between the farming practices and housing conditions/design fostered by the CAP and their outcomes on animal welfare are complex and influenced by many factors. Identification of the specific effects of the CAP instruments and measures would require comparison with a counterfactual situation in which the policy does not exist. However, the diversity of measures and their potential combination options, as well as the different context of Member States, means that it is not possible to find similar examples of farmers with and without the measures in a given context. This makes it challenging to isolate the impact of each individual CAP measure and instrument.
- **Absence of data on the types of operations supported by the RDP measures**: Consequently, it is difficult to assess to what extent the RDP measures targeted animal welfare and antimicrobial use reduction issues. For this reason, details on the types of operations supported and the corresponding executed budget are found in the case studies.
- **Lack of data – at the EU level and in most sectors – on the specific farm practices having an effect on animal welfare or the reduction of antimicrobial use**: This lack of data makes it difficult to observe changes following the implementation of CAP instruments and measures. Although FADN data were used to examine potential correlation between agricultural practices implemented and CAP supports, several limitations arise from the use of the database (see the box below).

Box 2: Limitations on the use of the FADN

Specificities of the FADN should be kept in mind when interpreting the data, and precautions must be taken for the analysis:

- The FADN does not include all agricultural holdings in the European Union; it includes only those which can be considered as commercial professional farms on account of their economic size. The definition of minimum economic size is specific to individual Member States.
- The FADN includes only data on a sample of farms in each Member State. Thus, the use of weighted factors is necessary to represent EU agriculture adequately.
- The FADN sample varies over time: each year, a certain proportion of farms leave the sample, and a similar proportion of new farms enter. Thus, depending on the type of analysis, identifying changes in the practices after the 2013 CAP reform would require the use of constant farm samples. This would essentially involve extracting from the FADN database the same farms present in the sample for all years of the interval under analysis. However, in practice, it is difficult to have constant farm samples for a long-term interval, as the number of farms remaining in a sample diminishes significantly with each additional year.
- It should also be emphasised that the FADN database refers to farms rather than to specific agricultural activities. Thus, to analyse changes relating to a specific production, samples of specialised farms must be used. Types of farming are defined in the FADN as the 'relative importance of the different enterprises on the farm', measured quantitatively as a proportion of each enterprise's output to the farms' total output. A farm is considered as specialised in one specific Farm Type when more than two- thirds of its total output is provided by one specific activity.
- In addition, in accordance with FADN rules, samples with less than 15 farms have not been analysed.

Finally, we have very serious doubts about the possibilities offered by the FADN to provide reliable answers on the subject of animal welfare.

Source: Agrosynergie

Besides these general challenges, some limits relevant to specific SQs are presented at the beginning of the answer to each SQ in this report, in Chapter 4. These limitations inevitably weaken the robustness of the conclusions that can be drawn.

6. STUDY QUESTIONS

6.1 SQ 1 on causal analysis – What are the main herd management practices and housing designs enhancing animal welfare and reducing antimicrobial use?

6.1.1 Understanding and method

This question provides the analytical framework which is used throughout the study. It establishes the causal relationships between **the farm practices (including housing conditions/design) implemented and the corresponding effects on animal welfare and antimicrobial use**. Farm practices can be divided into **five groups**: feeding practices, housing conditions, health management practices, practices enhancing natural behaviour and the particular case of killing unproductive animals on-site. The identification and the qualification of practices are based on scientific evidence and practical experiences in different contexts. Their outcomes were considered on the **'five freedoms' used for the assessment of animal welfare** (i.e. no hunger and thirst; no discomfort, fear and distress; no pain injury and disease; expression of normal behaviour) and on the reduction of antimicrobial use.

6.1.2 Herd management practices and housing conditions/design enhancing animal welfare and/or reducing antimicrobial use

6.1.2.1 Effects of feeding practices on animal welfare and antimicrobial use

Literature and case studies clearly showed that **appropriate supply of feed (including water)** quantity, quality, diversity and safety, adapted to the animal's needs and phase of development, is crucial for its health and welfare, and thus for the reduction of antimicrobial use, in all animal sectors (Ritskes-Hoitinga and Strubbe, 2007; Savenije, Strubbe and Ritshes-Hoitinga, 2010; Villalba and Manteca, 2019; Nagaraja and Lechtenberg, 2007; Snyder and Credille, 2017). Food restriction as well as force-feeding both have clear negative effects on all components of animal welfare and may induce antimicrobial use by affecting the immune system (EFSA, 2012; Devant and Marti, 2020). Moreover, **high fibre intake** is especially valuable and crucial to meet one of the **behavioural needs of ruminants**: oral manipulation of feed and rumination (Lindström and Redbo, 2000; Ridge, Foster and Daigle, 2020).

Effects associated with the implementation of feeding practices are described in the table below.

Table 4: Effect of feeding practices on animal welfare and the reduction of antimicrobials use

FARMING PRACTICES		ANIMAL WELFARE OUTCOMES				REDUCTION OF AMU
		Reduction of hunger, thirst	Reduction of discomfort, fear, distress	Reduction of pain, injury, disease	Perform natural behaviour	
Feed quantity	Feed restriction	-	-	+/-	-	-
	Force feeding		-	-	-	-
Feed quality and diversity	Good nutritional balance management	++	++	++	++	++
	High fibre intake	++	++	++	++	++
	Feed diversity and choice	++	++		++	
	Appropriate supply of feed additives	+/-	+/-	+/-	+/-	++
	Feed safety management	++		++		++
	Water safety management	++		++		++

Clear beneficial impact: ++; **Clear negative impact**: -; Beneficial impact, when combined with other practice(s): +, Mixed impact depending on their implementation: positive or negative: +/-; **Empty cells:** no relation found in the literature

Source: literature review, case studies and interviews with researchers

Feeding practices are particularly relevant for animal welfare and antimicrobial use **in the veal calves sector**. Literature mentions that the immunity of calves bred in anaemic conditions is poorer and that they are more likely to develop parasitism and diseases (EFSA, 2012; Devant and Marti, 2020). The Dutch case study[32] also highlights the **importance of a higher share of roughage in the diet**, in order to ensure higher iron levels and to prevent abnormal oral behaviour like tongue rolling. This issue is less significant in pink veal farming, which gives calves access to more roughage. A wider application of some selected feed additives and combinations thereof targeting intestinal microbiota and immunity can reduce antimicrobial use (Den Hartog, Smits and Hendriks, 2016).

6.1.2.2 Effect of housing conditions/design on animal welfare and antimicrobial use

Several issues of animal welfare and antimicrobial use are related to housing conditions, in particular to indoor conditions. Therefore, **sectors characterised by widespread indoor systems (i.e. pig, poultry and rabbit sectors) are those most concerned**.

Table 5: Effect of housing conditions/design on animal welfare and antimicrobial use

FARMING PRACTICES		ANIMAL WELFARE OUTCOMES				REDUCTION OF AMU
		Reduction of hunger, thirst	Reduction of discomfort, fear, distress	Reduction of pain, injury, disease	Perform natural behaviour	
Increased space allowance (area per animal)			++	++	++	++
Group size		+/-	+/-	+/-	+/-	+/-
Provision of enrichment			++	++	++	
Litter and indoor flooring	Flooring without vegetal litter		+/-	+/-	-	++
	Flooring with vegetal litter		++	+/-	++	+/-
Microclimate control	Air cleaner		++	++		++
	Humidity control		++	++		
	Temperature control		++	++		++
Proper light management			++	++	++	
Methods for keeping animals indoor	Group housing	+/-	+	+/-	++	+/-
	Individual housing		-	+/-	-	+/-
	Permanent tethering		-		-	
	Tethering with mostly daily access to pasture or outdoor/indoor run				-	
Well-managed outdoor access and grazing		+/-	++	+/-	++	+/-

Clear beneficial impact: ++; **Clear negative impact**: - ; Beneficial impact, when combined with other practice(s): +, Mixed impact depending on their implementation: positive or negative: +/-; **Empty cells:** no relation found in the literature

Source: literature review, case studies and interviews with researchers

Increased space allowance

Increased space allowance (i.e. lower density) is decisive for animal welfare and antimicrobial use and is broadly promoted by the farmers representatives and researchers interviewed. Generally, studies show that **high stocking rates induce social stress and fighting as well as disturb resting and food access** (Veissier et al., 2008; Weeks, 2008; Park, Foster and Daigle, 2020; Thomas et al., 2011; Zepp et al., 2018; Ferrante et al., 2006). High density also increases **risk of pathogens transmission** and **manure management** problems (Sevi et al., 2009; Caroprese et al., 2008; Richmond et al., 2017).

Density is key in sectors where animals are kept inside. Case studies[33] in Spain–Catalonia, the Netherlands and Sweden underlined the **importance of housing conditions of sows, with increased space allowance and group**

[32] The calves' sector were studied in France-Brittany and Pays de la Loire, and in the Netherlands.
[33] The pig sector was studied in Denmark, Germany, Spain, the Netherlands and Sweden.

housing. In Romania, reduction of density in **poultry farms** enabled birds to **express their natural behaviour** and helped **improve their health and/or diminish death rate**.

There are few studies on the **effect of farm size**, which seems to have no clear effect on animal welfare (Munsterhjelm, Heinonen and Valros, 2015; Meyer-Hamme, Lambertz and Gauly, 2016; Robbins et al., 2016; Meyer-Hamme, Lambertz and Gauly, 2018). The effect of **group size is not clear either**: studies are often contradictory, and it seems that there is no scientific consensus about the effect of group size on animal welfare (Weeks, 2008).

Provision of enrichment, litter and flooring

The provision of enrichment[34] is critical in indoor systems to **reduce aggressive and abnormal behaviour** (i.e. in the pig, poultry and rabbit sectors). It is implemented as a way to reduce **mutilations** (i.e. tail-docking to avoid tail-biting in the pig sector, beak trimming to avoid feather pecking in poultry sectors), some of which are carried out to prevent or limit the consequences of abnormal behaviour. Enriched environment **reduces discomfort, fear, distress, pain, injuries, diseases and allow the animals to express their natural behaviour** (Studnitz, Jensen and Pedersen, 2007).

The **presence of litter** in particular enhances natural behaviour, especially **for cattle and pigs**. In the poultry sector, littering material allows chicken to scratch. However, the provision of litter requires more work to clean and remove manure, and vegetal litter is more likely to contain bacteria and pathogens (Amon et al., 2007; Wang et al., 2011; Sutherland et al., 2017). On the contrary, **concrete, slatted or wire mesh floors without vegetal litter** allow the drainage of liquid manure, and the resulting decrease in ammonia concentration is beneficial for animal health and for reduction of antimicrobial use (Svennerstedt, 1999; Magnusson, Herlin and Ventorp, 2008).

Most case studies[35] highlighted that **provision of enrichment material** (e.g. straw and 'rode' materials) **was increasingly practised in the pig sector**, to reduce the risk of tail-biting. However, it remains marginal in the Netherlands because of the widespread use of slatted floors, which makes it difficult to use straw. Flooring is critical in other sectors too. In Germany and in the Netherlands, instead of litter, **one- or two-strip rubber flooring for both concrete and wooden slats is used to enhance calves' comfort** and limit leg problems. **In the rabbit sector, feet problems of does** are avoided in the Netherlands by using 'welfare cages' with a plastic floor instead of wire flooring. Despite a general positive effect, researchers underlined the increased antimicrobial use due to increased contact with faeces.

Microclimate control and light management

Microclimate control mainly concerns indoor systems, on which it has **positive effects in terms of both animal welfare and antimicrobial use reduction**. Indeed, literature showed that **immunity can especially decline in heat stress** conditions (Silanikove, 2000; Banhazi et al., 2009; Rath et al., 2015; Geers et al., 1989). In hot summers, water sprinklers can improve the stable climate and help to reduce sweating of cattle, whereas for pigs other cooling systems are needed (as pigs do not sweat). **Ventilation** sufficient to eliminate excess heat, moisture and pollutant gases (especially ammonia and carbon dioxide) as well as dust induces better comfort and limits the occurrence of diseases (Veissier et al., 2008; Weeks, 2008; Park, Foster and Daigle, 2020). **Light management** also boosts animal welfare and was particularly mentioned by researchers.

In the pig and rabbit sectors (e.g. Spain–Catalonia), the sheep and goats sector (e.g. Spain–Castilla La Mancha), as well as the poultry sector (e.g. Romania), farmers who modernised their buildings have invested in **microclimate control, with better air filtering**.

[34] Enrichment means any arrangement in the environment that stimulates animals to perform their normal behaviour. For instance, for cattle: cow brushes, hung balls, trees for body scratching and logs; for sheep and goats: wood blocks, bridges and bunks; for pigs: straw, substrates, peat or mushroom compost; for poultry: pecking stones, pecking blocks, substrate (mushroom, straw, paper, wood shaving, etc.), perches, bales of straw, balls, empty boxes, hollow concrete structures, dust baths, vegetation, shelters; for rabbits: gnawing sticks, platforms and hidings.
[35] Denmark, the Netherlands and Sweden.

Methods for keeping animals indoors

Individual housing (cage systems, farrowing crates and stall pens) can be implemented by breeders to reduce the dissemination of diseases (notably for calves to avoid the transmission of diarrhoeal and respiratory diseases). However, the effects of various housing practices on disease transmission are sparsely considered and currently hardly described in scientific articles. Moreover, **isolation induces distress that may increase health problems** and has mixed effects on the performance of natural behaviour and the frequency of pain, injury and disease, depending on the housing design (Marcé et al., 2010).

In each sector, housing is decisive for animal welfare, and new practices tend to emerge. In the Netherlands, where **group housing of sows is considered important**, law requires that gilts and sows can stay isolated only for 4 days after service[36]. The transition from farrowing crates to farrowing pens was identified as a positive change in Denmark and Spain and is widespread in Sweden.

Park housing systems for fattening rabbits, which encompasses group housing, enrichment and space to jump, is generally implemented in the Netherlands, while only in experimentation in Spain. Park housing is more difficult to implement for does, but 'welfare cages' give them more space for movement in the Netherlands.

In the poultry sector, interviews revealed major changes in housing conditions (free-range with outdoor access, barn systems[37]), notably in the laying hens sector after the mandatory end of unenriched cages and implementation of EU marketing standards for eggs[38]. Barn systems are particularly widespread in the Netherlands and in Sweden.

Tethering remains an issue in some dairy cow systems in Austria, Germany (in organic farming with the obligation of outdoor access several times a week) and in most dairy farms in Estonia (tethered grazing, mainly on small farms). Tethering is stressful for animals and prevents them from expressing a normal behaviour (Veissier et al., 2008; Weeks, 2008; Park, Foster and Daigle, 2020). Nevertheless, **it may allow grazing in some systems**, and negative impacts of tie stalls can be reduced when cows have daily exercise inside or/and outside.

Outdoor access and grazing

Outdoor access allows animals to live in a **more complex and more natural environment,** which helps to avoid frustration and enables animals to express natural behaviour such as foraging, food selection and lying down (Olmos *et al.*, 2009); (Charlton *et al.*, 2011); (Van laer *et al.*, 2014). Moreover, grazing with sufficient nutritional intake, implemented through rotational pasture systems, increases fibre intake and **improves the immune system and the global health condition** of animals. While leg problems, injuries and mastitis seem to occur less frequently, animals benefiting from outdoor access are more **sensitive to climate and weather events, and more susceptible to parasites** (Washburn *et al.*, 2002; Haskell *et al.*, 2006; Olmos *et al.*, 2009; Charlton *et al.*, 2011; Van laer *et al.*, 2014). Therefore, outdoor access must be adequately managed to provide shelter, good feeding conditions and prevent any health problems (Sevi et al., 2009; Caroprese et al., 2009).

In the **cattle sector, farming systems considered in the case-study areas generally provide outdoor access**. In Austria, outdoor access contributes to increased space allowance for exercise, social interactions, exploration and exposure to climate (sunbathing). In France-Brittany, temporary grasslands are being introduced in crop rotation systems and grazed. In Poland, **enlargement of living space enables outdoor access to grazing areas or paddocks**.

[36] Article 3(4) of EU Directive 2008/120/EC on the protection of pigs only requires sows to be kept in groups from four weeks after service.
[37] In barn systems, hens are kept in sheds using the floor space only.
[38] Provided by Reg (EC) No. 589/2008 on marketing standards for eggs. The systems which remain in use are enriched cages where laying hens have at least 750 cm² of cage area per hen and alternative systems where the stocking density does not exceed 9 laying hens per m² usable area, with at least one nest for every 7 hens and adequate perches. Whichever system is used, all hens must have a nest, perching space, litter to allow pecking and scratching and unrestricted access to a feed trough. In free range and barn systems, hens can roam freely in a shed, but they have the opportunity to roam outdoors during daylight hours only in free range systems.

However, **most pig, poultry and rabbit husbandry systems still have no outdoor access**[39]. In France, modern outdoor grazing systems for rabbits are being developed (mainly for organic farms) (Martin et al., 2016); Bio des Pays de la Loire, 2020). Outdoor access is also increasing in the laying hens sector, due to the marketing standards for eggs brought about by the CMO regulation[40].

6.1.2.3 Effect of health management practices on animal welfare and antimicrobials use

Animal health is key for both animal welfare and antimicrobial use. Several recent studies found evidence that a **high level of animal welfare on-farm is significantly linked to low antimicrobial use** (Stygar *et al.*, 2020; Diana *et al.*, 2020; Tarakdjian *et al.*, 2020). Nevertheless, case-study reports pointed out that an unreasonable reduction of antimicrobial use may also lead to more diseases and pain for animals, and thus have negative effects on animal welfare. **Antimicrobial use reduction needs to be accompanied by suitable farming practices or/and housing conditions (e.g. better microclimate control, alternative treatments)**. Furthermore, ill animals need to be treated.

Table 6: Effect of health practices on AW and the reduction of AMU

FARMING PRACTICES		ANIMAL WELFARE OUTCOMES				REDUCTION OF AMU
		Reduction of hunger, thirst	Reduction of discomfort, fear, distress	Reduction of pain, injury, disease	Perform natural behaviour	
Hygiene management	Holding and gear hygiene			++		++
	Quarantine and avoiding infections from the outside			++		++
Treatment management	Prophylaxis and alternative treatment[41]			++		++
	Targeted curative treatment with AMU[42]			++		++
	Curative AMU avoiding HPCIA[43]			++		++
Mutilations without method to avoid pain (long-term effect on animals of dehorning, tail-docking, teeth restriction, castration)			-	-	-	+/-
Alternative practices for the suppression of painful practices	Mutilation with pain-avoiding practices (analgesia, genetic selection, hormonal castration)		-	+/-		+/-
	No mutilations (keeping horns, tail, all teeth and no castration)		++	+	++	+
Genetic selections (to improve robustness, longevity and adaptability)		++		++		++

Clear beneficial impact: ++; **Clear negative impact**: -; Beneficial impact, when combined with other practice(s): +, Mixed impact depending on their implementation: positive or negative: +/-; **Empty cells:** no relation found in the literature

Source: literature review, case studies and interviews with researchers

Hygiene and treatment management practices

Hygiene and treatment management practices seem to be the greatest and most direct potential contribution to antimicrobial use reduction, and they also contribute to avoiding pain, injury and disease. All measures taken to **limit**

[39] The pig sector was studied in the following areas: Denmark, Germany–Lower Saxony-Bremen and North Rhine-Westphalia, Spain-Catalonia, the Netherlands, Sweden-West Sweden. The rabbit sector was studied in Spain and in the Netherlands. The poultry sector was studied in France–Pays de la Loire and Brittany, Italy–Veneto and Friuli-Venezia Giulia, the Netherlands, Romania and Sweden–East middle Sweden.
[40] Reg (EC) N. 589/2008.
[41] Other than antimicrobials.
[42] As opposed to metaphylaxis and group treatment.
[43] In this case, the reduction of AMU is qualitative, and not necessarily quantitative, and refers to the use of alternative treatments versus the use of Highest Priority Critically Important Antimicrobials (HPCIA), based on WHO and AMEG classifications.

the entry of pathogens from the outside and to **improve hygiene on the farm**, such as quarantine and overall hygiene (e.g. holding and gear hygiene) limit the occurrence of diseases and thus possibly antimicrobial use (Sevi et al., 2009) (Jones, 2011; Raisbeck, 2020; Umar et al., 2014; Meyer and Casey, 2012). **Appropriate treatment management** also helps to reduce antimicrobial use, either quantitatively or qualitatively, through the use of **prophylaxis[44] and alternative treatments to antimicrobials, notably to Highest Priority Critically Important Antimicrobials (HPCIA)** ((EMA), (CVMP) and (CHMP), 2019). These practices, as well as **early detection** of diseases, were highlighted in the case studies.

Group medication of cattle is rare, although veal calves can be subjected to group treatment using antimicrobials. On the contrary, **preventive group medication is carried out in the poultry and the pig sectors,** as part of herd health strategy (European Commission, 2015). According to an Austrian private standard, **HPCIAs are in common use in the dairy cow sector**, even when not needed from a veterinary perspective. However, antimicrobial use in extensive production systems is generally relatively low (European Medecines Agency, 2020).

Mutilations

Generally, the absence of castration, dehorning, tail-docking, teeth restriction and beak trimming is positive for animal welfare because it enables improved expression of natural behaviour. But **mutilations are practised for several reasons, which can be due to external factors or to other farming practices** (Nannoni et al., 2014); (AVMA, 2015); (Janczak and Riber, 2015):

In the cattle sector, **dehorning and disbudding** are practised to facilitate the handling of animals. Without the use of anaesthesia or/and analgesia, these are painful, and complications such as infections may occur if animals are not carefully nursed (Liron, 2011; Robert *et al.*, 2014; Hempstead *et al.*, 2018; Hempstead *et al.*, 2019; Casoni *et al.*, 2019). **Horn removal may affect social relationships in a herd**, as horned cattle resort less to physical interactions than hornless cattle, leading to more stable social relationships under suitable environmental conditions and management (Knierim, Irrgang and Roth, 2015).

In the pig sector, the systematic cutting of tails is a very significant pending issue in case-study areas, except in Sweden, where tail-docking was banned in 1988. Tail-biting can be avoided through enrichment (straw or rode material), lower density, feeding practices and ventilation, according to researchers and farmers representatives. **Pig castration is widely implemented**, except in Spain–Catalonia, due to the type of outlet for meat, and in the Netherlands, where a lot has been done to reduce castration of pigs consumed in the single market.

In the poultry sector, **beak trimming is banned for laying hens in Sweden and in the Netherlands**[45], where other practices have helped reducing feather pecking (e.g. multi-level housing, change in feeding, enrichment, quality lighting, change of breed).

Genetic selection

Breed choice and genetic selection are very important for animal health and welfare, since they directly impact **animals' capacity to adapt to fluctuations in farm environments** (input costs, dairy product demand, climate, etc.). To improve animal welfare and antimicrobial use reduction, genetic selection should focus on traits like health (e.g. foot health), longevity, reproduction qualities (fertility, ease at parturition) (Vickers and Wright, 2013).

In case studies, the positive effect of genetic selection is mostly mentioned for the **broiler sector** with the **use of slower-growing breeds in France, Italy, the Netherlands and Sweden**[46]. These breeds improve animal welfare through better health and also enable antimicrobial use reduction. Indeed, average antibiotic use in the production of the slower-growing broilers is one third of that of conventional broilers (Bergevoet, 2019). The importance of breeds was also highlighted in Sweden for **laying hens**, as one of the factors preventing feather pecking.

[44] Actions taken to prevent disease.
[45] It was announced in the Netherlands in 2013 and officially implemented in September 2018.
[46] The poultry sector was also studied in Romania.

6.1.2.4 Effect of practices enhancing natural behaviour on animal welfare and antimicrobial use

Practices enhancing natural behaviour have a clear positive effect in avoiding discomfort, fear and distress and an overall beneficial effect on animal health, e.g. by reducing abnormal aggressive behaviour and limiting distress.

Table 7: Effect of practices enhancing natural behaviour on AW and reduction of AMU

FARMING PRACTICES	ANIMAL WELFARE OUTCOMES				REDUCTION OF AMU
	Reduction of hunger, thirst	Reduction of discomfort, fear, distress	Reduction of pain, injury, disease	Perform natural behaviour	
Promotion of maternal behaviour: mother's milk consumption and later weaning	++	++	++	++	++
Maintenance of stable groups		++	++	++	++

Clear beneficial impact: ++; **Clear negative impact**: -; Beneficial impact, when combined with other practice(s): +, Mixed impact depending on their implementation: positive or negative: +/-; **Empty cells:** no relation found in the literature

Source: literature review, case studies and interviews with researchers

Weaning is stressful for animals, and excessively **early weaning increases stress and induces abnormal behaviour[47] and diseases** (Robert, Weary and Gonyou, 1999; Grøndahl et al., 2007; Napolitano, De Rosa and Sevi, 2008; Dorning and Harris, 2017; Orihuela and Galina, 2019). In addition, studies show that **mother's milk consumption, and specifically colostrum, improves the immune system** (Nocek, Braund and Warner, 1984; Besser and Gay, 1994; Allemand, 2008; Boudry et al., 2008); (Borghesi et al., 2014).

In the French and Austrian case studies on **cattle sectors, maternal behaviour, i.e. cow-calf contact during rearing, or even calves fed by their mother in France, is identified as a successful practice**, even if it is not widespread. On the contrary, the Dutch case study highlighted the risk of insufficient colostrum intake of calves intended for veal meat, since dairy farmers mostly care about calves kept for replacement. This could cause a lack of immunity in animals that will be mixed and encounter pathogens at a young age, and thus increase antimicrobial use.

In Spain–Catalonia, the **duration of pig weaning has increased by 4 days in 10 years**. According to the farmers representative, with later weaning, piglets gain more weight and are less aggressive. **Late weaning was also identified as a crucial practice for rabbit welfare**.

The constitution and **maintenance of stable groups**, when animals are kept collectively, is also an important factor for the balance of social animals, positively influencing their behaviour, limiting the fear and distress associated with the arrival of foreign congeners and thus limiting injuries and pain (Fernández, Alvarez and Zarco, 2007; Hemsworth et al., 2014; Proudfoot and Habing, 2015; Dorning and Harris, 2017; Hemsworth, 2018). It also reduces the risk of pathogen introduction and therefore of antimicrobial use.

6.1.2.5 Effect of killing-on-site practices and animal-human interactions on animal welfare and antimicrobial use

Killing on-site may occur for unproductive animals and needs to be performed adequately to reduce fear, distress and pain. **Animal/human interactions also influence animal welfare**, and appropriate treatment and management of animals may reduce the use of antimicrobials.

[47] The main oral abnormal behaviour observed in these situations was sucking the navel or the scrotum of pen mates. As this non-nutritive sucking is usually performed while the other lambs feed, the subject being sucked may be disturbed in milk ingestion, while the animal performing the abnormal behaviour may ingest reduced amounts of food.

Table 8: Effect of killing on-site and other practices on animal welfare and the reduction of antimicrobial use

FARMING PRACTICES		ANIMAL WELFARE OUTCOMES				REDUCTION OF AMU
		Reduction of hunger, thirst	Reduction of discomfort, fear, distress	Reduction of pain, injury, disease	Perform natural behaviour	
Human-animal interaction	Farmer training	++	++	++	++	++
	Management in loading and moving animal on-farm		+/-	+/-	+/-	
Killing on-site	Practices improving conditions when killing unproductive animals on-site		++	++		

Clear beneficial impact: ++; **Clear negative impact**: -; Beneficial impact, when combined with other practice(s): +, Mixed impact depending on their implementation: positive or negative: +/-; **Empty cells:** no relation found in the literature

Source: literature review, case studies and interviews with researchers

Animal-human interaction

For all sectors studied, **good animal-human relationships and farmer staff training** are a key factor which will positively influence all categories of practices related to animal welfare and antimicrobial use (Jansen et al., 2010; Verdon et al., 2015; Balzani and Hanlon, 2020). An interesting and successful concept is the stable schools for common experimental learning with farmers, developed by (Vaarst *et al.*, 2007) in Denmark.

For instance, on **feeding and housing**, training on suitable pasture for grazing dairy cows was underlined in Austria. **Training and advice to farmers for better health management,** especially to raise animal welfare, avoid the preventive use of antibiotics, improve diagnosis and implement biosecurity practices, were generally presented as very relevant to reduce antimicrobial use in case studies. Training on **handling animals** is crucial: if training is not properly implemented, handling procedures can lead to abnormal behaviour, distress and injuries (Tremblay, 2017; Ebinghaus, Ivemeyer and Knierim, 2018; Grandin, 2019).

Killing-on-site practices

Literature and official EU recommendations[48] also highlight that there is a need to train and inform operators on how to **safely, rapidly and painlessly kill animals on-site** and to avoid the major problems associated with killing on-site, which are consciousness, pain, fear and distress (Woods, Shearer and Hill, 2010; Nielsen et al., 2019).

6.1.3 Implementation of systemic approaches beneficial for animal welfare and antimicrobial use

Most stakeholders interviewed stressed the need to implement a **systemic approach to achieve animal welfare or the reduction of antimicrobial use at farm level**. Systemic approaches require farmers to have a global comprehension of how farming practices and housing conditions interact and potentially affect animal health and welfare.

According to literature and interviews, simple systemic approaches can be implemented on-farm to improve **climate management** or increase **biosecurity** to avoid the introduction of pathogens in a herd and prevent animals from contaminating each other. More complex and holistic approaches can rely on **the entire stable design** to foster the

[48] https://ec.europa.eu/food/animals/welfare/practice/slaughter/2018-factsheets_en

https://op.europa.eu/en/publication-detail/-/publication/ea4ef3e9-cda5-11e7-a5d5-01aa75ed71a1/language-en

implementation of specific animal welfare practices adapted to the needs of each animal species (e.g. group housing, avoidance of mutilations), and/or improve **animal robustness[49], including longevity and adaptability**, so that they can adapt better to their living conditions.

Table 9: Combination of practices and systemic approaches for AW improvement and AMU reduction

	Climate management	Biosecurity	Animal-friendly stable design	Animal robustness
Feeding		- Feed and water safety	- Feed and water safety	- Quantity, quality, diversity, safety - Adapted to the phase of development
Housing	- Litter and indoor flooring - Low density - Outdoor access - Microclimate control (air cleaner, humidity, temperature)	- Litter and indoor flooring - Low density - Outdoor access - Microclimate control	- Group housing - Litter and indoor flooring - Proper light management - Enrichment - Low density - Outdoor access - Group size - Microclimate control	
Health			- Avoidance of mutilations - Quarantine zone	- Genetic selection
Natural behaviour			- Promotion of maternal behaviour - Stable groups	- Colostrum intake
Killing on-site			- Improved conditions when killing unproductive animals on-site	

Source: literature review, case studies and interviews with researchers

Across the case-study areas, the **modernisation of farm buildings was often mentioned as contributing to the improvement of several aspects relating to housing conditions**, and thus can be considered as fostering systemic approaches for stable designs (e.g. for pig or cattle stables in Germany or for the poultry sector in Romania). Moreover, modernisation of farm buildings sometimes contributed to implementation of new feeding and biosecurity practices, which improved health and animal welfare conditions and enabled reduction in drugs administration and/or a decrease in death rate.

Enrichments, low livestock density, outdoor access and appropriate feed management were generally presented in case studies as the most relevant combination of practices to ensure animal welfare. In France and in the Netherlands, a successful systemic approach combined several practices and the use of slow-growing breeds of broilers (see box on next page).

[49] Animal robustness refers to the enhancement or continued good functioning of the animal's immune system and to the animal's good general health, thereby helping to limit the outbreak of diseases and consequentially reduce antimicrobial use.

Box 3: The systemic approach of slow-growing breeds in the broiler sector in the Netherlands

In the Netherlands, broiler systems using slow-growing breeds are **less dense** (25-38 kg/m²), **differentiate feeding** and promote **enrichment** (elevated perches, at least one straw bale per thousand animals, sometimes platforms). Rules differ depending on retailers. Lower density leads to less manure and **less footpad lesions**. Slower growing breeds are more moving animals, thus are less subject to **hock burns** and practice more scratching (better for the litter quality) and have **fewer locomotion problems** (better bone strength). **Mortality** is reduced. The average **use of antibiotics** (in daily dose) in the production of conventional broilers is threefold greater compared to that of slow-growing broilers.

Source: Case study from the Netherlands

Organic farming can also be considered as a relevant systemic approach for improved animal welfare and reduced antimicrobial use, as practices implemented in organic animal husbandry (according to the EU organic regulations) differ significantly from conventional ones and are characterised by increased space allowance, permanent outdoor access, no preventive antimicrobial use, stricter treatment management of antimicrobial use, reduced mutilations (for safety reasons and under anaesthesia or analgesia). Specific practices are also set for each animal species. Cattle have longer weaning periods, more roughage-based feeding and specific bedding requirements instead of full-slatted floors. Pigs get litter and roughage, and poultry benefit from more light, more perches and nests, access to dust baths and ad libitum access to fresh water. Broiler production requires the use of slow-growing breeds (Schmid and Kilchsperger, 2011).

One literature resource reviewed (Åkerfeldt *et al.*, 2021) systematically mapped and summarised animal health and welfare in organic production. The authors suggest that **organic standards provide a useful framework for a high level of animal welfare. However, some health and welfare issues are also present on organic farms**, such as mastitis and lameness of dairy cows. This shows a need for the development of more outcome-oriented approaches for animal welfare and more research.

6.1.4 Other factors influencing animal welfare and antimicrobial use

Aside from farming practices, **other factors may impact animal welfare and antimicrobial use**.

Literature and interviews with farmer representatives, researchers and veterinarians emphasise that **natural events may have significant effects on animal welfare and antimicrobial use**. Heat stress affects the metabolic and health status and the immune response of animals (Nardone et al., 2010). Therefore, **higher temperatures and humidity levels** may lead to the widespread administration of antibiotics to animals (Bailey, Froggatt and Wellesley, 2014). **Specific housing systems will help to counterbalance such external factors**. In outdoor free-range systems, there are many ways to improve thermoregulation for animals (e.g. provision of shelter, sprinklers in outdoor runs, temporary grazing, use of indigenous and adapted breeds, etc.) and thereby reduce high-temperature stress. In Estonia, Spain, France, Italy, Austria and Romania, researchers and farmer representatives highlighted that droughts or heavy rains can also impact crops and therefore animal feed availability and quality.

Sanitary crises also directly affect animal welfare and animal health, and they increase antimicrobial use. Researchers and farmer representatives pointed out the effects of enteropathy in young rabbits (Spain–Catalonia), porcine flu (Spain–Catalonia) and avian flu in poultry sector (France).

The use and dosing of the various antimicrobial agents varies substantially between animal species. As indicated in the ESVAC report, variations in reported sales (mg/PCU) between countries are likely to be due in part to differences in the composition of the animal population, production systems and prescription guidelines or habits in the different countries (European Medecines Agency, 2020).

6.1.5 Summary of findings

A thorough literature review helped to set the **list of management practices and housing conditions influencing animal welfare and/or reducing antimicrobial use**. These practices encompass feeding practices, housing conditions,

practices enhancing the natural behaviour of animals, practices affecting the health and practices related to killing unproductive animals on-site.

According to literature and case studies, **housing conditions** may have a significant impact on animal welfare. Animals reared indoors can be exposed to increased discomfort and stress and must be able to express their natural behaviour. **Increased space allowance** and **provision of enrichment**, especially litter, are both practices used to reduce stress and aggressive behaviour; they also promote better health. **Microclimate control** in indoor systems also contributes to both animal welfare and antimicrobial use reduction, e.g. by preventing heat stress. **Group housing** is generally favoured in case studies (e.g. for sows, poultry, rabbits, calves and cows), as isolation leads to distress that may increase health problems.

Literature and case studies agree on the importance of **outdoor access**, which allows animals to live in a **more diverse and more natural environment** and helps them to express their natural behaviour. However, particular attention must be given to appropriate feeding, shelter from climatic conditions and prevention of parasitism. In these conditions, outdoor access is also beneficial for health. Most pig, poultry and rabbit husbandry systems have no outdoor access in case-study areas.

Mutilations such as castration, dehorning, tail-docking, teeth restriction and beak trimming are still common practices in most case-study areas**.** Some mutilations are carried out to prevent abnormal behaviour that could be tackled by implementing other practices For example, tail-biting can be avoided through enrichment, lower density, feeding practices and ventilation according researchers and farmers representatives.

Among **health practices**, **hygiene** and appropriate **treatment management** have the greatest potential to reduce antimicrobial use and pain, injury and disease. According to the literature and case studies, animal welfare helps to reduce antimicrobial use. However, it requires adapted health management practices and treatment of animals who need it. **Genetic selection** is also an important practice impacting animal welfare as well as antimicrobial use, as it can enable animals to better adapt to their environment and develop fewer health problems. It was mentioned frequently in case studies when discussing the broiler sector, with regard to the use of slow-growing breeds.

Both case studies and literature show the importance of **feeding practices** for animal welfare as well as antimicrobial use reduction in all sectors. The provision of roughage appears as particularly important for ruminants.

Practices enhancing **natural behaviour** (provision of enrichment, outdoor access, later weaning) were highlighted in case studies. **Good animal-human relationship** and **farmer staff training** can also impact both animal welfare and antimicrobial use issues by helping farmers to act appropriately and implement appropriate practices.

To be particularly effective, animal-friendly practices must be **designed and implemented in combination at farm level**. According to literature and interviews, simple systemic approaches can be implemented on-farm to improve **climate management** or increase **biosecurity**. More complex and holistic approaches can rely on **the whole stable design** to foster the implementation of practices adapted to the needs of animal and/or improve **animal robustness, including longevity and adaptability**. Organic farming is another systemic approach which promotes high standards for animal welfare.

Furthermore, **external factors** were identified as having a direct effect on animal welfare and antimicrobial use. **Natural events and sanitary crisis can impact animal welfare and health** and should be appropriately managed by farmers. Another factor influencing overall antimicrobial use in husbandry sectors in Member States is the composition of the animal population, production systems and prescription guidelines or habits in the different countries.

6.2 SQ 2 on causal analysis - To what extent have the implementation of animal welfare practices supported by the CAP influenced livestock production and the economic viability of farms?

6.2.1 Understanding and method

This question aims to examine the effects of the implementation of new practices enhancing animal welfare on livestock production (i.e. quantity, quality and geographical location, broken down by type of livestock production system) and economic viability of farms (production costs/production prices and farm income).

However, there are no data available at EU level accurately documenting the effects of animal welfare practices on production and costs. Notably, it is impossible to identify in the FADN holdings benefiting from M14-Animal welfare. Hence, to assess the impact of animal welfare practices on production and economic viability of farms, different analyses were carried out:

- First, the analysis focused on how production costs changed after the implementation of improved practices induced by regulatory requirements (e.g. Council Directive 2008/120/EC laying down minimum standards for the protection of laying hens as from 2012 and pigs as from 2013). Indeed, since the FADN does not make it possible to identify animal welfare practices, the changes improving animal welfare enforced by the regulation was the most reliable means identified for examining the effects of the implementation of new practices enhancing animal welfare. FADN data are used to examine potential differences in production costs of farms specialised in pig rearing and laying hens before and after the implementation of measures on cages in 2012 (laying hens) and on the group housing of sows 2013 (pigs).
- Secondly, it focused on whether different production systems with specific animal husbandry systems present different average volumes of production, costs and farm income. For that purpose, two comparisons were carried out. The first compared organic/non-organic production systems of all animal husbandry systems. The second compared different pig production systems. The FADN was also used to see whether production costs (including veterinary costs), production value and farm net added value were different for organic farms vs non-organic farms. All animal husbandry sectors and all Member States were considered for this analysis, except for the comparison among pig systems, which was focused on the example of the **Spain**-Andalusia and **Spain**-Catalonia systems.

The change in quality arising from practices was mostly documented through case studies (opinions of stakeholders) and a literature review. EIP projects were considered, as some could also provide valuable information on this aspect.

For voluntary practices to improve animal welfare and reduce antimicrobial use, all analyses were rounded out by opinions of stakeholders in case studies and by the literature review.

Nota Bene – limitations: Whilst the qualitative information collected (literature, interviews in case studies) enabled us to identify good examples of specific practices/production systems associated with positive economic returns, demonstration is very difficult to establish on a quantitative basis. Moreover, quantitative analyses based on FADN needed to be carefully interpreted, because of:

- the wide disparity in farms considered in the analysis and the predominant role of other factors in economic results, and
- the time left by the legislation for farmers to comply with the minimum requirements. For instance, the banning of unenriched cages applied for all holdings in 2012. but the measure was adopted in 1999 and became applicable for new buildings from 1/1/2003 and may have been anticipated by farmers.

6.2.2 Changes in production costs and investments

This part analyses how changes in practices/housing conditions to improve animal welfare affected investments, additional production costs and savings.

6.2.2.1 Short-term effect on investment costs

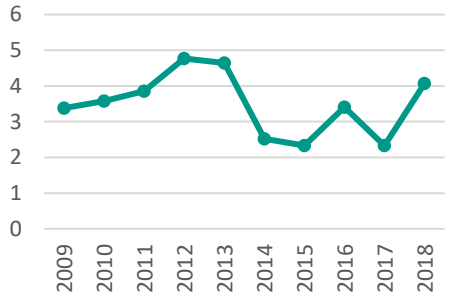
The implementation of practices/housing conditions improving **animal welfare often involves investments for farmers.**

These investments can be significant, in particular when building improvements are needed (e.g. introducing group housing of animals, removing slatted floors or giving outdoor access). But less significant investments can also improve animal welfare, (e.g. some types of enrichment, adding drinking troughs and light sources, etc.). A study showed that in some instances improving ventilation in cattle buildings could be carried out without significant investment (Vickers and Wright, 2013). Some practices even do not require special investment (e.g. colostrum intake, genetic selection).

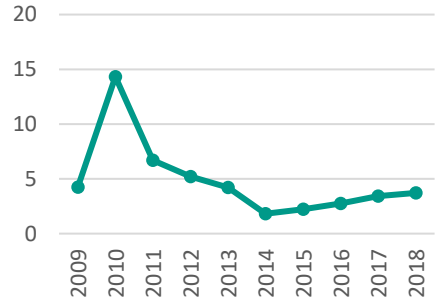
FADN data were used to measure the impacts of the implementation of animal welfare practices on investments and production costs, economic viability, and herd size of farms following regulations introducing higher animal welfare requirements in the pig and laying-hen sectors. Council Directive 2001/88/EC on **minimum standards for the protection of pigs** mainly addresses livestock building characteristics (reduced density) and equipment (enrichment material) for breeding sows. Requirements had already been in effect since 2003 for all newly built or rebuilt holdings, but from 2013 all pig had to must comply. Similarly, under Directive 1999/74/EC on **minimum standards for the protection of laying hens**, since 2003 no unenriched cages can be built or brought into service for the first time, and since 2012 this type of rearing system has been prohibited.

Figure 10: Analysis at EU level of the effects of animal welfare practices on investments in buildings (EUR 10 000)

In the pig-rearing sector - Constant sample[50]



In the laying-hen sector - Constant sample[50]



Source: FADN.

The figure above shows that the average annual investment cost of pig-rearing farms dropped after 2013. Regarding the laying-hen sector, annual investments in buildings were relatively high in 2010 (more than EUR 143 000 on average) and 2011 and quite low in 2014 (less than EUR 20 000 on average). Based on the assumption that, at EU level in the 2012-2013 period, just these two directives (Council Directive 2001/88/EC and 1999/74/EC) pushed farmers to make significant changes in their production methods in order to meet mandatory requirements (in both the pig and laying-hen sectors), the results shown in Figure 10 might indicate that farmers had to make significant investments over the period, but there is not enough other information to conclude that this investment was significantly for animal welfare purposes.

50 Constant samples gather farms present in the FADN sample each year from 2009 to 2018. A constant sample was built for pig farms (376 farms) and another one for laying hens farms (85 farms) each at EU level due to the limited number of farms available. These samples make it possible to avoid biases related to differences in FADN samples from one year to another.

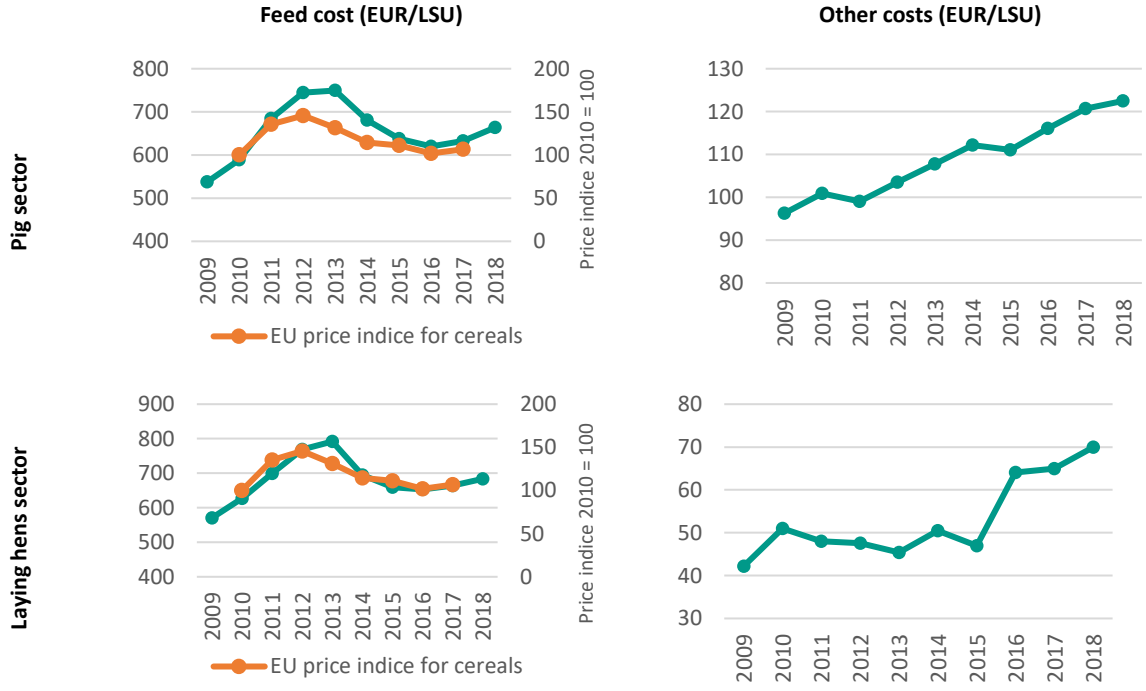
6.2.2.2 Animal welfare improvements and additional production costs

Apart from investments in equipment material and buildings, the implementation of practices enhancing animal welfare can lead to additional production costs depending on the practice (e.g. regular provision of straw or roughage as enrichment for pigs, vaccination programmes, regular hoof trimming of ruminants). The Econwelfare project (Schmid and Kilchsperger, 2010) for instance highlighted that **labels promoting animal welfare generally led to higher production costs, but less than in the case of organic farming** because they involve fewer requirements.

However, **the significance of these additional costs depends on the system in which the practice is implemented**. More broadly, the additional costs of implementing a set of practices to reach a system that could be considered 'animal-welfare friendly' depends on the level of animal welfare consideration already in the system in which they are implemented. The poorer the animal welfare in this system, the more likely additional costs will be significant to reach the objective. This is illustrated by a study from the European Commission assessing the cost of compliance with EU directives (Menghi et al., 2014), which underlines that, to reach a certain standard of animal welfare (in this case compliance with EU directives on animal welfare), cost varied from one Member State to another. It was for instance lower in Denmark, where stringent national requirements were already in place, and more significant in Poland, where pig farms are relatively small and without previous stricter national measures.

The **FADN analysis** in constant samples, showed that pigs feed cost seemed to peak in 2012-2013, before stabilising over the 2015-2018 period and as seen in Figure 10, in the 2012-2013 period investments in buildings also peak in the pig sector. However, the evolution of EU price index of cereals suggests that the increased feed costs in the 2012-2013 period is more likely to result from feed price variations rather than a cut in in feed quality or quantity to cover extra production costs linked to the directive. Furthermore, other livestock specific costs (including veterinary costs) do not show such variations. For laying hens feed costs per LSU show the same trend. **No clear relationship between the implementation of new animal welfare practices and the evolution of livestock production costs** established except that it did not seem to negatively impact the quality or quantity of feed provided. **Even if evidence is limited it seems that farmers did not compensate expenses needed to comply with the Directive 1999/74/EC by cutting off feed costs**.

Figure 11: Analysis at Member States level of the effects of animal welfare practices on production costs



Source: FADN - Constant sample analysis[50] ; Eurostat database (online data code: APRI_PI10_OUTA).

6.2.2.3 Savings due to improved animal welfare

The effect on production costs of having implemented animal welfare practices must take into consideration the savings that can also lead to. Indeed, the Happy Milk EIP project in Italy showed that in eight dairy cow farms the **higher the animal welfare score was, the lower the production costs were,** and that an increase in the IBA score of 50 points allowed for potential reduction in production costs of between EUR 3.5 and 6 per 100 kg of milk (Menghi et al., 2018).

Notably, **production statistics and costs on farms are significantly influenced by the health indicators of their animals**. Most losses in the area of animal husbandry (mortality, compulsory slaughtering, diseases, poor reproduction and body mass index (BMI) results, medical expenses, etc.) are the result of diseases of animals caused by unfavourable conditions related to animal breeding, feeding and raising or other external factors (power failures, damage from hail, etc.) (Vetter, Vasa and Ózsvári, 2014). For instance, a study stated that poor ventilation of cattle buildings could increase the incidence of Bovine Respiratory Disease (BRD) in groups of weaned calves. A BRD outbreak could cost at least £82 per animal affected (approx. EUR 95.5) due to loss of live-weight gain, medicines, mortality, veterinarian costs and other costs. Therefore, improvement of ventilation would reduce the costs related to BRD outbreaks (Vickers and Wright, 2013).

Choosing cows breeds by taking into consideration animal robustness characteristics can have a huge effect on cost reduction. Problems in fertility, udder and hoof health are the current crucial themes on dairy farms, as they often cause huge economic losses for farmers (Brocard et al., 2018). Good reproduction characteristics (e.g. fertility and easy farrowing) contribute to longevity and are linked to the robustness of the animals (Bodas et al., 2018).

Another example is **feeding costs in the dairy-cow sector, which represent about 50% of all costs** in milk production (Brocard et al., 2018), and of which almost three quarters is derived from purchased feed[51]. Enhancing grazing could contribute to feed self-sufficiency by improving home-grown feedstuff and protein production. Self-produced forages are the cheapest feedstuff and make it possible to reduce inputs in the farming systems, and therefore production costs (Bodas et al., 2018). Introducing grassland (including legumes) into agricultural rotation for high-quality forage production can reduce N fertilisation, pesticide application and feeding costs. Nevertheless, the cost reduction made by introducing new strategies will not always compensate for the input costs caused by meeting new standards (Wosnitza et al., 2018). Positive effects on animal health were also identified from grazing, which leads to lower veterinary, breeding and medicine costs per cow than in indoor systems. Consequently, cows can be milked longer and culled older (Hanson et al., 2013) (Wosnitza et al., 2018).

In particular, in the high-yield-milk dairy farming system, which is often sensitive to increase in soybean and protein costs and which remain economically efficient only with very high yields and high milk price, use of a high proportion of grass derived from high-quality forages can lead to significant (more than 20 per cent) reduction in feeding costs and in an increase in income over feed costs by about 10% (Borreani et al., 2013).

As a consequence, **appropriate keeping and care of animals that takes into account animal welfare and related practices may prevent material losses** (Vetter, Vasa and Ózsvári, 2014) (Vickers and Wright, 2013) (Hanson et al., 2013).

Also, the **changes undertaken to fulfil animal welfare requirements are often accompanied by technological improvements and modernisation**, which might keep a husbandry farm competitive. For instance, in Hungary, most turkey-meat market participants suffered a loss in 2012, due to increased energy and feed prices, except those who had already modernised their ventilation, feeding and water supply systems (Vetter, Vasa and Ózsvári, 2014).

Therefore, the effects that implementing animal welfare practices can exert on production costs and savings are not easy to assess, as they greatly depend on several factors, such as the system in which they are implemented and the level of animal welfare conditions already established. Indeed, neither the FADN analysis implemented nor the case studies made it possible to significantly round out the above analysis, which is mainly based on a literature review.

[51] European dairy farms are becoming increasingly dependent on off-farm and human-edible feedstuff, often imported from other continents (i.e. soybeans from South America). According to FADN data, purchase of off-farm feed represented 88% of feed cost increase in the 2007-2014 period.

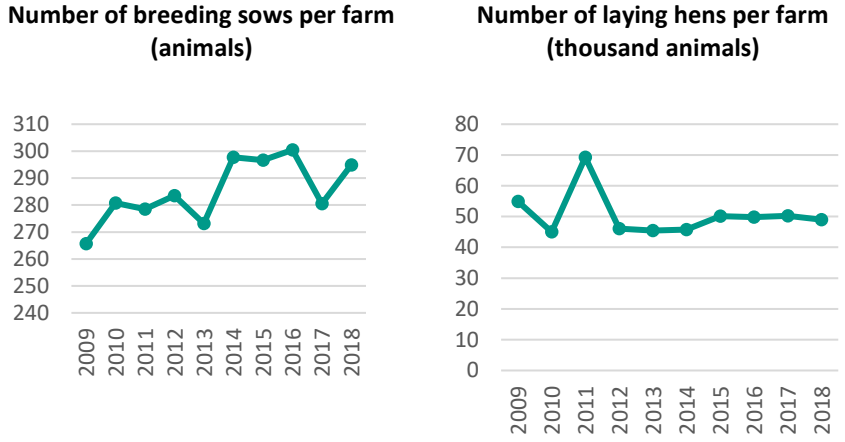
6.2.3 Changes in volumes produced and number of farms at regional level

This part will examine the relationship between volumes, number of farms and animal welfare requirements.

6.2.3.1 Effect of animal welfare practices on volumes

To investigate how animal welfare regulatory requirements could impact farm characteristics such as herd size, FADN analyses were performed. They show (see figure below) that introducing new animal welfare requirements did not seem to impact the average number of breeding sows per farm (which seems to be undergoing a relatively stable increasing trend). In the laying-hen sector, although a peak in the number of animals per farm can be observed in 2011, further analysis shows that this situation is specific to a Member State which is overrepresented in the FADN sample[52]. **It is therefore difficult to state that introducing new animal welfare requirements had any effect on the size of farms**, except that the average number of laying hens per farm has remained remarkably stable since the 2012 deadline (around 50 000).

Figure 12: Constant sample analysis[50] at EU level of the effects of animal welfare practices on farms sizes



Source: FADN. Average value per farm. The pig sector is represented by holdings specialised in pig rearing and pig rearing and fattening combined. The laying-hen sector is represented by holdings specialising in laying hens and laying hens and poultry-meat combined. Constant samples[53] are based on 376 holdings for pigs and 85 holdings for laying hens. The number of farms of each Member State included in the constant sample is provided in the table:

MS	Pigs	Laying hens
BE	10	2
BG	11	12
CY	0	1
CZ	0	1
DK	1	0
DE	107	1
ES	29	10
EE	0	1
FR	39	3
HU	1	9
IT	2	1
LU	1	1
LV	2	2
MT	6	2
NL	27	17
AT	58	5
PL	54	7
RO	0	1
FI	5	0
SE	17	0
UK	6	9

In the dairy cow sector, literature-review conclusions vary with regard to the effect of implementing animal welfare practices on milk yield, in particular related to use of pasture (Schulte *et al.*, 2018; Wosnitza *et al.*, 2018). But it is recognised that feeding management can cause fluctuations in milk yield (Bodas et al., 2018; Brocard et al., 2018). Hence, the effect of grazing on milk yield will greatly depend on effective pasture management and on use of forages to maximise the energy or protein yield of grassland (herbage phenologic stage, cow grazing selection, grazing management, etc.) (Farruggia et al., 2014). Also, the Happy Milk EIP project carried out on eight dairy-cow farms

[52] This cannot be further detailed as data protection policy of the FADN does not allow to expose the results of samples smaller than 15 farms.

[53] This means that the sample is composed of the same holdings each year.

pointed out that an increase in the IBA Animal Welfare Score[54] of 50 points on farms allowed for potential increase in milk production of approximately 500 kg/year/cow (Menghi et al., 2018). Additionally, a study (Vickers and Wright, 2013) points out that poorly ventilated cattle buildings increased the risk of BRD outbreaks in calves and thus affects production level.

Therefore, practices improving animal welfare do not necessarily affect production negatively, and they even have the potential to increase production volumes, depending on the practice, the context and management of the farm. Nevertheless, no robust quantitative information at EU level is available to measure these effects.

6.2.3.2 Production concentration

The analysis of volumes and farm numbers at NUTS 2 level based on Eurostat data made it possible to identify changes in these aspects in the various sectors.

Eurostat data showed an increase in production (e.g. milk production for the dairy-cow sector, or in LSU for other sectors[55]) in a lower number of farms in certain areas, which indicates overall intensification of production in all sectors over the 2010-2016 period, except in the rabbit sector, for which no data are available.

But the data available for the **dairy-cow sector**, i.e. milk volumes and LSU, show that this intensification can occur **at animal level** (increased milk production by a lower number of LSU), for instance in Estonia, where in 2020 the annual average milk yield per cow continued to grow, reaching 9 943 kg, i.e. a rise of 310 kg year-on-year[56]. Such intensification can also occur **at farm level** (increased number of LSU for a lower number of farms). For instance, the case study revealed that Estonia went through a sharp increase in farm size in recent years. Between 2000 and 2015 the average number of cows per farm in Estonia spiked from 32 cows to 136 cows. But this phenomenon is also visible in some regions of Spain, Germany-North Rhine-Westphalia and Lower Saxony, France-Brittany and Austria.

Examples of extensification (lower number of LSU or milk production by a higher number of farms) **are quite rare**, e.g. in Italy-Sardinia and Romania for the dairy-cow sector, Romania-South East for the cattle-fattening sector, Poland-Pomerania for the sheep and goat sector, **Italy-Lazio and Latvia** for poultry sectors, and Sweden-Middle Norrland and Lithuania for the pig sector.

The relation between concentration, intensification, productivity and animal welfare is shown in the next section.

6.2.4 Changes in productivity, sales and farm income

6.2.4.1 Productivity and animal welfare

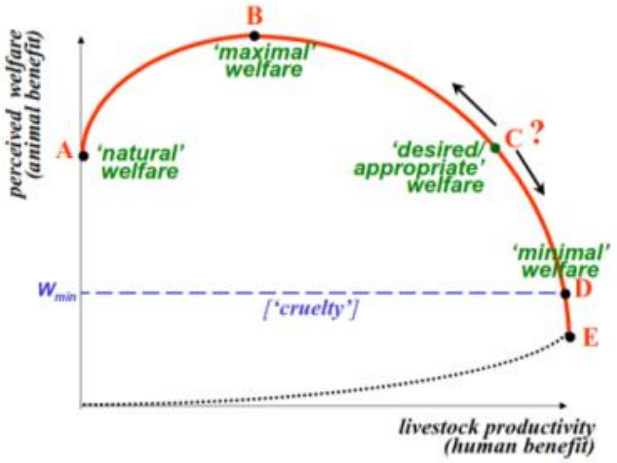
The McInerney Welfare-Productivity Model (see **Figure 13**) shows that **improved animal welfare is linked to improved livestock productivity until a certain point** (Point B). **Beyond that point, livestock productivity can be improved, but to the detriment of animal welfare**, until it productivity reaches a point where the level of welfare is considered unacceptable by society (Point D) and then to where the system is no longer sustainable and collapses (Point E). Therefore, according to this model, beyond a point, higher welfare standards involve some sacrifice in livestock productivity. However, this is a conceptual model that originated from general principles that are almost impossible to quantify, and impossible to calculate for an individual farm (Vetter, Vasa and Ózsvári, 2014).

[54] The Livestock Welfare Index, known as IBA (Index Benessere Animale), is an evaluation system developed by the CRPA which estimates the potential of farming methods and structures to provide a certain level of animal welfare. It is a tool whose goal is to identify the weak points of a farm, allowing the owner to make targeted adaptation interventions, in order to improve the well-being of their animals and the profitability of their enterprise. This index provides a score for each aspect of the farm: management, buildings, housing, cleaning of cows, etc. https://www.ruminantia.it/la-valutazione-del-benessere-animale-con-il-sistema-iba/

[55] In most sectors, the livestock units are the closest information available regarding production volumes at NUTS 2 level.

[56] https://news.err.ee/1608088000/statistics-agricultural-output-rises-in-2020 (accessed 05/08/2021).

Figure 13: The McInerney Welfare-Productivity Model



Source: (Mcinerney, 2004)

The short-term costs of animal welfare changes are the easiest to recognise. In the long term, it is harder to determine the measurable and quantifiable positive effects of the improvements because it is not easy to identify which factor causes the enhanced results (i.e. more effective medicines, better quality feed, more effective equipment or improved animal welfare) (Vetter, Vasa and Ózsvári, 2014). However, experiments focusing on different aspects of the connection between animal welfare and productivity show a clear correlation. Indeed, while adjustment to a new environment requires energy in adaptation from animals, which may reduce their performance, improved animal welfare will in most cases improve rates of productivity, especially in the long run. **Animals able to express and live according to natural behaviour are healthier, live longer and produce more** (Vetter, Vasa and Ózsvári, 2014; Wosnitza *et al.*, 2018; Fraser, 2007).

Economic productivity is a balance between production costs and volume, and, as discussed in previous sections, the fact that several aspects come into play makes it difficult to assess the effect of the implementation of animal welfare practices on these aspects. Still, improving animal welfare has the potential of reducing costs and increasing volumes (even if not in all examples), and therefore of improving productivity. The question is to identify where the farm is on the McInerney model curve compared to Point B, and also to find out if the targeted practices are the ones that will provide enough welfare to reduce costs and/or increase volumes.

Intensification, productivity and animal welfare

(Fraser, 2007) states in his article that what is commonly called **'intensification'** includes two aspects: the **concentration of animal production on fewer units**, and the **move toward indoor confinement systems**, especially for non-ruminant animals. Both of these trends are and have been the result of a variety of factors (e.g. workforce shortages, technologies and medication allowing large numbers of animals to be raised successfully in small spaces), the major one being the declining profit. Thus, with less money and time available per animal, farm size tends to increase and farmers focus on reduction of costs and losses. Indoor systems initially enabled reductions in labour costs and in losses due to disease and mortality (better hygiene control). However, **further reduction of costs** creates living conditions (e.g. reduction of space and bedding comfort, poor air quality, less time for animal care and handling) that no longer suit animals' needs and create major welfare problems (Fraser, 2007). Finally, these two trends often occur together and imply higher risks for animal welfare, i.e. the risk of going over Point B of the McInerney welfare-productivity model, meaning a decrease in animal welfare.

Furthermore, grazing dairy systems are limited by their need for pastureland that is adjacent to the milking parlour and located no further than a cow can walk to and from twice a day. This requirement likely limits the maximum size

of a grazing farm, especially in areas where land prices and rents are high (Hanson et al., 2013), confirming that production concentration is indeed likely to occur to the detriment of grazing systems.

Genetic selection has historically focused mainly on production traits rather than on welfare traits such as fertility and health (Bodas et al., 2018). Genetic selection for increased milk production has been associated with increased milk production per cow, lower body condition score, greater milk production response to concentrate supplementation, and reduced fertility and survival (Dillon et al., 2006). This suggests that intensification at the animal level may be correlated with a higher risk of lower animal welfare due to lower animal robustness.

Therefore**, the production concentration identified in the previous section may suggest a higher risk for low animal welfare**, since increasing productivity beyond the optimal point could be achieved at the detriment of animal welfare. However, we have no detailed information to enable us to identify on which part of the McInerney curve the various EU production systems can be positioned by sector.

6.2.4.2 Effects on quality and sales

From the sales point of view, the situation is paradoxical. As underlined in literature and in several Member States/regions studied (e.g. in the Netherlands), consumers usually do care about farm animal welfare. Indeed, **ethical consumerism has increased over the last two decades** (Te Velde, Aarts and Van Woerkum, 2002). Nevertheless, a **majority of EU consumers do not take animal welfare into consideration when buying food**. This could be explained by financial reasons and by the lack of available information on the shelves (Vetter, Vasa and Ózsvári, 2014). As for the EESC study, it concludes that **consumer decisions are basically determined by prices** and that animal welfare often plays no part or is only one factor among many influencing product choice (EESC, 2012). But the situation is evolving quickly, and a small but powerful animal-rights lobby is raising public awareness about its criticisms, thereby putting pressure on politicians, retailers and industry. As a reaction to the increasing social demand for animal welfare, **dairy companies have created products with new standards and labels on the milk production process and started up advertising campaigns** to demonstrate their respect of animal welfare ((Bodas *et al.*, 2018); (Wosnitza *et al.*, 2018).

Farmers are requested to meet contradictory demands from society: to produce quality but cheap raw material for the processing industry, but in a more resilient way[57]. New requirements and standards often generate additional costs, but **the value added by farmers to such products does not always result in sufficient economic return**. This could result in solutions which are not feasible on-farm and are not economically sustainable (Bodas et al., 2018). In the dairy farming system with a low stocking density, a large proportion of grassland surface (e.g. in mountain areas), the feeding costs are usually lower compared to the intensive dairy farming systems. But low milk yield makes these systems often dependent on increased added value of dairy product derivatives for their economic performance (Brocard et al., 2018).

Initiatives are attempting to overcome these issues and encourage the implementation of animal welfare practices. For instance, the animal welfare initiative in the German pig and poultry meat sectors (Initiative Tierwohl) established a **fund financed by retailers** based on the amount of meat they sell, to reward farmers who implement additional animal welfare practices. In 2020, 25% of pigs and about 70% of chicken and turkeys were affected (see box below). This fund will be abolished for fattening pigs because costs are now apparently covered by higher market prices.

Labels are a way to address consumers' concern for animal welfare, but also to highlight other qualities. The dairy sector in particular is seeing an increasing number of labels of milk produced from 'pasture' feeding systems, 'mountain milk' production systems, and 'hay-milk'; these natural products with higher nutritional value are increasing their market share (Wosnitza et al., 2018). **Labels can enable higher selling prices for farmers in some but not all cases,** as pointed out in the Member States/regions studied. For instance, the French 'Label rouge' implies

[57] On 27 September 1999, the Council of Ministers for Agriculture showed clearly that agriculture in the EU involves more than just producing sufficient and cheap food for EU citizens. The multifunctional model of EU agriculture has an important role in the economy and in society as a whole.

improved welfare for animals and higher production costs according to an NGO, sectors and standards representatives. But it was also highlighted that the selling prices covered the additional costs for the poultry sectors, but not necessarily for the cattle sectors, depending on the market segments. In the Netherlands, the Beterleven label is recognised by consumers, NGOs and farmers representatives: among Dutch retailers, in 2020, this label accounted for 90.7% of the pig market, 21.5% of the poultry market, 13% of the cattle and calf markets and 78.8% of the egg market. It is a voluntary system, but market pressure (i.e. Dutch retailers or export countries with high concern for animal welfare) makes it sometimes necessary for farmers to enter this quality system to access this dominant market.

Farmers can also use different sales channels to enable them access to different types of consumers and provide them with different selling prices. In 2019, a study demonstrated that participation in **short food supply chains is beneficial for producers from an economic perspective.** Short chains enable a higher sale price for farmers compared to long chains, as they allow the producers to capture a large share of the added value, which would otherwise be captured by different intermediaries. This situation applies to all short distribution channels, product categories, as well as countries. However, some of these short chain channels may induce high distribution costs (e.g. sales at farmers' markets) and therefore become less attractive than longer chains from an economic perspective (Malak-Rawlikowska et al., 2019).

Box 4: Animal welfare initiative in the German meat sector (Initiative Tierwohl)

Considering the difficulties in improving animal welfare in a competitive market and keeping in mind the gap between consumers' concerns and their willingness to pay for animal welfare, the German meat sector established **an 'animal welfare initiative' in the pig and poultry sectors** ('Initiative Tierwohl').

All relevant retailers participate in the system, but they cover only about a third of overall German pork and poultry demand. **Exports are excluded from the initiative, and hotels, restaurants, canteens, refused to join the system**.

The concept of the initiative excludes differentiation of products from participating and non-participating farms. This saves the effort and costs of organising a segregated value chain, allowing the money of the fund to be invested in animal welfare practices. Moreover, imposing a uniform fee on all retailers did not impact the competitive situation of individual retailers. Therefore, they could agree to the system in spite of intensive competition between them.

In the first period (2015-2017), retailers contributed to the fund with EUR 0.045 per kg of meat, i.e. EUR 85 million per year. About 12% of fattening pigs, 31% of chicken and 23% of turkeys benefited from the system.

In the second period (2018-2020), the fee was increased to EUR 0.065 per kg, i.e. EUR 130 million per year. Requirements increased, and, due to the greater volume of the fund, the share of animals involved in the initiative increased to about 25% of pigs and about 70% of chicken and turkeys.

This system remained in place for six years. However, for the next period (2021-2023) the system was reformed for two reasons in particular: (1) more and more retailers wanted identification of the meat and (2) the sector's authority required this. The fund will be abolished for fattening pigs as the costs for improved animal welfare are covered by higher market prices.

This initiative shows that it is possible for a sector to develop innovative ways to expand animal welfare practices and to find means and methods to set it up and manage it over time.

Source: German case study

Therefore, improving animal welfare may give farmers access to concerned consumers and enable them to obtain added value, thanks to product quality or quality schemes, which could compensate for the additional costs. However, this is not always the case, as shown in the case studies examples and literature.

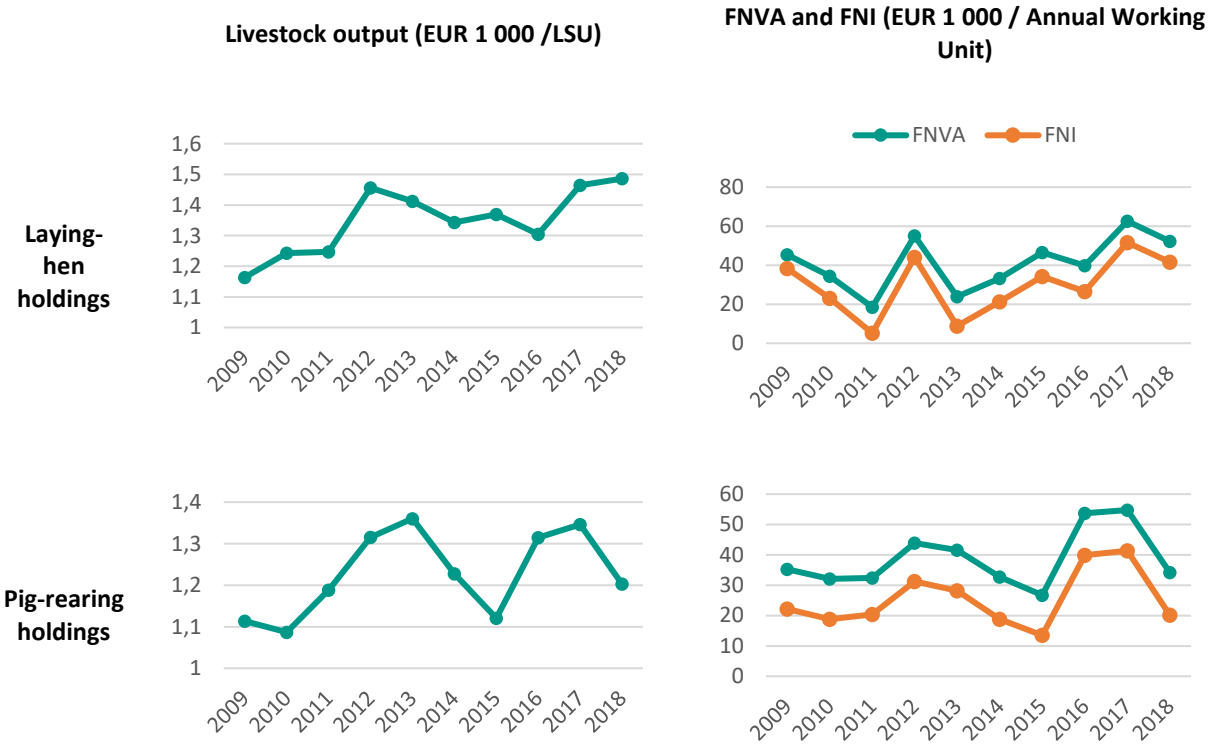
6.2.4.3 Productivity and farm income

The FADN analysis made it possible to examine the effect of the implementation of EU directives on farm income.

In the laying-hen sector, constant sample analysis **Figure 14** shows a peak in output (in EUR 1 000 per LSU) in 2012. It is linked to the 2012 peak observed in Farm net value added (FNVA), as this indicator concerns the remuneration of production factors (outputs and public support minus intermediate consumption and depreciation). After the 2012 peak, livestock output decreased, reaching pre-2012 values again only in 2017. After a drop in 2013, FNVA increased, suggesting that **the implementation of new animal welfare requirements did not impact the economic viability of**

laying-hen farms. Further FADN analysis show that the farm net income, (which further takes into account wages, interests and investments subsidies), follows the same trend as FNVA, showing the absence of negative impact of the practices on farmers' income.

Figure 14: Analysis at EU level of the effects of animal welfare practices on productivity and farm net value added (EUR 1 000 / LSU or EUR 1 000 / Annual Working Unit)



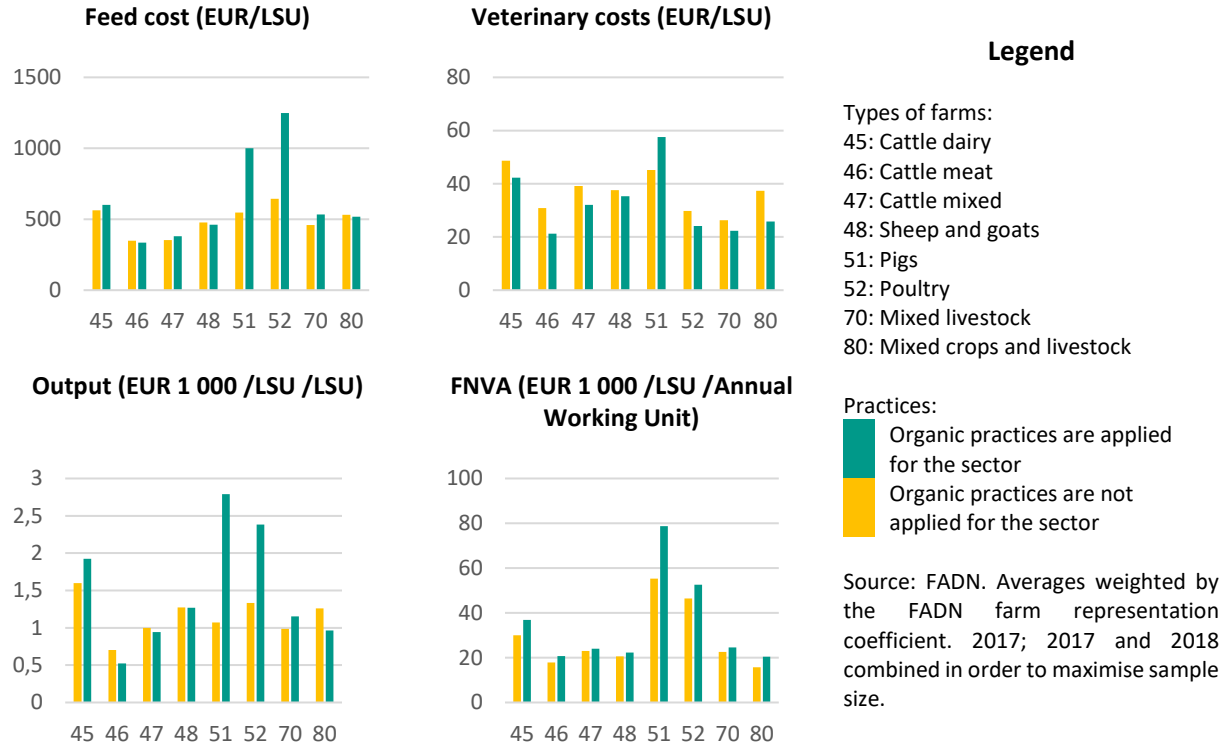
Source: FADN-Constant sample[50]. Average value per farm. See Figure 12 for sample structure.

In the pig sector, **Figure 14** shows a peak in productivity (in EUR 1 000 per LSU) and FNVA in 2013 and 2017. Both indicators follow very similar trends, as also does the farm net income indicator, with no variation apparently linked to the 2013 deadline. **Results therefore suggest that the implementation of new housing practices did not impact the economic viability of pig-rearing farms.** The peak in productivity and FNVA in 2013 might, however, suggest that farmers could have intensified their production to counterbalance the investment costs in new buildings.

6.2.5 Focus on the economic viability of organic farming

In order to compare costs and outcomes of intensive and extensive livestock farming systems, an analysis at EU level based on the FADN was performed. As no alternative method was found to differentiate intensive from extensive livestock farms with FADN variables, it was decided to compare organic and non-organic production systems as a proxy of extensive and intensive production systems. Results are presented in the figure below and discussed in the following paragraphs.

Figure 15: Annual farm averages by sector for organic and non-organic farms (2016-2018)



Source: FADN. Averages weighted by the FADN farm representation coefficient. 2017; 2017 and 2018 combined in order to maximise sample size.

6.2.5.1 Organic farming and production costs

Literature and FADN analyses show that pig and poultry organic systems usually bear higher production costs. FADN analysis at EU level (**Figure 15**) shows that the biggest difference in feed costs between non-organic and organic farms is observed in the poultry and pig sectors. In both sectors, feed costs per livestock unit are much higher for organic farming, whereas in the cattle and sheep and goats sectors the difference does not appear significant. Furthermore, FADN analysis shows that organic cattle farms have lower veterinary costs on average, whereas organic pig farms have higher veterinary costs on average per LSU. Literature supports these findings, indicating that organic dairy farms usually have lower variable costs (up to 30%) and total costs (up to 19%) per cow compared to conventional systems, whereas variable costs are generally higher for organic farming in the other animal systems studied (Van Wagenberg et al., 2017). Regarding the pigs sector, however, (Cabaret, 2003) reports that organic pig systems are more prone to parasitic infections than conventional ones. According to (Van Wagenberg *et al.*, 2017) as well, conventional livestock systems generally have equal or better udder health and equal or lower microbiological contamination. These statements support the results of the FADN analysis, which showed that organic pig farms have higher veterinary costs on average per LSU (at EU level and in most Member States making up the sample).

6.2.5.2 Productivity of organic farms

According to literature and FADN analyses, while productivity in terms of financial outputs seems higher in organic farming, the productivity in terms of volumes is generally lower. FADN analysis (**Figure 15**) shows that outputs per livestock unit are on average much higher for organics pigs and poultry farms than for conventional ones. However, literature supports the hypothesis that the productivity measured in volumes is usually lower in organic production systems. For instance, according to (Van Wagenberg *et al.*, 2017), feed intake level of organic sows is 20% to 29% higher, and the number of piglets weaned per sow was 2% to 30% lower. The same study shows that organic dairy cows also produce less milk. Moreover, in the broiler sector slow-growing breeds in organic production compared to

the fast-growing breeds used in conventional production show lower yields in term of growth and feed conversion (Röös *et al.*, 2018)

This difference is explained by higher selling prices for organic productions. The study of (Van Wagenberg *et al.*, 2017) pointed out that organic systems had farm gate prices up to 25%, 84%, 107% and 139% above conventional prices for beef cattle, dairy production, broilers and laying hens, respectively. Nevertheless, price and yield risk were found to be significantly higher on organic dairy farms (Van Wagenberg et al., 2017).

6.2.5.3 The economic viability of organic farms

Literature and FADN analysis indicates that organic systems are usually more profitable. FADN analysis at EU level (**Figure 15**) shows that organic production systems have on average higher FNVA per annual working unit than other systems, for all studied livestock sectors. The difference is particularly high for the pig sector (EUR 30 000 difference on average between the two production systems). Literature (Van Wagenberg et al., 2017) also supports these results, showing that organic farm income per cow is generally higher, as well as farm income per head for beef cattle (up to 170% higher), farm income per full time equivalent for laying hens (up to 156%) and income per farm for broilers (up to 124%).

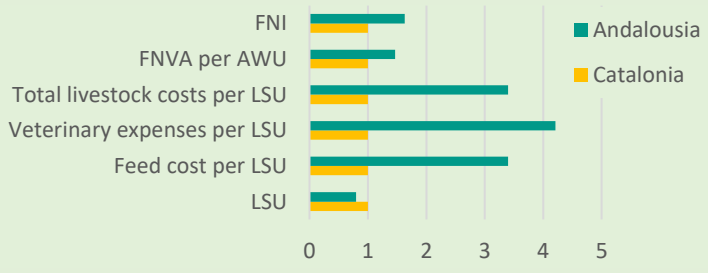
Another FADN analysis carried out further supports that extensive pig farming systems are potentially more economically viable that intensive ones. Results in **Box 5** show that, thanks to the high quality of their production, Andalusian pig farms, characterised by a high proportion of extensive systems, have FNVA and farm net income (FNI) about 50% higher than intensive Catalonian farms.

Box 5: FADN analysis on pig farming in Andalusia and Catalonia

In Spain, the Andalusian region is characterised by a high number of extensive pig farms, whereas the Catalonia region is almost entirely represented by intensive pig farms. According to the Spanish case study, the majority (60%) of pig farms in Catalonia are under the Spanish integration model, and almost all pig farms in Catalonia (99.8%) are intensive. Such systems have no outdoor accesses, limited space allowance (0.65 m^2 per pig) and between 21 and 25 days of lactation.

On the other hand, in Andalusia, according to literature (Consejería de Agricultura y Pesca, 2007) among the over 14 472 pig farms present in the region, about 45% were extensive in 2006. These extensive systems are characterised by more self-consumption, reduced capacity (lower number of pigs), and also by more farms performing both rearing and fattening (30% of total Andalusian extensive farms in 2006). It is notably linked to Iberian pig production, historically present in the region. This local breed, traditionally managed extensively, is adapted to pasture and provides high-quality products. It therefore enjoys higher added value compared to white pig products (García-Gudiñoa et al., 2021). It shall be taken into account that these two systems have very different approaches, extensive vs intensive, different breeds and even more different market segments with distinct selling prices.

FADN results show that Catalan intensive systems have, on average, a higher number of livestock units, relatively low livestock cost per livestock unit, but also a lower FNVA than the Andalusian extensive pig farms. On average, feed costs and veterinary costs per LSU are respectively 3.4 and 4.2 times higher on pig farms in Andalusia. These farms are also 25% smaller in terms of LSU on average, but they also seem more economically viable (around 50% more FNVA/AWU and total farm net income). It should be noted that this analysis of the FADN data does not provide information on the distribution channel and added value of final products, which are also key variables explaining the difference in average FNI between both regions.



Source: FADN 2016-2018. In the sample of Andalusia, 2 out of 78 farms (2.5%) are organic. In the sample of Catalonia, 3 out of 274 farms are organic (1%). In both these samples most of the pig farms are specialised in pig fattening (70% in Andalusia and 82% in Catalonia), but it should be noted that Andalusia represents relatively more mixed farms (breeding and fattening – 20% in Andalusia and 13% in Catalonia).

Source: Case studies, FADN analyses and literature cited

6.2.6 Summary of findings

Literature shows that the **first effect of the implementation of practices enhancing animal welfare is the potential significant need for investments** (e.g. related to building modifications), **even if in some instances this is not the case** (e.g. genetic selection). The FADN data analysis confirmed that the implementation of new practices, related to the mandatory requirements set by the two EU directives[58] regarding the protection of laying hens and pigs, could have induced investments on farms. However, the FADN data did not enable the evaluators to measure to what extent the investments observed during the period of implementation of these directives were linked to animal welfare related investments.

Literature highlighted that **the effect of animal welfare individual practices on production costs depends on the practice implemented and on the production system** in which it is implemented, i.e. if the starting point is far from the objective. But, generally, higher standards requested by animal-welfare labels led to higher production costs. However**, the FADN analysis did not point out any negative effect** on production costs of the implementation of the requirements set by the two EU directives.

However, **savings that ensue from the implementation of practices can reduce production costs**. Indeed, by improving the health of animals, animal welfare practices can reduce health-related costs (diseases, reproductive difficulties, mortality), in particular in systems with poor animal welfare. Other costs can also be reduced, e.g. feed costs are reduced by grazing practices. Moreover, some improvements can have a positive effect on the modernisation and competitiveness of farms.

Regarding volumes, the FADN analysis did not show a clear effect of the implementation of the directives on the number of animals. Literature's conclusions on **the effect of animal welfare practices on volumes are mixed, as the effect depends on the way the practice is implemented** (e.g. grazing management), **and on the system and its animal welfare level**. Thus, animal welfare practices do not always result in lower volumes, they also have the **potential to increase production volumes depending on the context**, e.g. through their effect on the health status, as highlighted by literature.

The analysis of Eurostat data pointed out that the **concentration of production in a smaller number of farms is a widespread phenomenon in the EU and among all sectors**[59]. The example of the dairy-cow sector in particular showed that two processes can co-exist: increased production per animal and an increase in farm size (i.e. number of animals per farm). There are some examples of the opposite phenomena in almost all sectors, but they are rarer.

The McInerney Welfare-Productivity Model shows that **improving animal welfare is linked to improved livestock productivity up to a certain point, beyond which livestock productivity can be improved but to the detriment of animal welfare**. As a conclusion to the assessment of production costs and volumes, the effect on productivity depends on several factors. The answer will have to take into consideration the status of the farm compared to the optimal point of the model, and the **potential of the selected practices** to reduce costs and/or increase volumes in **addressing the main welfare issues** of the farm. The FADN analysis showed that **the implementation of new animal welfare requirements did not impact the economic viability of laying-hen and pig farms**.

According to literature, the **concentration of production** as pointed out in the previous analysis of Eurostat data, is often linked to a trend toward **indoor systems with a focus on cost reduction** that may bring these systems beyond the optimal point of the McInerney model. These phenomena, often bundled under the term '**intensification' may suggest a higher risk for a lower level of animal welfare**.

To compare intensive and extensive production, a comparison was made using FADN data between organic (with average lower density and better animal welfare conditions) and conventional systems. This comparison showed, as did the literature, that **organic pig and poultry systems usually bear higher production costs**, in particular feed costs. In contrast, **organic cattle farms have lower veterinary costs on average** than do conventional ones, whereas organic pig farms have higher veterinary costs on average per LSU. While **profitability seems higher in organic farming, productivity in terms of volume is generally lower** in the pig, poultry and dairy-cow sectors. This difference is

[58] Directive 1999/74/EC for laying hens, Council Directive 2001/88/EC for pigs.
[59] Except rabbits, for which data are not available.

explained by **higher selling prices** for organic production. Organic systems are usually **more profitable** than conventional ones, (the difference being particularly high in the pig sector), showing that development of organic farms in animal production could lead to better animal welfare. Another FADN analysis was carried out in order to compare an extensive and an intensive pig farming system. This analysis did not lead to a clear conclusion since the two very different systems cannot be fully compared (different breeds, feed, outdoor access, densities). From the data analysed, Andalusian pig farms, characterised by a high proportion of extensive and partly outdoor systems, appear to have, on average, a lower number of livestock units, higher livestock cost per livestock units, but also better profitability probably due to higher selling prices responded to a specific market demand. Catalan intensive systems, instead, show on average a higher number of livestock units, relatively low livestock cost per livestock units, but also a lower profitability.

6.3 SQ 3 on causal analysis – What are the drivers and reasons behind the implementation choices regarding the CAP instruments and measures directly or indirectly related to animal welfare and on reducing antimicrobial use:

6.3.1 Understanding and method

This question seeks to gain insights into the reasons for the implementation decisions made with respect to animal welfare and antimicrobial use reduction.

The first part provides a **description of Member States' and regions' implementation choices** addressing animal welfare and antimicrobial use. CAP instruments (e.g. cross-compliance, direct payments, marketing standards) and RD measures were considered in the analysis. Examples of strategies and measures implemented in case studies are provided. Monitoring data (ISAMM, CMEF) reported the planned and executed budgets of the measures over the 2014-2020 and 2014-2019 periods respectively.

Then, the second part considers the **factors that may promote or hinder Member States' and regions' decision** to implement CAP instruments and measures, as well as specific criteria associated with livestock production systems. It also looks at the **drivers that influenced farmers' decision to** apply for these voluntary supports. The analysis is based on interviews with the national/regional authorities, stakeholders involved in the design process and farmer representatives. It was rounded out by literature review on the subject.

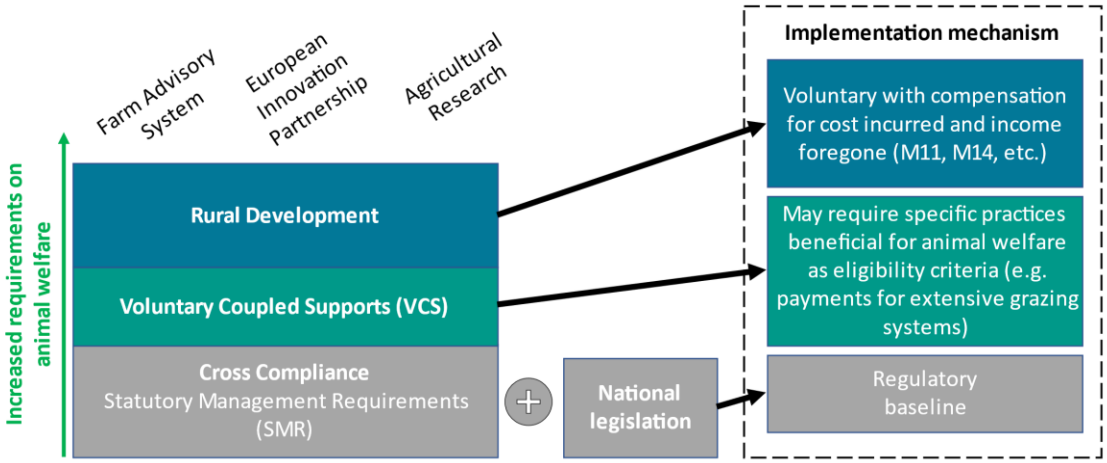
6.3.2 Analysis of implementation choices of Member States/regions

Whereas SMRs included in cross-compliance must be implemented according to the legislative requirements set down in EU directives, the principle of subsidiarity allows Member States to take certain decisions on the implementation of direct payments and RDPs.

6.3.2.1 EU legislative requirements enforced by cross-compliance and national legislations

EU directives related to animal welfare and antimicrobial use are incorporated in the scope of cross-compliance (SMRs 4, 11, 12 and 12), which links the granting of most CAP support to compliance with a set of basic rules on public and animal health and animal welfare (aside other mandatory provisions included in cross-compliance scope). Cross-compliance obligations are part of the baseline for granting CAP support that goes beyond these basic EU compulsory rules; this includes the animal welfare payments, the agro-environmental measures under rural development, etc.

Figure 16: CAP architecture of instruments/measures addressing animal welfare



Source: Agrosynergie based on DG Agriculture and Rural Development

The EU requirements established by EU directives are cross-compliance relevant as **transposed by Member States in their national legislative framework**. They concern holdings conditions (e.g. cleanliness, lighting, size of boxes, etc.), feed diet, surgical intervention (e.g. castration, docking), correct storage and use of veterinary medicinal products, the keeping of treatment records, veterinary medicinal residue limit in animal products, etc.

Few Member States implement **rules stricter than the standards set out in EU directives on animal welfare and antimicrobial use in their national legislative framework** (e.g. Denmark, the Netherlands, Austria, Finland, Sweden). These national rules increase the level of requirements for farmers. However, these stricter national rules are not cross-compliance relevant. In Member States with higher requirements regarding practices related to animal welfare, **farmers must comply with the national framework**, which helps to ensure general compliance with EU standards.

Box 6: Examples of national requirements going above EU standards on animal welfare and antimicrobial use

The Netherlands implemented a series of national regulations[60] setting stricter rules for animal welfare than requirements set at EU level. For instance, in the laying hens sector beak trimming is tolerated under specific circumstances by the Directive 1999/74/EC but forbidden by Dutch national laws since 2018. Regarding housing of pigs, Council Directive 2008/120/EC requires 0.95 m² per gilt after service, whereas Dutch national laws set the minimum space allowance at 1.3 m² per gilt. Moreover, in the calves sector, Council Directive 2008/119/EC requires only comfortable, clean, and adequately drained lying space, whereas Dutch national laws set the additional requirement of lying space that is sprinkled or that has a plastic mat, wooden slatted frame or rubber top layer. On top of the minimum surface for the group pens, a minimum surface of the lying area is provided.

Other examples of extra national requirements were found in Austria, where calves must be anaesthetized before dehorning, or in Denmark, where in the pig sector national requirements regarding water sprinkling, solid or drained floor, outdoor access, tail-docking (no more than half of the tail may be docked) go beyond EU requirements.

Source: Case studies

The existence of national regulations directly impacts Managing Authorities' implementation choices when designing RDPs, as rural development payments cannot support mandatory practices, even if these practices are set by Member States' national legislation.

[60] The Animal Health and Welfare Act, the Animals Act, the Veterinary practitioners decree, the Animal keepers decree.

6.3.2.2 Pillar I – Direct payments and rules from the Common Market Organisation (CMO)

Voluntary Coupled Support (VCS)

The direct payments ensure minimum income support for farmers engaged in agricultural activities. In that respect, **subsidiarity is left to Member States to complement basic payments with voluntary coupled support (VCS)** to sectors or regions where specific types of farming or specific agricultural sectors particularly important for economic, social or environmental reasons undergo certain difficulties. All EU Member States except Germany applied the VCS. **Livestock is by far the main sector supported by VCS**. Eligible animal sectors cover beef and veal, milk and dairy products, sheep meat and goat meat.

As VCS are determined at Member State level, some might require specific practices beneficial for animal welfare as eligible criteria. **Cases studies provided examples of VCS implemented with animal welfare or antimicrobial-use-related requirements**. In Italy for instance, VCS for suckler cows supports **extensive grazing systems** and targets farms that have adopted breed management plans aimed at rehabilitation from the virus responsible for Bovine Rhinotracheitis. Other examples were found in France, where VCS for calves supports only **organic production or other labels**, and in the Netherlands, where a 'grass-premium' is available for the sheep and cows left grazing in natural parks.

Common Market Organisation

Animal welfare is also addressed in the CMO regulation through the provision of marketing standards for eggs, which ensure that the quality of the product stays high, protect the consumer and make sure that standards are consistent throughout the EU marketplace[61].

Marketing standards specify how eggs should be labelled, notably according to the production conditions of laying hens. The numbers from 0 to 3 correspond to organic, free-range, barn or enriched cage production respectively. These standards are implemented consistently throughout EU. No subsidiarity is left to Member States for their implementation.

6.3.2.3 Pillar II – Rural Development measures (RD measures)

Flexibility is left to Member States/regions for the implementation of RDPs. This part examines how animal welfare and antimicrobial use were addressed in case studies through RD measures implementation choices.

The table below presents the RD measures relevant for animal welfare and antimicrobial use reduction. These measures and corresponding strategies were identified through interviews with Managing Authorities and thorough examination of RDPs to identify their objective and potential contribution to animal welfare and antimicrobial use (e.g. sectors concerned, examples of operations supported). The overall budget allocated to the measure was considered at EU level.

[61] https://ec.europa.eu/info/food-farming-fisheries/animals-and-animal-products/animal-products/eggs

Table 10: Rural Development measures implemented to improve AW and AMU

Measure	Objective	Contribution to AW and AMU	Implementation and budget	Sectors concerned	Examples of operations
M04-Investment support	Improving the competitiveness of agricultural holdings and their sustainability. AW is sometimes cited as an objective in RDPs (EE, FR-Pays de la Loire).	Can support investments contributing to better housing conditions (space allowance, flooring, microclimate conditions, etc.). AW-friendly investments were also promoted through selection and eligibility criteria (in 1/5 of RDPs) or bonuses (e.g. AT).	Implementation All EU Member States and regions EU planned budget EUR 33.9 bn = 22.53% of EU planned RDP budget (highest in IT) Executed budget 81% of budget (less than 50% in PL, HU, NL; more than 150% in BE and FI)	This measure usually applies to all livestock sectors	¾ of RDPs explicitly target AW/AMU through M04 (notably sub-measure 4.1 investments in agricultural holdings). In FR-Alsace, selection and eligibility criteria as well as bonuses promote investments improving AW. In AT, the payment rate increases by 5% for the construction of stables that are 'especially animal friendly'. Indirect effects can also be expected on AMU, such as in ES-Cantabria and Catalonia, where M04 aims to improve hygiene conditions (enhanced biosecurity regarding access to the farm, feeders, drinkers and ventilation) or in FR-Brittany, where M04 supports technologies that improve buildings' ambiance allowing better sanitary conditions.
M10-Agri-environment-climate	Promoting agricultural practices with positive contribution to the environment and climate.	It mainly contributes to animal welfare by fostering outdoor grazing (feeding), but also through the preservation of animal breeds adapted to their environment (health).	Implementation All EU Member States and regions EU planned budget EUR 25.3 bn = 16.77% of EU planned RDP budget	Mainly herbivorous (cows, sheep and goats)	Operations with indirect positive effects on AW were only mentioned in four studied Member States (ES, IT, AT, RO). They mainly concern pasture grazing, but one operation in ES-Castilla la Mancha aims to maintain and increase native breeds of cattle, sheep, goats, and pigs that are in danger of extinction but better adapted to their environment.
M11-Organic farming	Supporting farmers who convert to or maintain organic farming practices and methods as defined in the EU organic regulation	Organic farming encompasses high standards for animal welfare, mainly through better housing conditions and health practices (increased space allowance, permanent outdoor access, no preventive AMU, stricter treatment management regarding AMU, reduced mutilations).	Implementation All RDPs except NL EU planned budget EUR 11.6 bn = 7.68% of EU planned RDP budget Executed budget 62% of budget	This measure applies to all livestock sectors	Although organic farming requirements are laid down in Regulation (EC) 834/2007, the case studies showed that extra national requirements can for instance make M11 contribute to later weaning (natural behaviour) for pigs (ES), or to no-dehorning (health) (AT).
M14-Animal welfare	Improving animal welfare through compensation to farmers for costs or income losses associated with commitments going	The main goal of this measure is to improve animal welfare. Its implementation mainly addressed housing, but also included feeding, health and natural behaviour. See table below for further information.	Implementation 34 RDPs across 17 MS EU planned budget EUR 2.9 bn = 1.89% of EU planned RDP budget (RO, IT and FI have the highest planned budget)	Each herbivorous animal sector and the pig sector is targeted in at least 14 RDPs Poultry <10 RDP	This measure being key to the study, its implementation is further detailed in the next paragraph of this section.

Measure	Objective	Contribution to AW and AMU	Implementation and budget	Sectors concerned	Examples of operations
	beyond mandatory requirements.		Executed budget 65% of budget	Rabbits and ducks/geese <3RDP	
M16-Cooperation	M16.1 supports EIP groups and M16.2 pilot projects focusing on developing markets, supply chains, product quality and technologies.	Some EIP projects and pilot projects directly focus on animal welfare (health, housing, feeding, natural behaviour) and AMU.	Implementation 27 MS EU planned budget EUR 2.6 bn = 1.73% of EU planned RDP budget Executed budget 19% of budget (relatively low in all MS)	All except rabbits – although 2/3 of the listed AW-related EIP projects target pigs and dairy cattle	Almost half of the AW-related projects are found in DE and IT. Examples: the 'development of an animal welfare assessment tool based on selected indicators for Schleswig-Holstein dairy farms' (DE) or the project "Compost barn for dairy cows in the Parmigiano-Reggiano district: an innovative and sustainable housing system and an alternative to cubicles' (IT). Some projects also directly target AMU reduction, such as the 'Rational and Prudent Use of Antibiotics in Pig Production' project (ES).

<5% EU RDP budget. Implemented in <50% RDPs	Between 5 and 10% EU RDP budget. Implemented in >50% RDPs	>10% EU RDP budget. Implemented in all RDPs

Sources: Case studies; questionnaires; RDP review, CMEF indicator O1 – 2014-2019; RDPs Financing plans 2014-2020; https://ec.europa.eu/eip/agriculture; Information sent by DG Agri on M04 .

Focus on M14-Animal welfare

The implementation choices for M14 – Animal welfare are further detailed in the table below.

Table 11: RDPs implementing M14 (2014-2020) and sectors and practices supported

RDPs	Supported sectors									Group of practices supported				
	Cattle			Sheep and goats	Pigs	Poultry		Geese and ducks	Rabbits	Feeding	Housing	Health (mutilations + genetic selection)	Natural behaviour	Killing on-site
	Dairy cows	Beef	Veal			Broilers	Laying hens							
Case-study areas and other Member States questioned														
Germany - Baden-Württemberg	X				X	X					X			
Germany - Mecklenburg-Western Pomerania	X	X								X	X			
Germany - Lower Saxony + Bremen					X		X				X	X	X	
Germany - North Rhine-Westphalia	X	X			X						X		X (pig)	
Estonia	X	X	X	X	X		X				X	X (pig)		
Spain - Cantabria		X								X	X			
Spain – Castilla La Mancha				X							X		X	
Italy - Friuli-Venezia Giulia		X	X	X	X	X	X		X		X			
Cyprus				X								X		
Hungary	X	X	X	X						X	X	X	X	
Austria	X	X	X	X						X	X			
Poland	X	X			X						X			
Romania					X	X	X				X			
Slovakia	X				X	X	X				X	X		
Finland	X	X	X	X	X			X	X	X	X			
Other areas														
Bulgaria	X	X	X								X			
Czech Republic	X				X						X			
Ireland				X								X	X	
Greece	X	X		X	X	X	X			X	X	X	X	
Croatia	X	X	X							X	X			

RDPs	Supported sectors									Group of practices supported				
Italy - Calabria	X	X	X			X	X				X	X	X	
Italy – Campania	X	X	X	X	X	X	X				X	X	X	
Italy - Lazio	X	X		X						X	X	X		
Italy - Liguria	X	X	X	X	X	X	X			X	X			
Italy - Marche	X	X	X	X	X					X	X	X		
Italy - Sardinia				X						X	X			
Italy - Umbria	X	X	X		X					X	X		X	
Italy - Valle d'Aosta	X	X	X	X							X			
Slovenia			X	X	X	X	X			X	X	X	X	
Sweden				X						X	X			
Total														
29	20	19	14	17	16	9	10	1	2	14	28	12	10	0

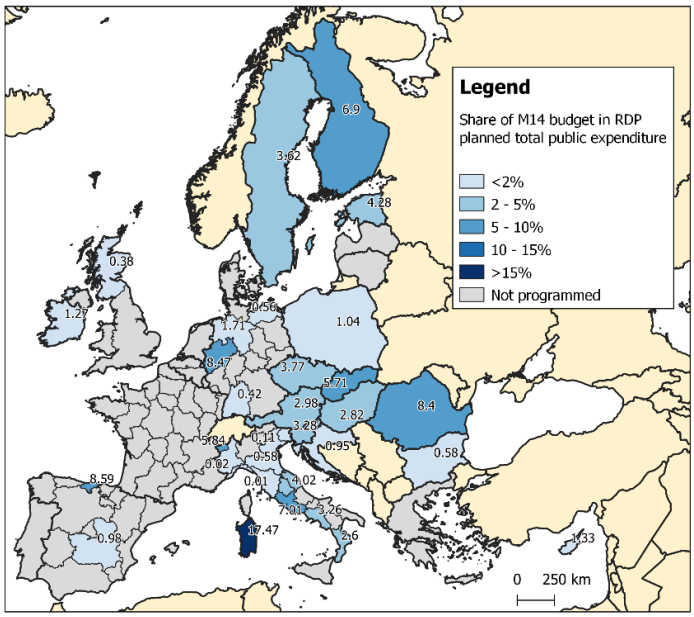
Source: Agrosynergie based on RDPs, (Maria Carmela Macrì and Scornaienghi, 2020), Questionnaire to the Managing Authorities

During the 2014-2020 implementation period, **35 out of 115 RDPs (15 national and 20[62] regional RDPs) programmed M14**.

Table 11 shows the different strategies implemented by Managing Authorities. For instance, in Italy–Calabria the measure is designed to benefit most livestock sectors, but in Cyprus or Estonia it targets one specific sector. Different choices were also expressed in terms of allocated budget, as shown in **Map 1** (the share of M14 varies from 17.5% of planned RDP budget in Italy–Sardinia to less than 0.01% in Italy–Piemonte).

Different strategies are also observed for the types of practices targeted, as **some operations apply to a wide range of practices, whereas most of them target housing practices**. Examples of such operations were collected in Member States and regions studied, related notably to appropriate flooring, reduced density, outdoor access, improved microclimate conditions or providing bedding and enrichment materials. For instance, in Germany–Baden-Württemberg an operation for pigs combines requirements

Map 1: Share of M14-Animal welfare in total RDPs planned budget for 2014-2020



Source: RDPs Financing plans 2014-2020. No budget allocated in EL.

[62] In Italy–Emilia-Romagna, Veneto, Tuscany, Piemonte and United Kingdom–Scotland; M14 was not programmed for the 2014-2020 period, but a budget was allocated to this measure to cover late commitments made under M215 for the 2007-2013 implementation period.

on density, bedding and enrichment material on the one hand and microclimate conditions for pig stables on the other; it is split into two levels of commitments depending on the intensity of the requirements (€9/pig and €14/pig). Other operations have a **more systemic approach**, such as in Spain–Cantabria where an operation on cattle combines housing (enriched environment, sufficient capacity for the entire herd) and feeding practices (pasture access, access to water and food). Other operations involve farmers training or can also directly address **health**, such as in Cyprus (biosecurity, eliminating painful practices and preventing diseases and injuries). Finally, examples of operations supporting **grazing** were also identified. For instance, in Austria an operation aimed at giving cattle, sheep and goats access to pasture for at least 120 days/year, granting €55/LSU. Other operations on **feeding** were implemented, such as in Cyprus, where an operation on sheep and goats involves receiving advice from a specialist in animal nutrition. Operations to foster **natural behaviour** were supported less, one of the few examples being in Italy–Campania, where the measure requires extension of the lactation period of calves on the farm up to 30 days.

Other relevant RD measures

Other RD measures were identified as potentially contributing to animal welfare or antimicrobial use reduction depending on their implementation. They are described in the following table.

Table 12: Potential contribution of other RD measures

Measure	Example of implementation relevant to AW or AMU
M01-Knowledge transfer	This measure is usually designed to address cross-cutting objectives (competitiveness, innovation and environmental challenges). Examples of projects related to animal welfare were identified in the Member States studied (e.g. DK, ES–Catalonia, Castilla La Mancha, FR–Pays de **la** Loire, IT, NL, AT and PL), related to a variety of livestock sectors. Examples: professional training, further education, publishing of information material and exchange programmes on animal health and AW practices.
M02–Advisory services	M02 was implemented for diverse reasons in the Member States studied, although improving economic performance of farms remains its main objective. Examples of M02 used to grant advisory services on AW and training of advisers on this issue were identified in DE, ES, IT, AT and PL, notably on pasture management, construction and reconstruction of functional buildings, health and treatments, and organic agriculture.
M03–Quality schemes	The main objective is generally to enable production diversification toward high added-value systems. Some of the quality schemes supported can directly benefit animal welfare, such as in NL where M03 supports farmers joining the veal quality scheme "Vitaal Calfes", which includes requirements on hygiene and housing conditions. In PL, a supported label for beef includes requirements on leash/tethering systems, antibiotics use, and transport and slaughter conditions.
M07–Basic services	M07 supports territorial development through preservation and enhancement of the natural and cultural heritage and improvement of the quality of life in rural areas (development of basic services and recreational activities). In FR-Midi-Pyrénées, the measure was implemented to foster pastoralism, notably because of the positive expected effect of this practice on animal welfare and sanitary issues.

Source: RDPs and case studies

6.3.3 Analysis of significant drivers for the implementation and uptake of CAP measures related to animal welfare and antimicrobial reduction

This section considers the factors that influenced the implementation choices of Managing Authorities and their decision to address, or not, animal welfare in their CAP strategic plan.

Levers for the consideration of animal welfare and antimicrobial use issues in Managing Authorities' implementation choices

Awareness and expectations among **civil society and consumers** for improved practices on-farm significantly influenced political decisions to support animal welfare. As highlighted by literature[63] and the interviews carried out with Managing Authorities, civil society expectations are one of the most significant drivers for the implementation of RD measures targeting animal welfare. For instance, the Managing Authority in Austria mentioned that M14 was implemented to support grazing, as this practice was considered as essential by consumers. The consideration of civil society expectations was strengthened through early participation by NGOs in the decision-making process of CAP design and implementation choices. The NGOs interviewed generally participated in the institutional process for the decisions on CAP implementation choices, either at national (e.g. Spain) or regional level (e.g. Germany). However, the general discussions would sometimes not consider animal welfare issues specifically, such as in Austria and Poland. **On-going research initiatives** were also mentioned as a driver which can significantly influence the design and implementation of RD measures on animal welfare. For instance, in Spain-Castilla La Mancha, M14-Animal welfare was defined based on a study from the University of Extremadura. In Romania, the design of M14 was based on needs identified through the survey 'Attitudes of Europeans towards Animal Welfare' (EC, 2015).

Previous commitments to the animal welfare measure (M215) during the last implementation period (2007-2013) sometimes fostered the implementation of M14-Animal welfare, as mentioned by Managing Authorities in Germany–North-Rhine-Westphalia and Romania, to ensure continuity of the support provided. In some cases (Germany–North-Rhine-Westphalia, Italy–Friuli Venezia Giulia and Austria), **supporting traditional practices or areas in difficulty**, such as grazing in mountain areas, can be another driver for the implementation and design of M14-Animal welfare. According to the Managing Authorities, such implementation choices are justified by the need to maintain traditional practices that risk disappearing due to their low competitiveness, notably because of the environmental benefits associated with those practices.

The last lever identified is **anticipation of future regulations on animal welfare**. Managing Authorities in Italy–Emilia-Romagna and Lombardy and France–Pays de la Loire explained that M04-Investments had been implemented to help farmers achieve higher animal welfare standards that might become mandatory in the future.

Reasons hindering the consideration of animal welfare and antimicrobial use issues in Managing Authorities' implementation choices

On the other hand, some factors hindered the consideration of animal welfare and antimicrobial use issues in CAP implementation choices. The **influence of stakeholders** during the consultation on CAP design and implementation choices can be one of them. For instance, in Italy–Emilia-Romagna, farmer representatives were against the implementation of M14-Animal welfare because of the difficulties that farmers encountered in fulfilling the requirements of M215-Animal welfare over the previous implementation period. Another factor behind Managing Authorities not supporting animal welfare through the CAP is the existence of **sufficient market demand** for products with animal welfare attributes. This was one of the reasons M14-Animal welfare was not implemented in the Netherlands, where the Managing Authority targeted funding toward operations not supported by the market alone.

[63] Miele, M., Veissier, I., Evans, A. and Botreau, R. (2011) 'Animal welfare: establishing a dialogue between science and society', *Animal Welfare,* 20(1), pp. 103. Broom, D. M. (2010) 'Animal welfare: an aspect of care, sustainability, and food quality required by the public', *Journal of veterinary medical education,* 37(1), pp. 83-88.. Hashem, N. M., González-Bulnes, A. and Rodriguez-Morales, A. J. (2020) 'Animal welfare and livestock supply chain sustainability under the COVID-19 outbreak: An overview', *Frontiers in veterinary science,* 7, pp. 679.

Finally, **limiting administrative burden** is one of the main reasons cited by the Managing Authorities interviewed for the non-implementation of M14-Animal welfare. In France–Pays de la Loire, Italy-Emilia-Romagna and the Netherlands, the priority was given to few RDP measures with cross-cutting objectives and global impacts on holdings (such as M04-Investments, M10-AECM, M11-Organic farming, M16-Cooperation). Regarding antimicrobial use, it should be noted that the complexity of the subject as well as **the difficulty for setting suitable payment rates and effective control procedures** discouraged Managing Authorities from implementing specific measures (as highlighted in Germany, Austria and France-Pays de la Loire).

Drivers for the uptake of CAP measures related to animal welfare and antimicrobial reduction by farmers

According to farmer representatives, Managing Authorities, NGOs, representatives of organic farmers and researchers, **ethical considerations** and **well-being at work** are the paramount drivers for farmers to uptake voluntary CAP measures for animal welfare. Farmer representatives in France, Romania and the Netherlands, as well as literature (Kielland *et al.*, 2010; Balzani and Hanlon, 2020; Hansson and Lagerkvist, 2016), emphasise the link between animal welfare and farmer welfare. Regarding antimicrobial use, **farmers' awareness** on impacts for human health can be a strong driver to reduce their use, as mentioned by the Managing Authority and farmer representatives in the Netherlands. **Societal expectations** are also a strong driver, especially toward the adoption of practices inducing no potential economic gain (e.g. in Germany with summer pasture grazing in North-Rhine-Westphalia or protection on pigs' tails in Lower Saxony as highlighted by farmer representatives).

On the other hand, potential **economic gains** brought by the sale of products on high-end markets are also a key driver for the uptake of voluntary measures to improve animal welfare. For instance, in Germany-North-Rhine-Westphalia, the provision of straw bedding for pigs allows farmers to sell their products on specific sales channels with higher added value. Increasing production's value can notably be achieved through participation in **quality schemes**. In North-Rhine-Westphalia, pasture grazing supported under M14-Animal welfare is a prerequisite to participate in the 'milk marketing programme'.

To a lesser extent, as RD measures cannot be used for farms to comply with regulatory requirements, **anticipation that some practices might become mandatory in the future** can be a driver in applying voluntary measures beneficial to animal welfare and antimicrobial use. In Germany, for instance, this driver is particularly relevant for stables with breeding pigs, as a reform concerning the national Ordinance for Protection of Farm Animals mentions that stables for breeding pigs will have to be rebuilt in the future.

6.3.4 Summary of findings

The **analysis of Member States' and regions' implementation choices addressing animal welfare and antimicrobials** considered Member States decisions on the implementation of direct payments and Rural Development Programmes. As underlined in SQ1, **these choices might reflect the existence of national regulations which are stricter than the standards from EU directives** on animal welfare and antimicrobial use, and consequently increase the minimum standards for farmers (e.g. as in Denmark, the Netherlands, Austria, Finland, Sweden).

Among Member States that decided to provide VCS, livestock is by far the main sector supported. Eligible animal sectors are beef and veal, milk and milk products, sheep meat and goat meat. **Examples of specific eligibility criteria related to animal welfare were identified in some Member States** (e.g. VCS targeting suckler cows in extensive grazing systems in Italy).

In most of the regions/Member States studied, **animal welfare and antimicrobial use were mostly addressed through RD measures**. Managing Authorities outlined M04-Investment support, M10-Agri-environment-climate, M11-Organic farming, M14-Animal welfare and M16-Cooperation as relevant RD measures to foster the implementation of specific animal husbandry practices or improve housing conditions (notably space allowance, flooring, microclimate conditions, etc.). **M14-Animal Welfare is the only RD measure intended to improve animal welfare**, by compensating commitments going beyond the regulatory requirements. Over 2014-2020, 35 RDPs (15

national et 20[64] regional RDPs) in 18 Member States implemented this measure, with Romania, Italy and Finland having the highest planned budget. **Cattle was the most targeted sector, followed by sheep and goats, pigs and poultry**. Only two Member States targeted rabbits (Finland and Italy-Friuli-Venezia Giulia). Supported practices mostly concern **specific housing conditions to be implemented, feeding practices or to a lesser extent health management practices**. Practices enhancing natural behaviour were scarcely targeted, and killing unproductive animals on-site was not addressed at all. Other RD measures were identified as potentially contributing to animal welfare or antimicrobial use reduction depending on their implementation (M01-Knowledge transfer, M02-Advisory services, M03-Quality schemes and M07-Basic services).

The first driver influencing the decisions of Managing Authorities to address animal welfare issues is **expectations by civil society and consumers for improved practices on-farm**. Sometimes, these expectations are advocated by NGOS associated with the decision-making process of CAP design. **On-going research initiatives** were also mentioned as a driver which can significantly influence the design and implementation of RD measures in relation to animal welfare. In some cases, **supporting traditional practices or areas in difficulty**, such as grazing in mountain areas, can be another factor pushing for the implementation of specific support under M14-Animal welfare targeting these sectors. Furthermore, support was also implemented in specific RDPs to help farmers achieve higher animal welfare standards that might become mandatory in the future. Interviews with stakeholders also made it possible to identify the list of factors hindering the consideration of animal welfare and antimicrobial issues in the CAP. In some cases, the Managing Authorities would consider the **market as sufficient to reward products with animal welfare attributes**. In addition, **limiting the administrative burden** is one of the main reasons cited by Managing Authorities interviewed for the non-implementation of M14-Animal welfare. In other cases, past experiments encountered with M215-Animal welfare would also discourage Managing Authorities. Regarding antimicrobial use, the complexity of the subject as well as the **difficulty in setting suitable payment rates and effective control procedures** discouraged Managing Authorities from implementing specific measures. Hence, antimicrobial use was often targeted by national action plans.

From the farmers' perspective, **ethical considerations** and **well-being at work** are significant drivers for them to take up voluntary CAP measures for animal welfare. Regarding antimicrobial use, **farmers' awareness** about their impacts on human health can be a strong driver to reduce their use, as mentioned by the Managing Authority and farmer representatives in the Netherlands. **Societal expectations** are also a strong driver, especially in the adoption of practices which induce no potential economic gain.

[64] In Italy - Emilia-Romagna, Veneto, Tuscany, Piemonte and United Kingdom – Scotland; M14 was not programmed for the 2014-2020 period, but a budget was allocated to this measure to cover late commitments made under M215 for the 2007-2013 implementation period.

6.4 SQ 4 on effectiveness – To what extent have CAP instruments and measures (individually and taken together) addressing the implementation of herd management practices and housing design contributed or not to achieving the objective of viable food production?

6.4.1 Understanding and method

The SQ considered **the effects of the CAP instruments/measures on the implementation of animal-husbandry management practices and housing conditions** influencing animal welfare at farm level[65]. The analysis focused on **CAP instruments and measures with direct and indirect effects at farm level on the implementation of these practices and housing conditions** influencing animal welfare[66]. The study question covers:

- For each CAP instrument and measure, the analysis considered their **level of uptake and the corresponding sectors and practices concerned.** Limitations to the analysis came from the **lack of data available on farming practices enforced/supported by the CAP at EU level.** Consequently, a different source of information was used depending on data availability:
  - The main findings came from output data available for RD measures addressing animal welfare at the EU level, by assessing in case-study Member States, the uptake among farmers and the practices/sectors supported by these measures. This information was rounded out by data provided by Managing Authorities of the studied Member States.
  - For other measures with potential indirect effects on practices beneficial for animal welfare or reduction of antimicrobial use, information came from opinions of relevant stakeholders interviewed in the Member States studied.
  - The analysis was rounded out by a literature review when relevant publications existed.
- Examples of **combinations of CAP measures and instruments** fostering the implementation of integrated system approaches or collective projects influencing animal welfare were also identified in the Member States studied.
- **Bottlenecks associated with the design** (e.g. shortcomings in the measure design, lack of programming by Managing Authorities, etc.) **or the implementation of the measures** (e.g. difficulties in implementation, lack of uptake, lack of means, etc.) **and other factors** that have affected their effectiveness in supporting the implementation of animal-welfare/antimicrobial-use practices were also identified. The information was collected through interviews conducted with national/regional authorities as well as representatives of the agricultural sector.

6.4.2 Individual effect of CAP instruments and measures on the implementation of practices and housing conditions/designs having an effect on animal welfare and antimicrobial use

6.4.2.1 Cross-compliance

According to the experts/stakeholders interviewed in Member States and regions studied, the **implementation of the EU directives related to animal welfare have influenced farmers' practices, especially those associated with**

[65] As identified in SQ 1. Changes in practices positive for the reduction of antimicrobials use are investigated in SQ 6 (i.e. practices related to treatment management, holding and gear hygiene, quarantine and practices to avoid infections from outside).

[66] i.e. SMR4, SMR11, SMR12 and SMR13, M04-Investments, M11-Organic farming, M14-Animal welfare, marketing standards (CMO) concerning eggs and poultry, VCS, M01-Knowledge transfer, M02-Advisory services, M03-Quality schemes, M07-Basic services and village renewal in rural areas, M10-Agri-Environment-Climate and M16-Cooperation).

the feeding of animals. In Italy, the mandatory feeding of a small amount of roughage for veal calves changed the traditional feeding based on the provision of a milk-replacer diet without any addition of solid feeds[67]. In France, EU directives contributed to the improvement and enhancement of good nutritional-balance management, fibre intake and food and water quality.

At EU level, farmers representative outlined the **economic implication of cross-compliance**: reduction of CAP support can significantly affect farmers financially (in particular as it comes in addition to the specific penalty applied for breaching such EU Directives). The threat of such a penalty is judged as **effective in ensuring that farmers maintain their compliance with the EU requirements**.

In the Member States studied, the most significant **impact of cross-compliance was reported by local experts in Member States where animal farms do not yet fully meet EU directives requirement on animal welfare**. For instance, in Poland and Romania, farmers must change their practices to become compliant with these directives and receive full CAP direct support.

As stressed by the NGOs interviewed, **some livestock farmers do not benefit from CAP support – the threat of losing part of their CAP payments by not complying with SMR 4, 11, 12 and 13 does not therefore apply**. Specialised livestock holdings producing indoors, which do not benefit from CAP direct payments (no VCS or basic payments) or area-based RD measures, are therefore not subject to cross-compliance. In Spain–Catalonia for instance, the pig and rabbit sectors were only slightly influenced by the CAP.

Table 13: Sectors and practices supported by SMR 4, 11, 12 and 13

SMR	Sector	Practices
SMR 4	All animals Food safety	**Health**: treatment management[68], record for medicinal treatments, record for analyses of animals and feed, hygiene management **Feeding**: appropriate supply of feed additives
SMR 11	Calves	**Housing**: no tethering, good microclimate conditions **Health**: holding and gear hygiene, treatment management **Feeding**: good nutritional balance management, feed and water safety management **Natural behaviour**: colostrum intake
SMR 12	Pigs	**Housing**: good microclimate conditions, increased space allowance, proper flooring, enriched environment **Health**: restriction of mutilations (exceptions for tail docking, reduction of corner teeth, etc., of the use of tranquilising medication to facilitate mixing **Feeding**: access to food and fresh water **Natural behaviour**: minimise aggression in groups, weaning age
SMR 13	All animals	**Housing**: space allowance, microclimate conditions, shelter **Health**: clean environment, treatment management, record for medicinal treatments, restriction of mutilations **Feeding**: appropriate diet and access to water **Natural behaviour**: farmer training, appropriate breeding procedures

Source: Agrosynergie, based on Regulation (EC) No 178/2002 (SMR4), Council Directive 2008/119/EC (SMR11), Council Directive 2008/120/EC (SMR12), and Council Directive 98/58/EC (SMR13)

The ECA 2016 special report on cross-compliance effectiveness and simplification states that the performance indicators used by the Commission are insufficient to assess its effectiveness adequately. The ECA found that, in 2014, half of the breaches in the cross-compliance rules were related to the 'keeping animals' area, with infringements mostly occurring on the identification and registration of animals (cattle, sheep, goats and pigs), stocking rates and the welfare of pigs.

On the other hand, the main reason for farmer non-compliance, raised by the Paying Agencies and the Farm Advisory Bodies (no analysis from the Commission on this topic), is that the EU legislation is too complicated (including requirements checks for cross compliance) and that simplification is therefore needed.

[67] Directive 2008/119/EC.

[68] 'Correct use of feed additives and veterinary medicinal products'.

6.4.2.2 Pillar I instruments

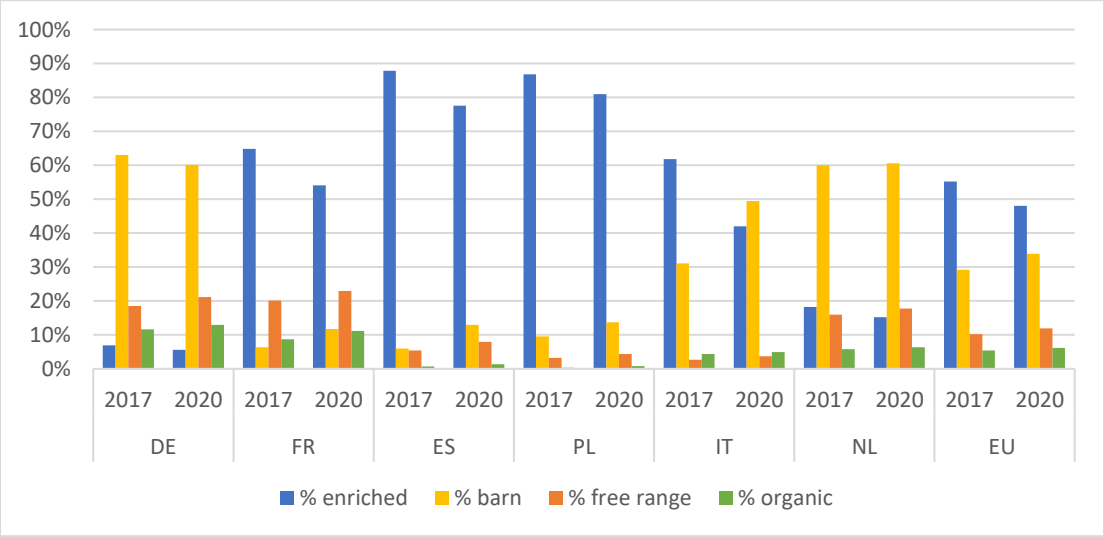
Marketing standards for eggs induced by the EU CMO regulation

In two poultry sector case studies (France–Brittany and Pays de la Loire and Italy–Veneto and Friuli Venezia Giulia), NGOs, farmers representatives and researchers highlighted the positive impact on animal welfare of Regulation (EC) 589/2008 on marketing standards for eggs. The **beneficial effects of these marketing standards on housing conditions for laying hens** (group housing, outdoor access, provision of enriched environment, increased space allowance) **was mentioned**. In France and Italy, the percentages of laying hens reared in enriched cages are 54.1% and 49.4% respectively.

According to a French NGO, the mandatory egg labelling system is **effective in promoting production systems that are better for animal welfare**. In Italy, both producers and NGOs believe that this obligation led to **greater consumer awareness** of the various production methods. By preferring eggs coming from barn systems, consumers encouraged producers to implement more animal-friendly production systems. Researchers generally mentioned the relevance of marketing standards to address animal welfare issue in the poultry sector.

Available data on the different production systems (i.e. enriched cages, barns, free-range and organic production systems) show that **the percentage of laying hens reared in enriched cages decreased slightly from 53% to 48% at EU level between 2017 and 2020**. The chart below shows the changes observed in the six Member States with the largest number of laying hens at EU level (**Germany, Spain, France, Italy, the Netherlands and Poland)[69].** In all Member States, the percentage of laying hens reared in enriched cages decreased, whereas **the percentage of laying hens reared in free-range and organic systems slightly increased from 2017 to 2020**. But differences among Member States remain very significant.

Figure 17: Comparison of percentage of laying hens in terms of their system of production between 2017 and 2020 in the six Member States with the highest number of animals, and in EU Member States as a total



Source: European Commission (DG ESTAT, DG AGRI), MS notifications (CIR) (EU) 2017/1185 and Regulation (EC) 617/2008), GTA

[69] The share of laying hens in other Member States is inferior to 5% of the EU laying-hens population.

Voluntary coupled support (VCS)

As demonstrated in SQ3, VCS are sometimes implemented with animal welfare-related requirements (e.g. in the Netherlands, a 'grass-premium' is granted for sheep and cows that are left grazing in natural parks), although their objective is not only to enhance animal welfare. In these cases, this CAP instrument helped foster **housing-specific practices enhancing animal welfare, e.g. space allowance, outdoor access and grazing** (see table below).

Table 14: Sectors and practices supported by VCS

MS	Sector	Practice supported
FR	**Calves**	Only organic production or other labels are supported. Practices supported: **Housing:** space allowance and outdoor access
NL	**Sheep** **Cows**	A 'grass-premium' is available for the sheep and cows that are left grazing in natural parks. Practices supported: **Housing:** space allowance and outdoor access
IT	**Suckler cows**	The payment supports extensive grazing systems. Practices supported: **Housing:** space allowance and outdoor access

Source: case studies

6.4.2.3 Rural Development measures

For each measure, the actual effects are assessed by considering the uptake and corresponding sectors/practices targeted at EU level and/or in Member States/regions studied. The methodology can vary depending on the available information on each aspect.

M14-Support to animal welfare

As detailed in SQ3, M14–Animal Welfare is the main CAP measure addressing animal welfare, with global expenditures at EU level of EUR 1 843 48 million in 2019. The **number of livestock units concerned by commitments under M14 reached 6.9 million LSU in 2019 at EU level (i.e. 10% of LSU at EU level**). Romania is the Member State with the largest number of LSU concerned (2.26 million LSU in 2019), followed by Finland (0.89 million LSU) and Austria (0.6 million LSU)[70], although it should be noted that not all Member States have programmed this RD measure.

The map below shows the **annual volume and the share of LSU concerned by commitments under M14 in each Member State/region** where M14 was implemented[71]. To avoid double-counting, the map reflects the maximum annual number of LSU supported in each Member State/region over the 2014-2019 period.

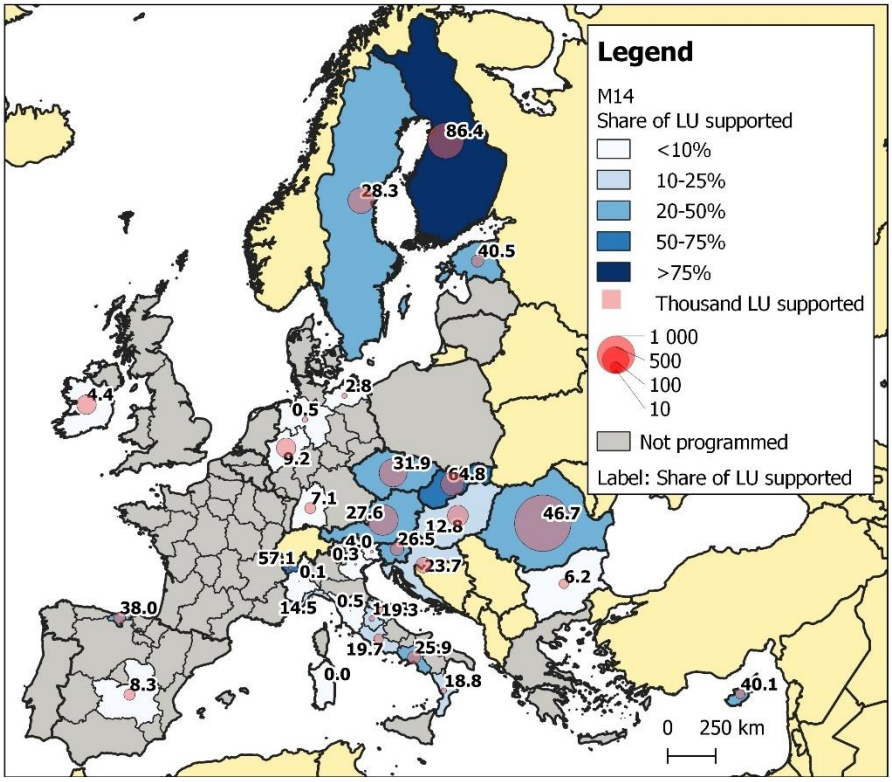
NB: Annual LSU reported under M14 may concern several cycles of production each year. Hence, the ratio of supported LSU / total number of LSU[72] must be taken with caution. For example, in Romania, several cycles of production are eligible under M14 for broilers and turkey (6.5 production cycles per year for broilers; 3.7 production cycles per year for turkeys)[73].

[70] These three Member States also were those with the highest expenses for M14 from 2014 to 2019: Romania with EUR 544.78 million, followed by Finland with EUR 265.14 million and Austria with EUR 155.83 million.

[71] As M14 was implemented in 2020 in Poland, no LSU were reported in 2019. In addition, the map presents IT - Emilia-Romagna, Italy- Veneto, IT - Tuscany, IT – Piemonte and UK – Scotland, where M14 was activated only for the completion of the payment operations of the commitments undertaken during the 2007-2013 programming.

[72] Available data from Eurostat refer to the situation on 31 December 2016, not the entire production for the year.

Map 2: LSU supported over the 2014 – 2019 period
(maximum annual livestock units supported and share of LSU)



Source: Agrosynergie, based on Annual Implementation Reports, Dashboard on food and health, published in July 2021, DG Agri and Eurostat database (online data code: ef_lsk_main)

Effects from M14-Animal welfare are expected in Member States/regions with significant shares of LSU supported (e.g. Czechia, Estonia, Croatia, Cyprus, Hungary, Austria, Romania, Slovenia, Slovakia, Finland, Sweden and specific regions of Italy and Hungary). Sectors and practices supported by M14 in these Member States/regions are described in the table below.

Table 15: Sectors and practices concerned by M14 in MS/regions with significant uptake

RDP	Share of LSU supported	Supported sector(s) (reported share of animals supported, collected from case studies)	Supported practices
RO	47%	Pigs (95%) Poultry (95%) - *Broilers, laying hens*	**Housing:** increased space allowance**,** microclimate control, flooring with vegetal litter (pig)
FI	86 %	Cattle (53%) - *Dairy cows, Beef, Veal* Sheep and goats (54%) Pigs (70%) Poultry (71%) - *Broilers, Laying hens, Geese and ducks*	**Feeding:** good nutritional balance management, water safety management **Housing:** outdoor access and grazing (except poultry), flooring with vegetal litter (pig), provision of enrichment (pig and poultry), increased space allowance (sows), group housing (veal and poultry) and microclimate control (poultry), no tethering (cattle), free-range farrowing (sows) **Health**: mutilation with pain-avoiding practices (veal calves and piglets), prophylaxis and alternative treatments (sheep and goats), quarantine and avoiding infections from the outside (cattle and pigs) **Natural behaviour:** promotion of maternal behaviour (veal calves)
SK	65 %	Dairy cows	**Housing:** increased space allowance, prolongation of broiler fattening period

RDP	Share of LSU supported	Supported sector(s) (reported share of animals supported, collected from case studies)	Supported practices
		Pigs Broilers, laying hens	
IT – Valley d'Aosta	57%	Dairy cows, beef, veal Sheep and goats	**Housing:** flooring with vegetal litter or covered floors with special carpets in winter (rubber mats, etc.)
EE	40%	Dairy cows, beef, veal Sheep and goats Pigs Laying hens	**Housing:** outdoor access and grazing (cattle and sheep and goats)**,** increased space allowance (pigs) and provision of enrichment (pigs and poultry) **Health:** prophylaxis (incl. pasture rotation) and alternative treatments (sheep and goats), **Animal-human interactions:** farmer training
CY	40%	Sheep and goats (48%)	**Feeding:** good nutritional balance management **Health:** holding and gear hygiene, quarantine and avoiding infections from the outside, treatment management, no mutilations **Animal-human interactions:** farmer training **Mandatory monitoring of livestock:** keeping a vaccination record
ES – Cantabria	38%	Dairy cows, beef	**Housing:** outdoor access and grazing **Feeding:** free access to food and water **Mandatory monitoring of livestock:** keeping a census on animal welfare practices for cattle (RABA book)
CZ	32%	Dairy cows Pigs	**Housing:** outdoor access and grazing (dairy cows), increased space allowance, flooring with vegetal litter (dairy cows), temperature control (dairy cows) **Health:** prophylaxis and alternative treatment (dairy cows), holding gear and hygiene (pigs), delaying the first farrowing of sows **Mandatory monitoring of livestock:** keeping a record of breeding practices
SE	28%	Dairy cows, Sheep and goats Pigs	**Feeding:** good nutritional balance management and feed safety management (sheep, pigs) **Health:** Quarantine and avoiding infections from the outside (sheep), prophylaxis and alternative treatment (dairy cows, sheep)
AT	28%	Dairy cows (41%), beef, veal Sheep and goats	**Housing:** outdoor access and grazing, free access to drinking troughs and shelter
SI	27%	Veal Sheep and goats Pigs Broilers, laying hens	**Feeding:** high fibre intake (pig) **Housing:** outdoor access and grazing (cattle, sheep and goats and poultry), group housing (pigs), increased space allowance (pigs) **Health:** mutilation with pain-avoiding practices (pigs), targeted treatment (cattle, sheep and goats) **Animal-human interactions:** farmer training **Mandatory monitoring of livestock:** keeping a grazing diary
IT - Campania	26%	Dairy cows, beef, veal Sheep and goats Broilers, laying hens	**Housing:** increased space allowance, group housing (cattle) **Health:** Holding and gear hygiene (cattle) **Natural behaviour:** promotion of maternal behaviour (buffalo calves)
HR	24%	Dairy cows, beef, veal	**Feeding**: good nutritional balance management and feed safety management **Housing**: increased space allowance, outdoor access and grazing **Animal-human interactions:** farmer training
IT - Lazio	20%	Dairy cows, beef Sheep and goats	**Feeding:** high fibre intake, good nutritional balance management **Housing:** increased space allowance, outdoor access (incl. pasture rotation to avoid parasitism) and grazing, provision of enrichment, proper light management **Health:** prophylaxis and alternative treatment, quarantine and avoiding infections from the outside, no mutilations
IT - Marche	19%	Dairy cows, beef, veal Sheep and goats Pigs	**Feeding:** feed and water safety management, good nutritional balance management **Housing:** outdoor access and grazing, free housing system **Health:** holding and gear hygiene, prophylaxis and alternative treatment, quarantine and avoiding infections from the outside and no mutilations or with pain-avoiding practices

RDP	Share of LSU supported	Supported sector(s) (reported share of animals supported, collected from case studies)	Supported practices
IT - Umbria	19%	Dairy cows, beef, veal Pigs	**Feeding:** feeders and drinkers in sufficient number **Housing:** outdoor access and grazing **Animal-human interactions:** farmer training
IT - Calabria	19%	Dairy cows, beef, veal Sheep and goats Pigs Broilers, laying hens	**Feeding:** drinkers in sufficient number (except for poultry) **Housing:** increased space allowance, microclimate control, free housing system, outdoor access and grazing (laying hens) **Health:** prophylaxis and alternative treatment (except for poultry)
IT - Liguria	14%	Dairy cows, beef, veal Sheep and goats Pigs Broilers, laying hens	**Feeding:** good nutritional balance management **Housing:** increased space allowance, outdoor access and grazing, air cleaner and proper light management (except for poultry)
HU	13%	Dairy cows, beef, veal Sheep and goats	**Feeding:** good nutritional balance management **Housing:** increased space allowance and outdoor access and grazing (cattle) **Health**: prophylaxis and alternative treatment

Source: Agrosynergie based on case studies, RDPs, AIR and Eurostat database (online data code: ef_lsk_main)

M14 reached significant uptake (> 10% of LSU concerned) in **11 Member States (Czechia, Estonia, Croatia, Cyprus, Hungary, Austria, Romania, Slovenia, Slovakia, Finland, Sweden), seven Italian regions and one Spanish region**. M14 was often implemented to support different animal sectors (cattle in 16 RDPs, sheep and goat in 13 RDPs, pig in 10 RDPs, poultry in 8 RDPs). However, output data are not broken down by sector. The analysis therefore considers detailed outputs collected from the Managing Authorities in the 11 RDPs that implemented M14 in the case-study areas to complement the information:

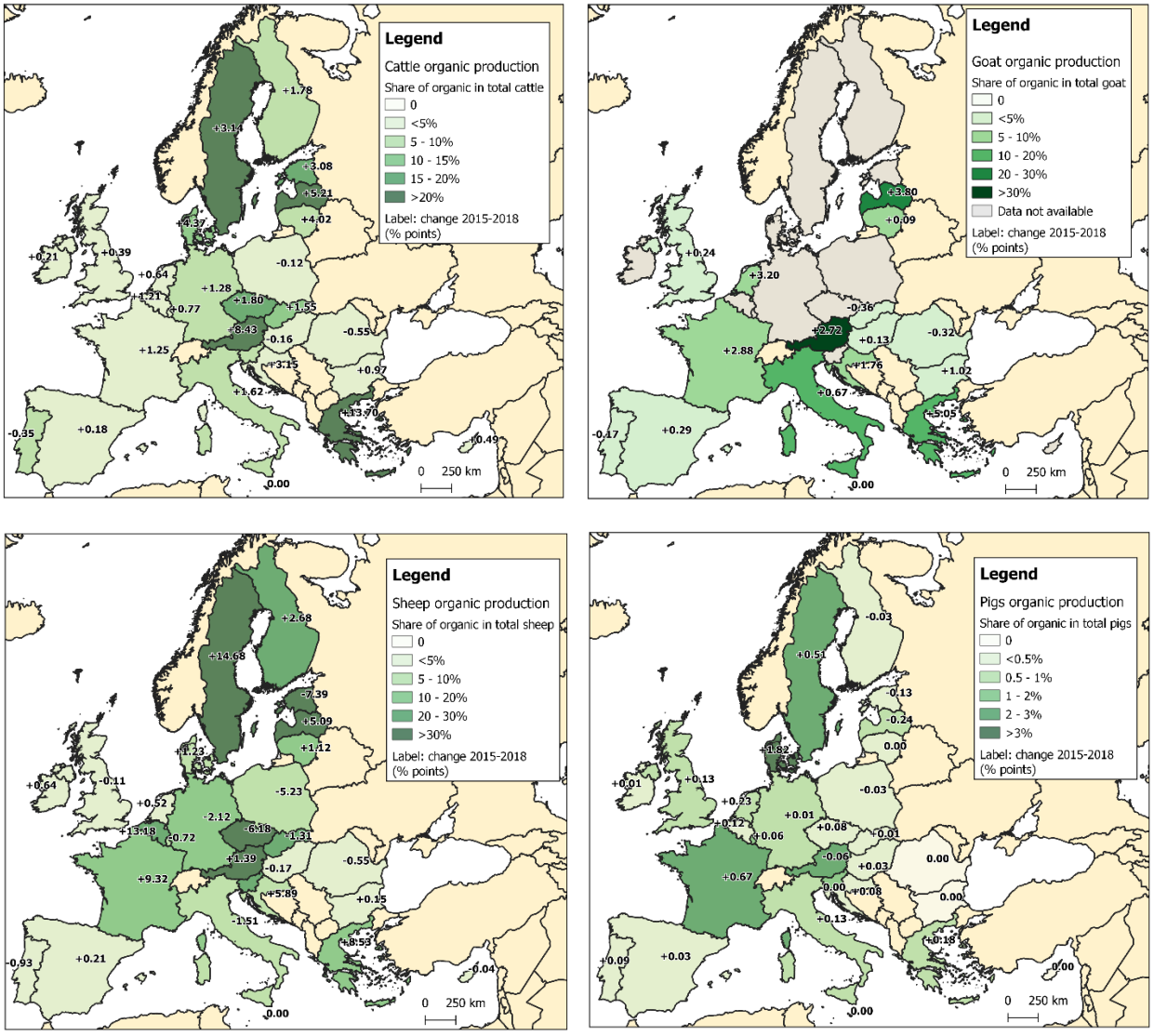
- in the **cattle sector**, 53% of animals were supported in Finland, with improved feeding practices, outdoor access and grazing, no tethering, mutilation with pain-avoiding practices, group housing, nursing stalls, as well as promotion of later weaning for calves. For **dairy cows**, in Austria, almost 41% of dairy cows benefited from M14, which focused on access to pasture and grazing. In Poland, 33% of dairy cows are concerned by M14 supporting grazing and/or enlargement of living space in buildings.
- in the **poultry and the pig sectors,** M14 concerned almost 95% of animals in Romania, supporting improved housing conditions (i.e. decrease in density, flooring and microclimate control) and 70% of animals in Finland, supporting improved feeding practices, housing conditions and nursing stalls for pigs. However, it concerned only 3% of pigs in Poland and 1.6% in Germany–Lower Saxony.
- In the **sheep and goat sector**, M14 concerned 54% of animals in Finland and 48% of animals in Cyprus, supporting feeding and health practices, notably prophylaxis and alternative treatments (including banning of castration in Cyprus). 50% of extensive or semi-extensive farms were supported in Spain–Castilla La Mancha, with a positive effect on outdoor access and farmers' awareness, including on early detection of diseases. In this region and in Cyprus, specific training on animal welfare is required for M14 beneficiaries. In Ireland, 45% of sheep and goats were supported in 2019[74].

[74] Own analysis based on Eurostat databases and Annual Implementation Reports of Member States.

M11-Support to organic farming

At EU level, **area under organic farming in 2018 reached 13.0 million ha, (i.e. 8 % of the total UAA)**, with a total of about 310 000 organic producers (308 823 in 2017). In 2018, organic cattle represented 5.3% of the total number of cattle units, organic sheep 6.5% of the total number of sheep and organic pigs only 0.9% of pigs. For goats, national data are lacking to calculate an EU average, but the data available show great disparity among Member States: from less than 1% of organic goats in Hungary, to up to 55.8 % in Austria.

Map 3: Share of organic cattle, sheep, goats and pigs in number of animals and changes (2015-2018) in the EU-28



Source: Agrosynergie, based on Eurostat database

Between 2014 and 2019, significant increases in the number of organic animals were recorded in the sheep sector (e.g. 15% in **Austria**, 13% in **Romania**, 9% in **the Netherlands**), **cattle sector** (e.g. 14% in **Greece**, 8% in **Austria**, 5% in **Latvia**), **and to a lower extent in the goat sector** (e.g. 5% in **the United-Kingdom**, 3.8% in **Belgium** and 3.2% in **Finland**). However, the number of organic pigs only slightly increased, despite the **very small share of pigs raised under organic rules in the EU** (i.e. 0.9% of organic pigs at EU level).

Table 16: Member States with highest changes in number of organic animals by sector over the 2014-2019 period

Sector	MS with highest increase in the number of organic animals	Supported practices
Cattle	EL 13.7% AT 8.43% LV 5.21% DK 4.37% LT 4.02% HR 3.15% SE 3.14% EE 3.08%	**Housing** Lower animal density per unit of surface (more space allowance) Permanent access to an open-air area (whenever conditions allow) Specific bedding requirements instead of full-slatted floors Tethering forbidden except for small holdings, with access to pasture or outdoor run (in winter) at least 2x/week. Group housing of calves after one week. Natural daylight mandatory **Feeding** Minimum percentage of roughage in ration (60 % of dry matter), more restricted under some private standards Grazing required (except for last 3 months for fattening of cattle) according to availability of pastures, whenever weather conditions allow. Restricted use of feed additives (e.g. no synthetic amino acids) **Health** Prohibition of chemically synthesised allopathic treatments and antibiotics (except under specific conditions: e.g. with double withholding period) Prohibition of the use of growth promoters (hormones and similar substances) Minimum surgical actions (may be authorised for reasons of safety, in bio-dynamic farms dehorning not allowed) **Natural behaviour** Longer weaning periods for calves Use of maternal milk preferred, or in any case natural milk (> 3 months, no milk replacer) No embryo transfer based breeding methods
Pig	PL 1.82% NL 0.67% AT 0.51% FI 0.23% UK 0.18% BG 0.13% EL 0.13% RO 0.12%	**Housing** Lower animal density per unit of surface (more space allowance) Permanent access to an open-air area (whenever conditions allow) Natural daylight required Provision of litter materials (enrichment) **Feeding** Regular provision of roughage **Health** Prohibition of the use of growth promoters (hormones and similar substances) Prohibition of chemically synthesised allopathic treatments and antibiotics (except under specific conditions: e.g. with double withholding period) Minimum surgical actions (may be authorised for reasons of safety) **Natural behaviour** Later weaning for pigs (40 days minimum)
Sheep	AT: 14.68% RO: 13.18% NL: 9.32% UK: 8.53% LU: 5.89% BE: 5.09% LV: 2.68% CZ: 1.39% PL: 1.23% FR: 1.12%	**Housing** Lower animal density per unit of surface (more space allowance) Permanent access to an open-air area (whenever conditions permit it) **Health** Prohibition of the use of growth promoters Prohibition of chemically synthesised allopathic treatments and antibiotics (except under specific conditions: e.g. with double withholding period) Minimum surgical actions (may be authorised for reasons of safety) **Feeding** Minimum percentage of roughage Grazing required according to availability of pastures, whenever weather conditions allow.

Sector	MS with highest increase in the number of organic animals	Supported practices
Goat	UK: 5.05% BE: 3.8% FI: 3.2% NL: 2.88% CZ: 2.72% LU: 1.76% PT: 1.02%	**Housing** Lower animal density per unit of surface (more space allowance) Permanent access to an open-air area (whenever conditions permit it) Minimum percentage of roughage Grazing required according to availability of pastures, whenever weather conditions allow. **Health** Prohibition of the use of growth promoters Prohibition of chemically synthesised allopathic treatments and antibiotics (except under specific conditions: e.g. with double withholding period) Minimum surgical actions (may be authorised for reasons of safety)
Poultry	n.a	**Housing** Lower animal density per unit of surface in stables and outdoor runs. Permanent access to an open-air area (whenever conditions allow) Natural daylight required Litter material required on the floor Provision of more perches and access to dust baths **Feeding** Restricted use of feed additives (e.g. no synthetic amino acids) Ad libitum access to fresh water **Health** Prohibition of the use of growth promoters Prohibition of chemically synthesised allopathic treatments and antibiotics (except under specific conditions: e.g. with double withholding period) **Natural behaviour** Slow-growing breeds for broilers (higher minimum age at slaughtering)

n.a: not available; Source: Agrosynergie based on Eurostat and case studies

The **role of M11 in increasing the number of organic animals is difficult to assess**. As support under M11 is delivered by hectare of UAA committed by farmers, it is only possible to document the total area supported for conversion to organic farming over the 2014-2019 period (3.26 million ha, i.e. 2% of total UUA) and for maintenance in organic farming (8.18 million ha, i.e. 5% of total UAA). No further breakdown is available on types of farms or number of animals in farms benefiting from M11 organic support. **Moreover, the stakeholders interviewed highlighted that M11 tends to benefit holdings/sectors with large UAA, i.e. livestock ruminant farms with extensive pasture surface for grazing or areas dedicated to feed production.** In contrast, organic indoor production systems with outdoor access (i.e. veal, pig, rabbit and poultry sectors) are generally less supported by the measure (as confirmed by the stakeholders, i.e. farmers representatives and Managing Authorities in France and Spain-Catalonia). This could explain the lower rate recorded in the pig sector (see table above). Also, the Netherlands show a significant increase in organic animals, in particular in the sheep sector, despite M11 not being implemented.

The case studies provided some insights into the support granted to the various sectors, confirming the hypothesis that grazing-based organic farms significantly benefit from M11 (e.g. 21.5% of total Austrian dairy cows have been supported by M11).

M04-Support to investments in physical assets

Managing authorities and farmers representatives interviewed highlighted the **role of M04 – Investment support to improve housing conditions for farmed animals**. However, no data are available at EU level to assess the number of supported operations which contributed to improving housing conditions. Information collected in case studies helped to identify **examples of specific operations targeting animal welfare** (see table below). No example of operations targeting antimicrobials use reduction could be identified, but indirect effects were mentioned, in particular through biosecurity-related investments.

Table 17: Examples of operations supported by M04 targeting animal welfare

Sector	RDP	Supported investments…	… contributing to the implementation of better housing conditions/livestock management practices
Pig	DK DE - Baden-Württemberg	Construction of loose housing for farrowing sows	**Housing**: increased space allowance, group housing
	SE	Investments to improve housing conditions. Expected outcome: 408 581 pigs (30% of total pigs[75])	**Housing:** microclimate control (ventilation), lighting, provision of enrichment, good flooring, outdoor access
Sheep	ES – Castilla la Mancha	Investments to improve housing conditions in dairy sheep indoor systems	**Housing:** microclimate control **Feeding:** proper access to feed and water
Cattle	FR – Grand Est	Animal-friendly floors for veal calves Creation of exercise area, isolation boxes. Investments in ventilation, temperature management, bedding	**Housing**: microclimate control, provision of enrichment, group housing, flooring with vegetal litter
	SE	Investments to improve housing conditions. Expected outcome: 406 014 cattle (27% of total cattle)	**Housing:** microclimate control (ventilation), lighting, provision of enrichment, good flooring, outdoor access and grazing **Health:** quarantine (nursing stalls)
	DE - North-Rhine Westphalia	Investments in new stables with a high level of animal welfare	**Housing**: increased space allowance, group housing **Feeding**: proper access to feed and water
	PL	Investments in stable	**Housing**: increased space allowance
Dairy cattle	EE	Appropriate feed and water regime, notably through the introduction of computerised feed distribution systems	**Feeding**: good nutritional balance management
Poultry	FR – Grand Est	Creation of outdoor access, exercise area	**Housing**: outdoor access
	SE	Investments to improve housing conditions. Expected outcome: 22 345 141 poultry to benefit	**Housing:** microclimate control (ventilation), lighting, provision of enrichment, flooring, outdoor access

Source: Agrosynergie based on case studies

M10-Support to Agri-Environment and Climate Measures (AECM)

As analysed in SQ3, M10 was implemented to support **outdoor access and grazing** and the promotion of **robust breeding lines** adapted to local geographical conditions.

Some AECMs fostered minimum grazing periods for animals over the year or extensive management practices on agricultural lands. It supported mainly landscape maintenance but also helped improve **grazing and outdoor access, as well as the robustness** of the animals concerned (see table below). However, as the measure is not targeting animal welfare, there is no output documenting the number of animals concerned.

Table 18: Examples of operations supported by M10 impacting animal welfare

Sector	RDP	Supported operations…	… contributing to the implementation of better housing conditions/livestock management practices
Cattle	IT-Friuli-Venezia Giulia	Sustainable management of pasture for climate protection	**Housing**: grazing and outdoor access
Dairy cattle	AT	Alpine Pasture: Seasonal holdings for different animal categories on permanent extensive grassland at high-altitude in mountain areas	**Housing**: grazing and outdoor access

[75]The production mentioned is the main production the applicant states in the application. The applicant can have one main production but the investment can be attached to other productions of the applicant. This is why there may be data on several species

Sector	RDP	Supported operations…	… contributing to the implementation of better housing conditions/livestock management practices
		Rare breeds (keeping of acknowledged rare breed)	**Health:** genetic selections (to improve robustness, longevity and adaptability)
Sheep and goat	ES-Castilla la Mancha	Promotion of grazing in extensive livestock production systems	**Housing**: grazing and outdoor access
Sheep and goat, cattle, pig	ES-Castilla la Mancha	Conservation of native breeds in danger of extinction (breeds that are perfectly adapted to their physical environment due to their rusticity)	**Health:** genetic selections (to improve robustness, longevity and adaptability)

Source: Agrosynergie based on case studies

Other RD measures: M01, M02, M03, M07 and M16 and appraisal of their effects

Specific operations supported by M01-Knowledge transfer, M02-Advisory services and M16-Cooperation targeted animal welfare and antimicrobial use. M03-Quality scheme also contributed to farmers implementing practices beneficial for animal welfare. The French case study revealed that M07-Basic services helped foster pastoralism in mountainous areas.

- **Training related to animal welfare and antimicrobial use supported under M01** took place among the Member States studied, in Denmark, Estonia, Spain-Catalonia and Castilla La Mancha, France-Pays de Loire, Italy, the Netherlands, Austria and Poland. The projects concerned a variety of sectors: some interesting examples are detailed in the table below. In Austria, M01 supported professional training on construction and husbandry systems, milking parlours, outdoor climate barns for cattle, outdoor access in tethering barns, light in cattle stables, keeping horned cattle, etc. Most stakeholders interviewed in case studies highlighted the crucial importance of training to foster changes on farms and improve housing and management practices. Nevertheless, training alone may not be effective; it should be combined with technical advice, as well as with support to investments when necessary (see also the section on the combination of measures).
- The granting of advisory services associated with animal welfare and antimicrobial use reduction, and training of advisers through M02, were pointed out as very effective by Managing Authorities in Germany, Spain, Italy, Austria and Poland, particularly in addressing animal welfare. In Austria, Managing Authorities specified that operations were supported in the following areas: advice and training on pasture management, advice for construction and reconstruction of functional buildings, advice and training on health and treatments, and training in organic agriculture. Some of the operations supported under M02 can be dedicated to other RDP measures (e.g. in Poland, training programs were granted to advisers in charge of drawing up animal welfare improvement plans needed for M14).
- **M03 on support for quality schemes was identified as indirectly contributing to the implementation of practices beneficial for animal welfare** in France, the Netherlands, Austria and Poland, **and for antimicrobial use reduction** in the Netherlands. While there is no evidence that the supported farms changed their practices to participate in quality schemes, M03 may have been an additional push factor toward the adoption of animal-friendly housing conditions, biosecurity, and feeding practices required under such quality schemes. The effects can be significant depending on the number of farms involved in the quality scheme, as outlined by representatives of the sector and researchers working on the calf sector in the Netherlands, which described the impact of the 'Vitaal Calfes' label as limited on practices implemented on farms, but significant when applied to the sector as a whole (see also the analysis carried out for M11-support to organic farming).
- Some **EIP projects and pilot projects under M16 on cooperation** directly focused on animal welfare (health, housing, feeding, natural behaviour) and antimicrobial use. However, farmers representatives and researchers interviewed explained that results achieved need to be more widely disseminated to effectively improve farmers' knowledge on practices to implement.
- In France-Midi-Pyrénées, **M07 was used to foster collective pastoralism in the cattle, sheep and goat sector**, thereby contributing to maintaining outdoor access and grazing of livestock. No further information could be collected on the outcomes of this 'Accompaniment of pastoralism in the Pyrenees' measure in the case study.

Overall effects of these measures on the implementation of practices beneficial for animal welfare and antimicrobial use are generally considered as limited by managing authorities and farmers representatives, due to the small proportion of projects focusing on animal welfare and antimicrobial use, or because the operations supported do not necessarily involve the implementation of new practices by beneficiaries.

Moreover, no exhaustive list of operations supported under M01/M02 related to animal welfare/antimicrobial use is available at the EU or at national level. **Outputs of those operations (number of farmers trained, farmers implementing new management practices following the trainings, etc.) cannot be quantified**. It is not possible either to identify which quality schemes are concerned by support delivered under M03, or to assess their potential requirements in terms of housing conditions/management practices.

Table 19: Examples of relevant projects supported through M01, M02, M03, M07 and M16

Measure	RDP	Sector	Example of practices supported
M01-Knowledge transfer	FR-Pays de la Loire	All except pig and rabbit	'*Animal welfare and alternatives to antimicrobial use*' (**Health**: prophylaxis and alternative treatments) was the most successful among the 11 training programmes proposed. Over 1 600 participants
	NL	Veal	'*From curative practices to resilient farming systems in the veal sector*' is a training, coaching-activities and group-meetings project, concerning all kinds of practices related to AW and AMU**. (Animal robustness, biosecurity)**
	NL	Dairy cattle	'Better prevent than cure' is a project based on regional meetings and working groups. It mainly concerns hygiene management (**health**).
	AT	Cattle	M01 is used to edit informational booklets, notably on: • **Housing conditions**: no tethering, exercise area, light management, outdoor access, proper flooring; • **Health**: no mutilations.
M02–Advisory services	DE-Lower Saxony	Cattle, pigs	Advisory services supporting AMU reduction. 1 241 consultations (6 319 hours)
	ES-Andalusia	Not specific	The trainings received by advisers under M02 must address issues related to animal health and welfare
	IT-Veneto	Cattle	Advisory services supported notably target better animal welfare practices in general
	IT-Emilia Romagna	Cattle, sheep and goats	Some interventions were funded to transfer best AW practices, including **biosecurity**
	AT	Not mentioned	Advice and training operations were supported for: **Housing conditions**: grazing and outdoor access, space allowance, 'functional buildings'. **Health**: treatment management.
M03–Quality schemes	NL	Veal	Quality scheme 'Vitaal Calfes', which includes requirements on **health** (hygiene management) and **housing conditions**.
	PL	Beef	Quality Meat Programme (QMP) with requirements on **housing conditions** (no tethering), but also transport and slaughter conditions.
M07–Basic services	FR-Midi Pyrénées	Cattle, sheep and goats	Fosters pastoralism (**housing conditions**: pasture).
M16-Support to cooperation	DE	Dairy cattle	The project 'Development of an animal welfare assessment tool based on selected indicators for Schleswig-Holstein dairy farms' assesses multiple components of animal welfare but mainly **housing conditions** (outdoor access and grazing) 'Use of plasma water against hoof infections' (**health**: prophylaxis and alternative treatment)
	IT	Pig	The project 'prototype to reduce ammonia emissions from pig housing with recovery as fertilisers' mainly concerns **housing conditions** (microclimate control).
	IT-Emilia Romagna	Dairy cattle	'Integrated approach for the reduction of antimicrobial drugs in the production of milk for PDO Regional Cheeses' (animal welfare, **biosecurity**, **health**: prophylaxis and alternative treatment)

Source: Agrosynergie based on case studies

6.4.3 Best approaches in the implementation of the Rural Development measures fostering changes in practices and housing conditions

As demonstrated in the previous sections, the **effects of CAP instruments and measures on the implementation of practices beneficial for animal welfare differ significantly depending on Member State, practices and animal sectors**. Among the CAP measures from the RDPs implemented by Managing Authorities to address animal welfare issues, **specific examples can be highlighted as having generated successful changes in practices implemented on-farm**.

Example of successful changes by category of practices

Successful changes in practices driven by the CAP were identified **in all categories of practices**. Changes in housing conditions and health practices were, however, the most numerous. Fewer examples were identified regarding changes in practices associated with feeding or natural behaviour of animals.

Figure 18: Examples of successful RD measures supporting changes by category of practices

Feeding	Housing	Natural behaviour	Health
M04 – Investment support • EE – *good nutritional balance management* (dairy cows) • ES - Castilla la Mancha, DE - North-Rhine Westphalia - *proper access to feed and water* (respectively sheep and bovine) **M14- Animal welfare** • FI - *good nutritional balance management, water safety management* (all sectors studied but rabbits) • CY - *good nutritional balance management* (sheep and goat)	**M11 – Organic farming** • FR – more space allowance, *outdoor access and grazing* (all ruminant sectors) • AT, PL – *more space allowance, outdoor access and grazing* (dairy cows) **M03-Quality schemes** • NL – *space allowance* (veal) • PL – *no tethering* (beef) **M04 – Investment support** • PL – *increased space allowance* (bovine) • EE – *improved design of building* (dairy cows) • FR-Grand Est, SE – *outdoor access, modernisation* (poultry) • DK, DE-Baden-Württemberg – *group housing* (pigs) • SE - *microclimate conditions control, lightening, provision of enrichment, good flooring, outdoor access* (pig , bovine, poultry) **M10-Environment and climate measures** • ES - Castilla la Mancha, IT- Fruili Venezia Giulia – *grazing and outdoor access* (all ruminant sectors) **M14-Animal welfare** • RO - *Increased space allowance, microclimate control, flooring* (pigs and poultry) • ES - Castilla la Mancha – *grazing and outdoor access* (sheep and goat)	**M14-Animal welfare** • FI - *promotion of maternal behaviour* (veal)	**M01-Knowledge transfer** • FR – Pays de la Loire - *prophylaxis and alternative treatments* (All except pig and rabbit) **M02-Advisory services** • AT- *treatment management* (all ruminants sectors) **M03-Quality schemes** • NL – *hygiene management (veal)* **M04-Investments** • ES – Catalonia – *hygiene management* (pig) • SE – *quarantine (nursing stalls)* (bovine) **M10-Environment and climate measures** • ES-Castilla la Mancha, AT- *genetic selections to improve robustness, longevity and adaptability* (respectively ruminants and pigs, and bovine dairy) **M11-Organic farming** • ES, FR- *prophylaxis and alternative treatments, targeted antibiotic use* **M14-Animal welfare** • FI - *mutilation with pain-avoiding practices* (veal and piglet), *prophylaxis and alternative treatments* (sheep and goat)

Source: Agrosynergie

The analysis revealed that most **successful changes concerned housing conditions** supported by the CAP. Throughout the EU, several measures were successfully implemented to **foster outdoor access and grazing** (e.g. M11 in France, Austria and Poland; M10 for ruminants in Spain and Italy; M14 for sheep and goat in Spain-Castilla la Mancha, M04 for poultry in France and Sweden), **increase space allowance** (e.g. M14 for pigs and poultry in Romania; M04 for cattle in Poland), and also **improve building design and microclimate control** (e.g. M04 for dairy cows in Estonia; M14 for pigs and poultry in RO).

For **health practices** implemented by farmers, changes fostered by the RD measures mostly concerned **prophylaxis and alternative treatments** or other **treatment management** practices by means of raising farmer awareness (e.g. M01 via the support of training in France and advice supported by M02 in Austria,) greater awareness among organic farmers in France and Spain (M11)), or through restrictions on antibiotics use linked to organic farming (M11, Spain and France). Other successful changes concern **mutilations with pain-avoiding methods** (M14, Finland for the pig and veal sectors), or the **use of robust native breeds** (M10.2, Spain for ruminants and pigs). **Hygiene management** was also fostered by M03 (for calves in the Netherlands) and M04 (for pigs in Spain-Catalonia).

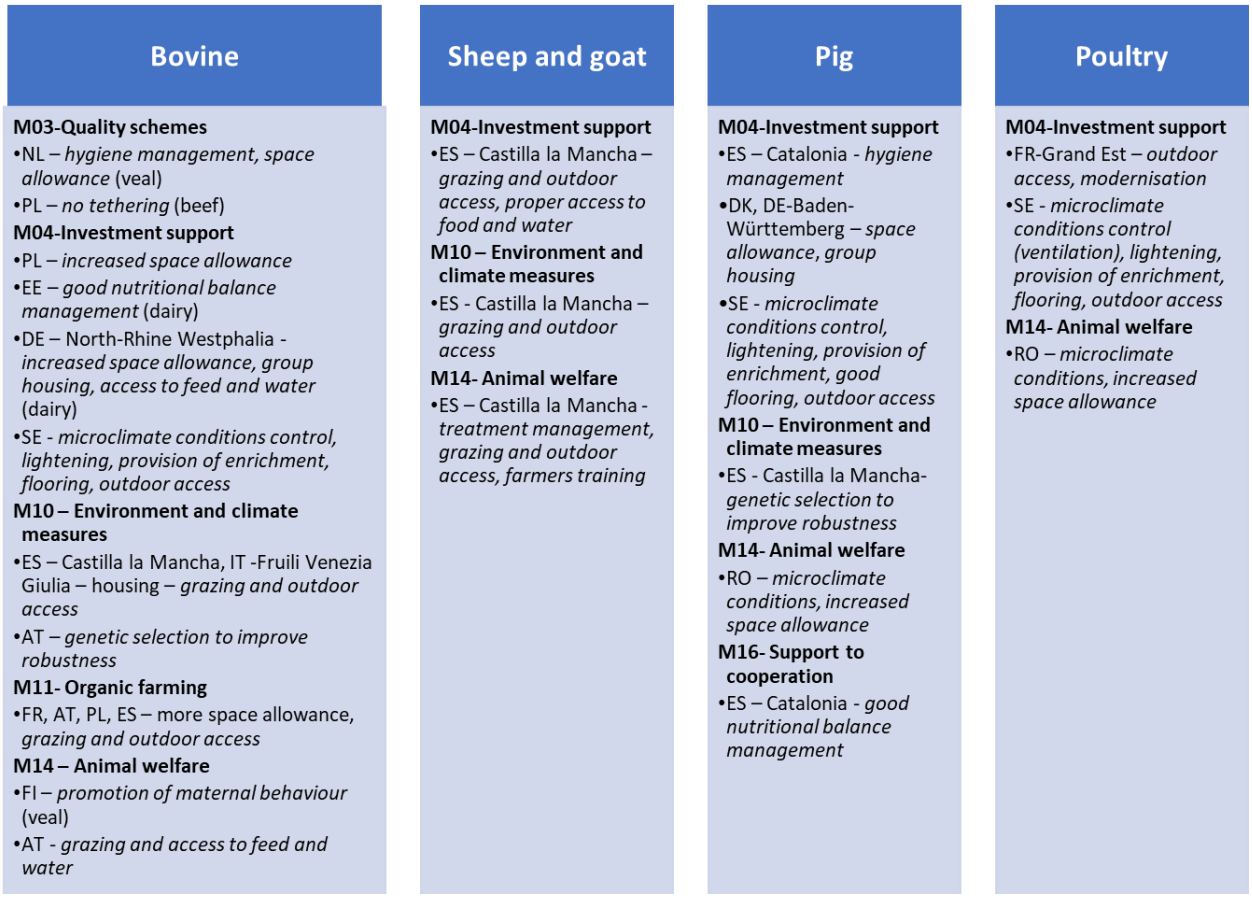
M04-Investment support and M14-Animal Welfare also led to **successful changes in feeding practices**. In Estonia and Spain, M04 helped to ensure **proper access to feed and water through investments, notably in new technologies** (Estonia). M14 also helped improve feeding practices in Finland and Cyprus by supporting **good nutritional balance management**.

An example was identified in Finland of the successful contribution of CAP measures to **promote natural behaviour of animals**: implementation of M14 helped **promote maternal behaviour and late weaning of calves**.

Example of successful changes by sector

Successful changes were **mostly identified in the cattle sector**. This may indicate that the RD measures were mostly used by cattle breeders/rearers or particularly met specific needs of the cattle sector. However, such a conclusion cannot be drawn, as the analysis did not consider all sectors in the Member States studied, and the cattle sector is over-represented in our case studies compared to other sectors. Rather, the analysis is focused on specific sectors for in-depth study. Consequently, **best examples were identified randomly (see Figure 19)**.

Figure 19: Examples of successful RD measures supporting changes by sector



Source: Agrosynergie

Few examples of successful changes were identified in the poultry, pig and rabbit sectors. In the pig and poultry sectors, this could be due to the high level of integration of production units into large, well-structured and financially viable production systems (e.g. in Italy for poultry, Denmark and Spain-Catalonia for the pig sector). In this type of large company structure, farmers have little influence on production choices and changes in practices, which are decided on by the companies and mostly influenced by market demand. For the rabbit sector, the peculiarities of the production system sometimes led to its exclusion from RD-supported schemes (e.g. in Spain-Catalonia).

Examples of **successful changes in practices in the cattle sector were identified in eight Member States**. In this sector, M03-Quality scheme helped improve **hygiene and housing conditions** of calves (Netherlands) and beef cattle (Poland). M10-Environment and climate measures, M11-Organic farming and M14-Animal welfare mostly contributed to **promoting grazing and outdoor access** (in Estonia, Spain, France, Austria, Poland). M04-Investment support fostered **increased space allowance** (Germany and Poland) as well as maintenance of stable groups in the dairy sector (Germany).

In the **sheep and goat sector**, M04-Investment support helped improve **housing conditions**. In Spain, the sector was successfully targeted by a set of measures (i.e. M04, M10 and 14) to support grazing and outdoor access.

Changes driven by RD measures in the **pig sector helped improve housing conditions** in Romania (M14 supporting microclimate control, as well as increased space allowance). In Spain, different measures supported **hygiene practices and general robustness of the animals** (through improved hygiene management, genetic selection and a pilot project on good nutritional balance).

In the **poultry sector**, M04-Investment support effectively **brought about changes leading to new production systems** (from enriched cages to barn or free-range systems) through building construction or modernisation. In Romania, the sector benefited from M04 and M14 to improve microclimate conditions and increase space allowance.

Examples of individual CAP measures fostering a systemic approach and the implementation of a set of coherent practices on-farm

M14-Animal welfare can support the implementation of different categories of practices (housing, feeding, enhancement of natural behaviour, etc.) to improve animal welfare on-farm. Whereas Managing Authorities generally drew up the list of practices to be implemented by farmers in each animal sector, **in Germany-Lower Saxony the choice of practices was left to farmers**. No specific commitments were drawn up in the RDP, but improvement of pigs and piglets' welfare was expected and measured by considering the share of pigs with intact tails[76]. Farmers could thus find solutions most suited to the circumstances of their farm to reduce or prevent tail bites. **However, the uptake of the measure remained quite low (1.6% of total LSU of fattening pigs) because the obligation to reach a minimum percentage of intact tails in order to benefit from the payments discouraged farmers from applying for the measure.**

M04 - Investment support, by fostering the construction or modernisation of buildings, can help farmers to implement new practices beneficial for animal welfare and antimicrobial use reduction (housing, feeding, biosecurity, etc.). In Austria, add-ons were delivered for **construction of stables that are 'especially animal-friendly'**, e.g. organic loose-housing barns with automatic milking systems and calf-rearing stables, deep litter loose-house stables for horned dairy cows.

M11-Organic farming is also supporting conversion toward a sustainable animal production system that requires new housing conditions and livestock management practices on-farm (e.g. organic feed, high fibre intake, robust breeds, outdoor access, longer calf-cow interaction with late separation, etc.).

6.4.4 Combined effect of CAP instruments/measures on the implementation of practices and housing conditions/design

Example of combination of measures/instruments having an effect on the implementation of practices and housing conditions/design beneficial to animal welfare

Combinations of animal welfare-related measures were implemented in some RDPs to increase the effectiveness of the supported operations. Examples were found in six of the RDPs analysed in the case studies (see table below). Combinations of measures are often not targeted toward a specific sector, with a few exceptions (e.g. combinations involving M14).

Table 20: Combination of CAP measures required in the RDPs in case-study areas

RD measures	M04-Investment support	M10.1 Agri-environment and climate	M11-Organic farming	M14-Animal welfare
M01-Knowledge transfer	EE - *all sectors* FR-Pays de la Loire - *all sectors* PL - *all sectors*	ES-Castilla la Mancha - *all sectors*	AT - *dairy cows** ES-Castilla la Mancha - *all sectors*	DE - *pigs* EE - *cattle, sheep and goats, pigs, laying hens* ES-Castilla la Manche - *sheep and goats* IT-Friuli Venezia Giulia - *beef and veal*

[76] At any given time, 80% of piglets (M14 dedicated to Highly animal friendly husbandry of piglets) and 70% of pigs (M14 dedicated to Highly animal friendly husbandry of fattening pigs) must have an intact tail for breeders to benefit from the payment.

RD measures	M04-Investment support	M10.1 Agri-environment and climate	M11-Organic farming	M14-Animal welfare
				CY-*Sheep and goats*
M02-Advisory services			AT, DK - *dairy cows**	DE - *pigs* PL - *dairy cows, beef and pigs*

*Information was collected only for the specific sectors studied in each case study

Source: RDPs and interviews with Managing Authorities

The combinations always rely on **M01-Knowledge transfer (e.g. supported training or seminars on animal welfare) associated with other RD measures on commitments (M10, M11, M14) or investments (M04)** to improve housing conditions or increase enrichments. All the Managing Authorities and farmers representatives interviewed in case studies (where training courses or advice were required for M04, M10, M11 or M14) emphasised the general importance of education and training for farmers to raise awareness, improve practices and **ensure knowledge of beneficiaries on animal welfare and antimicrobials use reduction practices**.

In Spain-Castilla la Mancha, the combination is enforced through **beneficiaries' obligation to attend an M01-supported training** to be eligible for M14 (see box below). In other case-study areas, the Managing Authorities introduced a **selection criterion giving extra points to beneficiaries** who took part in training supported under M01. A farmer representative in Spain-Castilla La Mancha said that the willingness of training depends on each farmer, thus it may be expected that, without the requirement, fewer farmers would have been trained.

In Poland, **M14 was associated with M02-Advisory services** to improve technical knowledge by **certified agricultural advisers** and support improvements in the dairy cow, beef and pig sectors.

These combinations could also be relevant for antimicrobials use reduction. But their effect highly depends on the topic of the training and on the investments/operations concerned.

Box 7: Example of combinations of RD measures implemented in case studies

In Spain - Castilla la Mancha, among the commitments to be eligible for the M14-Animal welfare measure, sheep and goat farmers have to supplement the basic training with additional qualification on specific welfare issues faced in extensive and semi-extensive systems. This training must be attended by both the owner of the farm and the staff handling the animals. This training is supported through M01-Knowledge transfer.

In **France-Pays de Loire**, beneficiaries of M04 must attend a two-day training course supported by M01 within three years in order to get their final payment. Under MO1, one of the most successful courses (in terms of attendees) concerned 'health and animal welfare'.

In **Poland**, M14 required the establishment of a specific plan to improve animal welfare, which had to be prepared by certified agricultural advisers, whose specific training on animal welfare was supported by M02.

Source: RDPs and interview with Managing Authorities

Potential synergies

Specific cases of synergies between RD measures were highlighted by Managing Authorities interviewed in the case studies. In these cases, no combination of measures was particularly required in the RDPs.

Table 21: Examples of synergies between CAP measures influencing practices impacting animal welfare

CAP Measure and Instrument combined with	M10.1	M11	M14	M16
M01/M02		Austria		Italy-Emilia Romagna
M04	France-Bretagne, with M07.6	Denmark		

CAP Measure and Instrument combined with	M10.1	M11	M14	M16
M10.1			Austria	
M14		Austria (M14 - AW Grazing scheme)		

Source: RDPs and interviews with Managing Authorities

The potential additional effects obtained through synergies between RD measures can be assessed only through stakeholders' own opinions, given that no data provide information on their implementation. In most cases, the identified synergies between measures supporting investments (M04), practices (M14, M10.1, M11) and knowledge (M01/M02) were considered to have the potential to provide significant added value.

In Italy-Emilia Romagna, Managing Authorities mentioned that training and visits to other farms supported by M01 and advisory services implemented through M02 helped improve sensitivity about animal welfare and make farmers aware that animal welfare can increase the added value of production in terms of quality, sustainability and price. As a result, farmers became more eager to become involved in projects supported by M16 (there are 14 projects addressing animal welfare and reduction of antimicrobial use funded by M16 in Emilia Romagna).

In Austria, a civil society representative and a representative of the Managing Authority pointed out that the general requirement of providing pasture in organic agriculture makes it easier for farmers to comply with the requirements of M14-Grazing scheme. Hence, the synergy between organic farming and M14 is expected to increase uptake of the practices required under both measures.

At the same time, there are still exemptions for organic farms in providing pasture. Farmer's representatives and the Managing Authority emphasised that, regarding access to pasture, additional effort are needed even for organic farmers.

6.4.5 Bottlenecks in design and in implementation hindering the effectiveness of CAP instruments and measures

6.4.5.1 Bottlenecks associated with the design of the CAP instruments and measures

Interviews conducted in the Member States studied revealed that shortcomings in the measure design and in the regulatory framework as well as lack of budget have affected the effectiveness of the CAP measures and instruments beneficial for animal welfare and the reduction of antimicrobial use.

As a whole, regarding animal welfare and reduction of antimicrobial use:

- **Difficulties in dedicating specific budget to enhance animal welfare or reduce antimicrobial use and/or in setting appropriate payment rates to farmers (M14)** were emphasised in Estonia (M01 and M02), Italy (M14), Cyprus (M14), and Slovakia (M14). In Estonia, Italy, Cyprus and Slovakia, farmers representatives, researchers and Managing Authorities highlighted that partial compensation of the additional costs and lost income may discourage farmers and lead to low uptake.
- According to Managing Authorities, the low uptake of farmers can be explained by **difficulties in determining a measure (M14) both effective and not too complicated to implement, coupled with the need for relevant indicators for commitments** (that are measurable and feasible). In the case of Italy-Emilia Romagna and Friuli Venezia Giulia, for instance, this led farmers to give up implementing this measure.

Moreover, stakeholders interviewed in Austria outlined two difficulties which can partially explain why no measures were specifically implemented to directly address antimicrobial use (see SQ3):

- The Managing Authorities highlighted the **difficulties in deciding on relevant measures on the complex subject of antimicrobial use and antibiotic resistance**, while drawing on cooperation that includes civil society and

responding to the needs of farmers.

- A farmer representative outlined **the lack of regulatory restriction on Highest Priority Critically Important Antimicrobials** (HPCIA) use[77] and therefore the absence of sanction envisaged in the CAP: HPCIA listed by the World Health Organisation (WHO)[78], are commonly used, even when not needed from a veterinary perspective, because there is no strict legislation or sanctioning of this use.

For animal welfare, stakeholders revealed two specific difficulties:

- According to Managing Authorities**, the lack of specific priority or focus area for animal welfare**[79] has complicated support to animal welfare projects in RDPs (**France**) and limited the number of RDP measures dedicated to animal welfare (**Austria**).
- The design of the measure does not always fit needs: In Spain-Catalonia, Managing Authorities indicated that farms with indoor systems (pigs and rabbits) and low surfaces are little concerned by the RDP measure, and it therefore reduced the incentive of requesting area-based payments.

6.4.5.2 Bottlenecks associated with the implementation of the CAP instruments and measures

Interviews conducted in the Member States studied outlined several bottlenecks which have limited the implementation of practices beneficial for animal welfare and the reduction of antimicrobial use, supported by the CAP:

- **The lack of information about the issues and existing measure to address it** have limited the uptake. In Italy-Emilia Romagna and Cyprus, Managing Authorities indicated difficulties in complying with the complex commitments under M14, resulting in **low uptake of the measure**. Furthermore, lack of farmer knowledge of animal welfare and antimicrobial use issues decreased their interest in support under M14.
- **The difficulty of implementing effective checks has limited the effectiveness of M14** in Germany, Estonia, Poland, Slovakia and Finland. According to Managing Authorities, many measures are difficult to implement because **they cannot be properly checked** (**Germany**-North Rhine Westphalia, **Estonia** and **Slovakia**), especially for requirements recorded by beneficiaries (e.g. pasture dairy) or assessed during on-site checks (e.g. commitments related to the supply of sufficient bedding). Uncertainties regarding efficient checks and the risk of reclaiming payment led to lower acceptance of M14 in Poland and Germany-North Rhine Westphalia. Finally, all these procedures **require time and commitment**, which limited initial ambitions (FI).
- Managing Authorities and farmers representatives considered that **high administrative costs for beneficiaries or Managing Authorities** led to a low acceptance rate of CAP measures in general in Sweden (dairy cows), of M02 in Germany-North-Rhine Westphalia, and the renunciation of programming M02 in France-Pays de la Loire and M16 in France-Brittany.
- According to Managing Authorities, **a strict definition of the eligible criteria or commitments** have excluded some farms and limited the uptake (maximum livestock density of 2 LSU per ha for M04 in Germany-Lower Saxony and North-Rhine Westphalia or minimum livestock density of 0.2 LSU per ha for M14 'summer grazing' in Germany-North Rhine Westphalia).
- In Poland, **fixed application deadlines for M14**, which did not reflect the realities of agricultural production, as well as possibilities of verification (checks) by the Paying Agency also limited its uptake.

[77] Under cross-compliance, CAP beneficiaries could see their CAP payments reduced if they did not respect the SMR 4 that includes the following hygiene requirement: 'to use feed additives and veterinary medicinal products correctly, as required by the relevant legislation' (point 4(j) of Part A of Annex I of Regulation (EC) No 852/2004 on the hygiene of foodstuffs). But these requirements do not specifically mention Highest Priority Critically Important Antimicrobials (HPCIA) use.

[78] https://www.who.int/foodsafety/publications/WHO-CIA-list-6flyer-EN.pdf?ua=1

[79] Animal welfare is linked to Priority 3 amongst marketing, processing of agricultural products and risks management.

6.4.6 Other factors influencing the implementation of animal welfare and antimicrobial use practices

Other factors external to the CAP influenced the implementation of farming practices beneficial to animal welfare and the reduction of antimicrobial use, thereby impacting the effectiveness of CAP measures and instruments.

Antimicrobial use reduction is mostly addressed by Member States at national level through **action plans based on voluntary participation of farmers** to tackle antimicrobial resistance. According to the ESVAC report, tentative explanations for the decline in sales include, among others, the implementation of responsible-use campaigns, restrictions on use, prescription control measures, increased awareness of the threat of antimicrobial use and the setting of targets for reductions in antimicrobial sales or use. The strong connection between the wholesaling VMP companies and the veterinarians can lead to **conflict of interest in prescribing antimicrobials** and consequently increase in their sales (example of **Cyprus**)[80]. In the Netherlands, there is a general consensus amongst managing authority, farmers representative and researchers interviewed on the positive effect of the Dutch policy to improve transparency and responsibility, as well as growing awareness among veterinarians on the reduction of antimicrobial use[81]. In the Netherlands and Austria, most stakeholders pointed out the **key role of national regulation** on the improvement of animal welfare, which sets requirements that come in addition to EU legislation (e.g. anaesthetizing calves before dehorning in Austria).

Public awareness on issues of animal welfare and antimicrobial use, value chain initiatives to enhance animal welfare and the existence of private standards on animal welfare have a great positive influence on the implementation of practices beneficial for animal welfare and reduction of antimicrobial use (see SQ3). According to farmers representatives, **competition between distribution chains has led to spread in the demand for animal welfare labels** (e.g. the pig sector, **Spain**). However, it can also create **competition distortion** with other countries which have lower standards (mentioned in **France** for cattle and in **Spain** for pigs), and within the EU (for cattle). **Demand from the market may also limit changes** in farmers' practices: in the Netherlands, Managing Authorities and the veterinarians' association confirmed that uncastrated pork is not accepted on the export market, which greatly limits the breeding of uncastrated pigs.

The **structure of the sector** can also have great effects on changes in practices. In the Netherlands, the high level of integration of sectors was mentioned by two stakeholders as a facilitating factor: even if integration may act as a limit to individual initiatives, in the event some changes are required by the market, those changes will be integrated quickly in a high percentage of farms.

Researchers, farmers representatives and organic producers' organisations (**France, Italy**) mentioned that **the sanitary crisis caused by the avian flu** led to the compulsory retention of animals indoors to prevent contamination, in buildings not necessarily adapted to keep animals inside.

6.4.7 Summary of findings

The extent to which CAP instruments and measures have contributed to the implementation of practices positive for animal welfare or the reduction of antimicrobial use was difficult to establish due to the lack of sufficiently detailed data on the type of operation and sector supported at EU level. Hence, information was rounded out by opinions collected in Member States and regions studied and by a literature review.

Situations differ greatly between Member States. In some Member States, the information collected did not make it possible to demonstrate the effects of the CAP on practices impacting animal welfare or antimicrobial use

[80] Data from ESVAC reports indicate that antimicrobial sales in Cyprus are the highest of the European Union (466.30 mg/PCU in 2018) and have strongly increased recently in the livestock sector (+14% between 2011 and 2018).

[81] Amongst the highlighted measures were measures targeting veterinarians by benchmarking their sales of antimicrobials and use by the latter on herds. This makes it possible to compare the antimicrobial prescriptions of veterinarians and the obligation to have one contracted veterinarian per herd, which gives a clear responsibility on herds' health management.

reduction, because these issues have been addressed by other means, and intensive indoor systems did not receive support from the CAP (notably the poultry, pig and rabbit sectors). However, in most Member States/regions studied, **cross-compliance, through SMR 4, 11, 12 and 13, was effective in influencing farmers' practices**, especially in Member States and regions where animal farms did not yet fully meet the requirements of the EU Directives of Animal Welfare. Nevertheless, the European Court of Auditors outlined that the performance indicators used by the Commission are insufficient to assess adequately animal welfare, which is not addressed by any of those indicators.

Regarding Pillar I CAP instruments, specific examples collected in Member States/regions studied highlighted that **CMO regulations on egg marketing standards were effective in promoting alternative farming methods, outdoor access, provision of enriched environment and more space allowance in the laying hen sector**. Regarding VCS, **a few examples of positive effects of VCS** on housing conditions (e.g. space allowance, outdoor access and grazing) in the sheep, calves and cows sectors were noted in case-study areas.

Overall, the analysis revealed that **most successful changes induced by RD measures concerned housing conditions (outdoor access, increased space allowance, microclimate control) and animal health (treatment management, no mutilations, prophylaxis).** While identified in all sectors except that of rabbits, successful changes of practices fostered by CAP measures were more frequent in the cattle and the pig sectors.

Amongst RD measures, **M14-Animal welfare is the most effective measure to foster changes in practices** leading to better animal welfare. Notably, it had the capacity of fostering systemic approaches, combining **different categories of practices (housing conditions, feeding, enhancement of natural behaviour and health management) to improve animal welfare on-farm**. This measure was implemented for around 10% of the total livestock units at EU level and **concerned all livestock sectors studied except that of rabbits.** Nevertheless, only 35 RDPs programmed the measure, targeting one or several sectors. Consequently, its effects on animals overall, at EU level, was rather limited.

For other RD measures, despite not targeting animal welfare, M11, M04, M10, M01 and M02 have contributed to maintaining or changing practices beneficial for animal welfare or the reduction of antimicrobial use. **M11-Organic Farming had a significant impact on the enhancement of numerous practices beneficial for animal welfare and the reduction of antimicrobial use** (better housing conditions, better feeding practices, health management and practices enhancing natural behaviour). **M11 tends to benefit holdings/sectors with large UAA, i.e. farms breeding ruminants** with extensive pasture surface, but the lack of data on the animals and sector concerned have limited our analysis. Specific examples of the contribution of M04-Investments to animal welfare through the improvement of housing conditions in all studied sectors (including biosecurity), except rabbits, were also pointed out. M10- Support to Agri-Environment and Climate Measures were found in specific cases to foster grazing in the sheep, goat and cattle sectors, but also animal robustness through breed conservation. Other RD measures had a positive effect, although limited, such as M01 and M02, which provided training and advisory services related to animal welfare and antimicrobial use, and M03, which contributed to implementation of beneficial animal welfare practices in a few cases (notably, **improving hygiene and housing conditions in the cattle sector**). Although the biggest impact on the animal welfare practices implemented could come from combining RD measures, this possibility was not taken up by many Member States and regions (though examples of good practices combining M01 or M02 with M04, M10.1, M14 or M11 were found in some Member States).

On a final point, Managing Authorities stressed the **difficulties in designing M14** (limiting complex design; setting appropriate payment rate; dealing with antimicrobial use, which is particularly complex with regard to addressing it through the CAP) **and implementing RD measures** (notably farmers' lack of information on the available supports, high administrative costs for beneficiaries and Managing Authorities). External factors also influenced to some extent the implemented practices, notably national action plans for the reduction of antimicrobial use at Member State level, public awareness on the use of antimicrobials and animal welfare, and value chain initiatives.

6.5 SQ 5 on effectiveness – To what extent have CAP instruments and measures (individually and taken together) addressing animal welfare contributed or not to achieving the objective of viable food production?

6.5.1 Understanding of the question

The previous SQ analysed the effects of the CAP measures on the **implementation of farm practices and housing conditions/design**, taken individually. This one considers to what extent these **changes in practices driven by the CAP helped to improve animal welfare, and not only the practices implemented**.

For this purpose, the analysis relies on theoretical contribution of practices to animal-welfare components, as established in SQ1. Tables were set up to **summarise the actual effects of CAP instruments[82] and measures[83] taken together** and to establish **links between CAP interventions, effects on practices and overall contribution to each animal-welfare component**: hunger and thirst, discomfort and fear, pain and diseases, and natural behaviour.

As this question examines the overall effect of the CAP on animal welfare, it will consider **both positive and negative effects** associated with the implementation of the CAP instruments and measures. For this purpose, the analysis identifies whether specific CAP instruments and measures have influenced **implementation of practices and housing conditions with unexpected negative impacts on animal-welfare aspects**. Opinions of stakeholders interviewed are used to complement findings from previous SQs.

The last part of the SQ was dedicated to **identifying one or several possible indicators to assess the impact of the CAP measures and instruments** on animal welfare. It lists examples of relevant indicators collected in case-study Member States and considers information collected through interviews with specialists of animal welfare to identify types of indicators and the **corresponding requirements to report the necessary information at Member State level**.

6.5.2 Effective contribution of CAP instruments and measures to animal welfare

In order to assess the contribution of the CAP instruments to the reduction of hunger and thirst, discomfort, fear and distress, pain, injury and disease, as well as their contribution to the promotion of natural behaviour, **the following sections outline the identified effects of each CAP instrument on farming practices that positively impact each animal-welfare component**. Therefore, the following tables summarise the examples of successful changes driven by CAP measures for each farming practice impacting the given animal-welfare component (as demonstrated in SQ1, which assessed the theoretical relations between farming practices and animal welfare). Information is provided for the Member State and region studied, except for M11-Organic farming and M14-Animal welfare, whose effects were considered at EU level (see SQ4).

[82] SMR 11, 12 and 13, VCS, marketing standards.

[83] M4-Investments, M11-Organic Farming, M14-Animal Welfare, M3-Quality schemes, M1-Knowledge Transfer, M2-Advisory Services, M9-Producers group and M16-Cooperation.

6.5.2.1 CAP instruments and measures addressing hunger and thirst

Table 22: Examples of instruments and measures addressing hunger and thirst

Farming practices	SMRs	CMO Eggs	M01/M02	M03	M04	M10	M11**	M14	M16	VCS
Good nutritional balance	PL, RO, etc.*				EE		EL, AT, LV, RO, UK, LU, BE	FI, CY, SE, HR, IT, HU	ES	
High fibre intake	PL, RO, etc.*			NL		IT, AT, ES	EL, AT, LV, RO, UK, LU, BE	IT, SI		
Feed safety management	PL, RO, etc.*				ES			ES, SE, HR		
Water safety management	PL, RO, etc.*				ES			FI, ES		
Genetic selection to improve robustness, longevity and adaptability						AT, ES	EL, AT, LV, RO, UK, LU, BE	SK	DE	
Promotion of maternal behaviour: mother milk consumption and later weaning	PL, RO, etc.*						EL, AT, LV, RO, UK, LU, BE	IT		
Animal-human interaction: one daily milking										
Farmer training	PL, RO, etc.*		NL, AT, IT					EE, CY, HR, IT	IT	

Source: based on SQ1 and SQ4 results from case studies, questionnaires and RDP reviews. *It was considered that SMRs have positive effects in all MS, as potential penalties for non-compliance were said to be highly dissuasive **MS with an increase between 2015 and 2018 in organic LSU exceeding 5% in at least one livestock sector.

Positive effect of the CAP instrument/measure identified in at least two Member States
Positive effect of the CAP instrument/measure identified in one Member State or to a limited extent in several Member States
Positive effect of the CAP instrument/measure spatially restricted or vague and depending on implementation choices
No example of positive effect identified in Member States/regions studied

Main CAP instruments and measures addressing hunger and thirst

Information gathered in previous SQs and summarised in **Table 22** shows that **M14-Animal welfare was the main measure implemented to tackle hunger and thirst**. In Finland, M14 benefits multiple animal-husbandry sectors (cattle, sheep, goats, pigs, poultry) and has high uptakes (more than 50% of LSU in each sector), but the measure can also be targeted towards fewer sectors, such as in Cyprus (only the sheep and goat sectors) or Croatia (only the cattle sector). **M11-Organic farming and SMRs 11 and 13 also contributed to the reduction of hunger and thirst**. In contrast, VCS and CMO regulations on eggs do not address this issue. It should be noted that M04-Investments is also mentioned in Estonia and Spain, as one of the main instruments to address hunger and thirst, through investments in feeders and drinkers for instance.

Details of practices implemented as a result of CAP instruments and measures

The analysis shows that **the CAP mainly contributed to the reduction of hunger and thirst by promoting good nutritional balance and high fibre intake**. These practices are promoted by the EU Directives included in the cross-compliance scope for all livestock sectors (SMR13). For example, there is a requirement that animals are fed with a diet appropriate to their age and species or that they have proper access to feed and water thanks to equipment limiting contamination and competition between animals. Further recommendations are given to the calf sector (SMR11), for which food must contain sufficient iron and fibre. **Good nutritional balance and high fibre intake are**

also well promoted by organic farming supported by M11, and by Managing Authorities who decided to use M14 to tackle this issue. Examples collected in Member States and regions studied revealed that, within the framework of M14, Finland supports the implementation of an appropriate feeding plan for each group of cattle considering the stage of the production season. Italy-Marche promotes a food ration that suits the needs of herbivores and pigs and requires food supplements for pastured animals, all established with support from a nutritionist. Regarding fibre consumption, Managing Authorities of Italy-Lazio and Slovenia each require a minimum 60% of dry matter in fodder for dairy cows, beef, sheep and goats, and an additional supply of structural roughage for pigs. When promoting pasturing, M10-Agri-environment also contributed to higher fibre intakes in the cattle, sheep and goat sectors (in Italy, Spain and Austria for instance). **Feed and water safety management were also relatively well supported by the CAP and helped to limit hunger and thirst**. **Maternal behaviour was only moderately supported**. Mother's milk consumption and later weaning are supported on a common baseline by SMR 12 in the pig sector or required by organic farming practices through M11-Organic farming. One successful example of M14 implementation also favoured later weaning for buffalo calves, in Italy-Campania. The action provides for extension of the lactation period of calves on-farm up to 30 days after the colostral milk phase, allowing for improved growth and immune systems of calves in the post-partum period. Nevertheless, colostrum intake is supported only by SMR 11 for calves and SMR 12 for pigs.

On the other hand, information gathered suggests that only M11-Organic farming promotes improvement in feed diversity and feed choice on-farm.

6.5.2.2 CAP instruments and measures addressing discomfort, fear and distress

Table 23: Examples of instruments and measures addressing discomfort, fear and distress

Farming practices	SMRs	CMO Eggs	M01/M02	M03	M04	M10	M11**	M14	M16	VCS
Good nutritional balance	PL, RO, etc.*				EE		EL, AT, LV, RO, UK, LU, BE	FI, CY, SE, HR, IT, HU	ES	
High fibre intake	PL, RO, etc.*			NL		IT, AT, ES	EL, AT, LV, RO, UK, LU, BE	IT, SI		
Increased space allowance	PL, RO, etc.*	FR, IT	AT	NL	PL, DE		EL, AT, LV, RO, UK, LU, BE	RO, FI, SK, EE, CZ, SI, IT, HR, HU		FR, NL, IT
Provision of enrichment	PL, RO, etc.*	FR, IT			FR, SE		EL, AT, LV, RO, UK, LU, BE	FI, IT		
Proper flooring	PL, RO, etc.*		AT		SE			RO, FI, IT		
Microclimate control	PL, RO, etc.*				FR, SE			RO, FI, CZ	IT	
Proper light management			AT		SE		EL, AT, LV, RO, UK, LU, BE	IT		
Outdoor access and grazing		FR, IT	AT		ES, FR, SE	IT, AT, ES	EL, AT, LV, RO, UK, LU, BE	FI, EE, ES, CZ, AT, SI, HR, IT, HU		FR, NL, IT
No mutilation	PL, RO, etc.*						EL, AT, LV, RO, UK, LU, BE	FI, CY, SI, IT		
Promotion of maternal behaviour: mother's milk consumpti	PL, RO, etc.*						EL, AT, LV, RO, UK, LU, BE	IT		

Farming practices	SMRs	CMO Eggs	M01/M02	M03	M04	M10	M11**	M14	M16	VCS
on and later weaning										
Maintenance of stable groups			AT							
Practices improving /phasing out culling of male chicks										
Practices improving conditions when killing unproductive animals on-site										
Farmer training	PL, RO, etc.*		NL, AT, IT					EE, CY, HR, IT	IT	

Source: based on SQ1 and SQ4 results from case studies, questionnaires and RDP reviews. *It was considered that SMRs have positive effects in all MS, as potential penalties for non-compliance were said to be highly dissuasive **MS showing an increase in organic LSU exceeding 5% in at least one livestock sector.

Positive effect of the CAP instrument/measure identified in at least two Member States
Positive effect of the CAP instrument/measure identified in one Member State or to a limited extent in several Member States
Positive effect of the CAP instrument/measure spatially restricted or vague and depending on implementation choices
No example of positive effect identified in Member States/regions studied

Main CAP instruments and measures addressing discomfort, fear and distress

Information gathered in previous SQs and summarised in **Table 23** show **that M14-Animal welfare helped to tackle discomfort, fear and distress by supporting a great variety of practices in Member States studied.**

SMRs 11, 12 and 13 also ensured farmers' compliance with provisions laid down in EU Directives. M11-Organic farming also significantly helped to reduce fear and distress of animals by supporting conversion to or maintenance of organic farming in all sectors studied (although M11 did not foster the development of organic production in the rabbit sector). Examples of successful changes supported by M04-Investments were also identified in several Member States studied, where investments contributed to higher space allowance in newly built stables, such as in Germany for the pig and cattle sectors. M04-investments mostly benefited the cattle, pig and poultry sectors.

Details of practices implemented as a result of CAP instruments and measures

CAP instruments and measures helped to address discomfort, fear and distress by supporting increased indoor space allowance and fostering outdoor access and grazing. The above-mentioned CAP instruments generally supported at least one of these two aspects, but it should be noted that outdoor access was promoted in numerous Member States through M14-Animal welfare. Most of the successful examples of **M14 promoting outdoor access concern the cattle or sheep and goat sectors**, but some examples can be found in the poultry sector (in Slovenia and Italy-Calabria), or even in the pig sector (in Italy-Liguria, Umbria and Marche). **Regarding space allowance, sectors targeted under M14 were mostly cattle and pig**, as noted in eight of the Member States studied. Poultry and sheep and goat were targeted in five Member States. Requirements consist of additional space per animal around 10 to 15% higher than minimum standards set by EU legislation, depending on the category of the animals concerned.

Managing Authorities of the two regions Italy-Calabria and Italy-Liguria supported this measure for all sectors whereas other Members States such as Estonia, Slovenia, and Finland focused only on the pig sector.

M04 also contributed to the improvement of housing conditions by favouring better comfort and by limiting fear and distress. Outdoor access and grazing were the most common practices supported in case-study areas, through the creation of outdoor access and exercise areas (**France**-Grand Est for poultry) or investments in the pig sector to improve housing conditions as a whole, including outdoor access (in **Sweden** for poultry, pig and cattle and in PL, especially for cattle). Space allowance was improved in stables supported in Poland, notably in the cattle sector and in the construction of loose farrowing for sows in Germany-Baden **Württemberg**. Provision of enrichment, improved flooring, better microclimate control and proper light management was also supported and contributed to improving comfort and to limiting fear and distress (see SQ4). **The CAP instruments also appeared relatively effective in ensuring the provision of minimum housing conditions, as minimum enrichment is required** through the regulatory provisions for the pig sector checked under SMR12 and the CMO regulation on eggs marketing standards in the laying hens sector. According to SMR12, each weaner or production pig must have a free space area of between 0.15 and 1m^2 depending on its weight. For gilts and sows when gilts and sows are cohabiting, the total area of open space available must be at least 1.64 m^2 and 2.25 m^2 respectively. Regarding enrichment, pigs are supposed to have permanent access to sufficient materials for suitable searching and handling activities (straw, hay, wood, etc.). The CMO regulation specifies how eggs should be labelled according to the production conditions of laying hens. The numbers from 0 to 3 correspond to organic, free-range, barn and enriched cage production respectively.

Nevertheless, **no example was found of a CAP measure effectively addressing the maintenance of stable groups or the killing of unproductive animals onsite, notably of male chicks** in the Member States and regions studied**.**

6.5.2.3 CAP instruments and measures addressing pain, injury, disease

Table 24: Examples of instruments and measures addressing pain, injury and diseases

Farming practices	SMRs	CMO Eggs	M01/ M02	M03	M04	M10	M11**	M14	M16	VCS
Good nutritional balance	PL, RO, etc.*				EE		EL, AT, LV, RO, UK, LU, BE	FI, CY, SE, HR, IT, HU	ES	
High fibre intake	PL, RO, etc.*			NL		IT, AT, ES	EL, AT, LV, RO, UK, LU, BE	IT, SI		
Feed safety management	PL, RO, etc.*				ES			ES, SE, HR		
Water safety management	PL, RO, etc.*				ES			FI, ES		
Increased space allowance	PL, RO, etc.*	FR, IT	AT	NL	PL, DE		EL, AT, LV, RO, UK, LU, BE	RO, FI, SK, EE, CZ, SI, IT, HR, HU		FR, NL, IT
Provision of enrichment	PL, RO, etc.*	FR, IT			FR, SE		EL, AT, LV, RO, UK, LU, BE	FI, IT		
Microclimate control	PL, RO, etc.*				FR, SE			RO, FI, CZ	IT	
Proper light management			AT		SE		EL, AT, LV, RO, UK, LU, BE	IT		
Hygiene management	PL, RO, etc.*		NL	NL	ES			CY, CZ, IT		
Treatment management	PL, RO, etc.*		AT				EL, AT, LV, RO, UK, LU, BE	FI, CY, CZ, SI, IT, HU	DE, IT	
No mutilation	PL, RO, etc.*						EL, AT, LV, RO, UK, LU, BE	FI, CY, SI, IT		
Genetic selection to improve robustness, longevity and adaptability						AT, ES	EL, AT, LV, RO, UK, LU, BE	SK	DE	

Farming practices	SMRs	CMO Eggs	M01/ M02	M03	M04	M10	M11**	M14	M16	VCS
Promotion of maternal behaviour: mother's milk consumption and later weaning	PL, RO, etc.*						EL, AT, LV, RO, UK, LU, BE	IT		
Maintenance of stable groups			AT							
Practices improving/phasing out culling of male chicks										
Practices improving conditions when killing unproductive animals on-site										
Farmer training	PL, RO, etc.*		NL, AT, IT					EE, CY, HR, IT	IT	

Source: based on SQ1 and SQ4 results from case studies, questionnaires and RDP reviews. *It was considered that SMRs have positive effects in all MS, as potential penalties for non-compliance were said to be highly dissuasive **MS showing an increase in organic LSU exceeding 5% in at least one livestock sector.

Positive effect of the CAP instrument/measure identified in at least two Member States
Positive effect of the CAP instrument/measure identified in one Member State or to a limited extent in several Member States
Positive effect of the CAP instrument/measure spatially restricted or vague and depending on implementation choices
No example of positive effect identified in Member States/regions studied

Main CAP instruments and measures addressing pain, injury and diseases

Information gathered in previous SQs and summarised in **Table 23** show **that M14-Animal welfare helped to tackle the highest number of practices in various livestock sectors.** Some Member States chose to design this measure to address specific issues, such as in Cyprus, where M14-Animal welfare concerned sheep and goats exclusively, and mainly focused on feeding and health issues. Others had a broader approach, such as Slovenia, which supported several sectors (calves, sheep and goats, pigs, broilers and laying hens) for various types of practices such as feeding, housing, health or animal-human interactions. **SMRs also helped to address a significant number of practices impacting pain, injury and disease, by reinforcing compliance of farmers with EU Directives.** Although few successful examples are associated with M01-Knowledge transfer and M02-Advisory in **Table 24**, farmers representatives and Managing Authorities interviewed outlined the potential of these measures in reducing pain, injuries and diseases through farmer training in all livestock sectors, especially when these measures are combined with others such as M04-Investments or M14-Animal welfare.

Details of practices implemented as a result of CAP instruments and measures

Pain, injury and disease were mainly tackled by the CAP through the promotion of increased space allowance, good nutritional balance management, fibre intake, and the provision of enrichment for animals. As mentioned earlier, these practices are actually mandatory in all Member States as minimum standards required in EU Directives, and their implementation is backed up by SMRs. M14-Animal welfare was sometimes implemented to support commitments going beyond the regulatory baseline (notably regarding increased space allowance that is about 10 to 15% greater than legislative provisions). **Better hygiene management was moderately promoted by the CAP, notably by SMRs 4, 11 and 13, as well as M14**, but also more locally through quality schemes supported by M03 such as in the Netherlands for calves. **Mutilation issues** are addressed in the pig sector (tail-docking) through SMR12, although the EU Directive enables farmers to practice tail-docking in the absence of other alternatives. M11-Organic farming supported the implementation of specific practices required by Regulation (EC) 834/2007, notably in the sheep and goat sector, with the requirement of minimum surgical interventions or in Austria where a special

requirement for no dehorning (or at least very early dehorning) is required under organic farming. Depending on implementation choices, M14-Animal welfare can also target mutilation practices, especially castration, such as in Finland (pain relief before and after surgical castration for calves and piglets), Cyprus (elimination of castration for sheep and goats except if it is documented and justified by the farm veterinarian and if it is done to minimise the burden on the animals) or Slovenia (surgical castration of male piglets using anaesthesia and/or analgesia up to the seventh day of age). **The CAP further addressed pain, injury and disease with the selection of robust breeds adapted to their environment**, as favoured by M11-Organic farming. M10-Agri-environment was also used to preserve rare breeds such as in Spain-Castilla la Mancha, where it targeted diverse sectors (sheep, goat, cattle and pigs). It was also implemented in Slovakia to preserve the Slovak Pinzgauer cattle breed for instance, which is adapted to very extensive production systems (Bulla, Polak and Cherenek, 2013). Even M14-Animal welfare can be tailored to indirectly encourage the use of more robust breeds, as shown by the example in Slovakia where the measure requires extension of broilers' fattening period. It corresponds to an increase of at least three days compared to the standard fattening period of 35 days. There are also constraints on the period for cleaning, disinfection and preparation of the housing for the new round, which must not be less than 14 days, and the number of rounds must not exceed 6 repetitions per calendar year.

6.5.2.4 CAP instruments and measures promoting natural behaviour

Table 25: Examples of instruments and measures promoting natural behaviour

Farming practices	SMRs	CMO Eggs	M01/ M02	M03	M04	M10	M11**	M14	M16	VCS
Good nutritional balance	PL, RO, etc.*				EE		EL, AT, LV, RO, UK, LU, BE	FI, CY, SE, HR, IT, HU	ES	
High fibre intake	PL, RO, etc.*			NL		IT, AT, ES	EL, AT, LV, RO, UK, LU, BE	IT, SI		
Increased space allowance	PL, RO, etc.*	FR, IT	AT	NL	PL, DE		EL, AT, LV, RO, UK, LU, BE	RO, FI, SK, EE, CZ, SI, IT, HR, HU		FR, NL, IT
Provision of enrichment	PL, RO, etc.*	FR, IT			FR, SE		EL, AT, LV, RO, UK, LU, BE	FI, IT		
Proper flooring	PL, RO, etc.*		AT		SE			RO, FI, IT		
Proper light management			AT		SE		EL, AT, LV, RO, UK, LU, BE	IT		
Group housing	PL, RO, etc.*	FR, IT			DE, DK			FI		
Outdoor access and grazing		FR, IT	AT		ES, FR, SE	IT, AT, ES	EL, AT, LV, RO, UK, LU, BE	FI, EE, ES, CZ, AT, SI, HR, IT, HU		FR, NL, IT
No mutilation	PL, RO, etc.*						EL, AT, LV, RO, UK, LU, BE	FI, CY, SI, IT		
Promotion of maternal behaviour: mother's milk consumption and later weaning	PL, RO, etc.*						EL, AT, LV, RO, UK, LU, BE	IT		
Maintenance of stable groups			AT							
Farmer training	PL, RO, etc.*		NL, AT, IT					EE, CY, HR, IT	IT	

Source: based on SQ1 and SQ4 results from case studies, questionnaires and RDP reviews. *It was considered that SMRs have positive effects in all MS, as potential penalties for non-compliance were said to be highly dissuasive **MS showing an increase in organic LSU exceeding 5% in at least one livestock sector.

Positive effect of the CAP instrument/measure identified in at least two Member States
Positive effect of the CAP instrument/measure identified in one Member State or to a limited extent in several Member States
Positive effect of the CAP instrument/measure spatially restricted or vague and depending on implementation choices
No example of positive effect identified in Member States/regions studied

Main CAP instruments and measures addressing natural behaviour

Overall, **Table 25** shows that **SMRs and M14-Animal welfare were the CAP instruments and measures identified as being more effective to promote animals' natural behaviour in the Member States studied**. It should be noted that M11-Organic farming and M04-Investments also contributed to natural behaviour on many aspects, as did the CMO Regulation on marketing standards for eggs in the laying hens sector.

Details of practices implemented as a result of CAP instruments and measures

Amongst the practices identified as significantly contributing to livestock natural behaviour, **the CAP mostly supported the increase of space allowance and outdoor access and grazing.** This was achieved by SMRs; VCS targeting specific production systems in the cattle sector (e.g. in France, Italy and the Netherlands) and sheep sector (e.g. in the Netherlands); as well as various voluntary rural development measures, such as M14-Animal welfare, M11-Organic farming and M04-Investments. Space allowance and outdoor access turned out to be among the most supported practices in almost all sectors studied, with the exception of rabbits. **The provision of enrichment, good nutritional balance and high fibre intake were also significantly supported by the CAP** (as mentioned previously). Moreover, the mother's milk consumption requirement laid down in EU Directive 2008/120/EC in the pig sector and reinforced by SMR12 guarantees that no piglets are weaned from the sow at less than 28 days of age. Late weaning is also implemented in organic production systems, supported by M11. This practice was further supported in the calf sector by M14 in Italy- Campania. Nevertheless, colostrum intake in the dairy sector is only supported by SMR 11 for calves, which requires intake within the first six hours of life but does not give any provision regarding quantity or quality and does not concern the other dairy sectors.

However, the CAP contributed to proper light management, group housing, maintenance of stable groups and proper flooring to a lesser extent or by specific type of operation. For instance, amongst Member States and regions studied, maintenance of stable groups is addressed only by M02 in Austria, for which animal welfare is a secondary objective. In this Member State, M02 significantly contributed to the construction of functional farm buildings. Group housing was identified as successfully supported by M04-Investments in the pig sector in Denmark and Germany-Baden-Württemberg, but also in the laying hens sector through the CMO regulation on marketing standards for eggs, as well as in the calf and poultry sectors in Finland through M14-Animal welfare. Calves aged 1 to 6 months must be kept in group pens, and, if there is a reason to separate them from the group, they still must maintain visual contact with other cattle. Lighting management was only occasionally addressed, such as in Sweden by M04-Investment in the pig, poultry and cattle sectors and in Italy-Lazio by M14-Animal welfare in the cattle, sheep and goat sectors, to promote natural light.

6.5.2.5 Potential negative effects associated with CAP measures affecting animal welfare

NGOs interviewed in France and Spain indicated that VCS could favour intensive livestock systems, when Member States do not set surface requirements or thresholds on the maximum number of animals supported. In addition, the setting of a threshold on the minimum number of animals supported might exclude small livestock farms, which are likely to be more extensive.

Some **voluntary measures with good impacts on animal welfare were also identified as having potential negative impacts depending on the way they were implemented**. M04-investments for instance, can support investments which have negative impacts on animal welfare. This was the case in Austria, where the measure may support the implementation of tethering systems through the funding of newly built tie-stalls (until 2020, albeit with lower grants), or in Estonia where it was used to construct stalls for year-round keeping of dairy cows without access to pasture. **Poor implementation of organic farming practices supported by M11 can lead to potential negative effects on animal welfare. To avoid this, a certain level of technical knowledge from farmers is required.** As mentioned by the researchers interviewed, lack of treatment of diseases in the pig sector (**Denmark**) or potential increase of parasites due to increased pasturing/outdoor access for sheep and goats, broilers and laying hens (**France**) can sometimes arise from organic farming practices (e.g. in case of insufficient pasture rotation or management). **Even for M14-Animal welfare, examples of potential negative impact of the measure on animal welfare were found in Germany**. In Lower Saxony, the operation requiring intact curly tails for pigs might increase the risk of tail-biting and subsequent infections when not managed properly, and in North-Rhine Westphalia the implementation of straw bedding systems for pigs might negatively impact animal health (respiratory diseases) if the straw quality is low.

6.5.2.6 Other factors

As explained in SQ1, **other factors might affect animal welfare by increasing hunger and thirst, discomfort, fear and distress, pain, injuries and diseases or hindering natural behaviour**. Notably, **natural events** may increase thirst and cause heat stress for pigs and poultry reared indoors. Extreme rain can also deteriorate pasture conditions and lead to injuries (e.g. lameness for ruminants that can slip in the mud or foot issues due to permanent humidity). **Sanitary crises** also affect animal welfare. In the event of avian influenza, pre-emptive culling of healthy poultry may be implemented to avoid the spread of the disease. Biosecurity measures, such as mandatory confinement limiting exposure of poultry to wild birds, can also alter housing conditions for broilers. Indeed, outdoor free-range systems for broilers may not be adapted to keep broilers inside for an undetermined period of time. When the entire batch is kept inside, density increases, and broilers may not be able to express their natural behaviour.

These external factors must be addressed by farmers, and compensation measures implemented to maintain good housing conditions for animals (e.g. air-cooling in buildings, increased number of water troughs, provision of shelter against heat and rain in pastures).

6.5.3 Example of relevant impact indicators to assess the development of animal welfare in the EU

As recalled in the Common Monitoring and Evaluation Framework (CMEF**)** webpage[84]**, impact indicators should help support CAP assessment by measuring the impact of policy interventions over the longer term and when there are effects beyond the immediate period**. Some impact indicators are also included in the context indicators set, which reflect relevant aspects of the general contextual trends in the economy, environment and society, and which are likely to have an influence on performance. Context indicators should be used by Member States to undertake their needs assessment and build their CAP strategic plans for the next implementing period.

However, **no context/impact indicator was available at EU level under the CAP 2014-2020 programming period regarding animal-welfare issues.** Only the number of livestock units was available as a context indicator (C.21), which has limitations as explained in SQ8. Therefore, it is important to analyse which indicators could be used to assess the effectiveness of the CAP instruments and measures addressing animal welfare.

In order to provide sufficient and coherent information to assess the contribution of the CAP to improvement of animal welfare, **the indicators must be considered as a set and reflect the CAP delivery model** (as will be illustrated in SQ8):

- **Output indicators** should document the implementation of CAP support (e.g. total expenditures, number of beneficiaries, number of animals per animal category, types of intervention, etc.)
- **Result indicators** should reflect the outcomes achieved at farm level (e.g. farm-based indicators on improved housing conditions or changes in animal-husbandry practices driven by the CAP).
- **Impact indicators** must reflect the corresponding long-turn effects on animals (e.g. animal-based indicators documenting the mortality rate, occurrence of disease and lameness, etc.).

[84] https://ec.europa.eu/info/food-farming-fisheries/key-policies/common-agricultural-policy/cmef_en

Examples of AW indicators identified in the case studies and the literature

Several EU projects as well as private certification schemes have developed animal-based indicators. The most important contribution came from the Welfare Quality project[85], developed for pigs, poultry, dairy and beef cattle. It is based on the Five Freedom concept (explained in SQ1), which was translated into 4 principles[86], 12 criteria and more than 30-50 indicators (both animal-related and farm-related indicators). Based on this project, in 2012 an EFSA working group developed a toolbox of indicators and recommended the use of more animal-based indicators. However, whereas the Welfare Quality indicators were developed primarily for very detailed scientific studies and are therefore time-consuming, the EU projects AWIN[87] (for sheep, goats, donkey and turkey) and AWARE (for cattle, goat, sheep, pigs and laying hens) and the UK-project AssureWel (for pigs, beef cattle and dairy cows, sheep, broilers and laying hens) developed simplified protocols and checklists to be used on-farm. The indicators (mostly animal-based) can be used both for evaluation of the impact of regulatory requirements (e.g. organic regulation) and for a quick assessment of the animal-welfare status on the farm.

For instance, a set of animal-based indicators has been used for several years by organic certification bodies in England (Soil Association, using indicators developed by AssureWel) and Germany (Naturland, Bioland).

In the studied Member States, very few animal-based indicators were collected to assess animal welfare. **These indicators can either be used to document the welfare of all types of farm animals or can be specific to the different sectors**. They relate mostly to the absence of injuries and mortality rate. In Denmark for instance, outside the CAP, specific indicators were set to monitor mortality of piglets in the pig sector (distinguishing dead piglets at birth and dead piglets before weaning). In Sweden, under M14, hoof diseases and injuries are recorded by the hoof trimmer.

Although no overall common indicator was identified at EU level, in most of the case studies (**Spain**-Catalonia, **France, Italy**-Friuli Venezia Giulia, **Italy**-Veneto, **the Netherlands, Austria**) and in all sectors, the **animal-based indicator most frequently mentioned by researchers, farmers representatives and Managing Authorities is the mortality rate**. Nevertheless, most of the interviewees and especially researchers highlighted the numerous limitations and possible bias in its collection and analysis, since it does not provide insight on the suffering of animals during their life (and a high mortality rate could also be related to a high rate of killing on-site by farmer to limit suffering of the animals[88,89]), it should be then cross-checked with data on context situations, notably epidemics. Moreover, mortality statistics are collected by farmers themselves and not an independent body. For this reason it is possible that, in some cases, mortality rates could be underestimated.

All stakeholders interviewed emphasised that no single indicator is sufficient to assess animal welfare. For this reason, the following paragraph and tables propose a set of the most practical indicators, taking into consideration the most frequently cited indicators in case studies by researchers, farmers representatives and Managing Authorities, or considering specific initiatives undertaken to assess animal welfare (research project or protocol: EU project Welfare Quality, AWIN and AWARE and AssureWel protocol). Antimicrobial use is also considered in the following tables, to analyse whether it could be used as an indicator.

[85] http://www.welfarequality.net/en-us/home/

[86] Good feeding, good housing, good health and appropriate behaviour.

[87] Protocols tested for sheep and goats: https://www.researchgate.net/publication/275887069_AWIN_Welfare_Assessment_Protocol_for_Sheep https://www.researchgate.net/publication/275341689_AWIN_welfare_assessment_protocol_for_goats

[88] http://www.assurewel.org/

[89] This was especially cited by a researcher in Spain, related to the rabbit sector.

Table 26: Contribution to the assessment of the animal-welfare components of the most cited indicators in case studies and in the following EU projects and protocols: Welfare Quality, AWIN, AWARE and AssureWel

Indicators and sources	No hunger or thirst	No pain, injury or disease	No fear or distress	Expression of natural behaviour
Metabolic health (somatic cell count gives an indication of udder health and it makes it possible to establish with a certain degree of certainty udder problems.) (*Sources: Welfare Quality, AWIN Protocol, AWARE protocol, Welfare of cattle on dairy farms)*		■	■	
Thermal stress (*Sources: Welfare Quality, AWIN Protocol)*		■	■	
Indoor density rate (*Source: Welfare Quality, AWIN Protocol)*		■	■	■
Antimicrobial use *(No source)*		■		
Comfort when resting: check based on behaviour when resting (*Sources: Welfare Quality, AWIN Protocol, Assurewel)*		■	■	■
Absence of injuries (lesions, swellings). Relates to: Pigs: Number of animals concerned by tail-biting or lesions on the tails, shoulders, vulva; ear and flank biting. Poultry: Rate of broken wings or broken legs; Presence of hock burns, foot pad dermatitis; feather loss. Rabbits: lesions on legs, shoulders. Cattle: number of lesions on the carcass at the slaughterhouse (breast, hoofs), carcass quality indexes, lesions on tails, shoulders, legs. *Sources: Case studies of IT-Friuli Venezia Giulia, ES-Catalonia, NL, DE- North-Rhine-Westphalia, Sweden, Welfare Quality, AWIN Protocol, AssureWel, AWARE protocol*		■	■	
Expression of social behaviour: check based on frequency of aggressive **behaviour** (*Sources: Welfare Quality, AWIN Protocol, AssureWel)*			■	■
Body condition score (BCS). Animals are scored according to the thinness of their bodies (5 scores: Thin = score 1 or 2; Moderate = score 2.5 to 3.5 and Fat = score 4 or 5) (*Sources: Case studies of SE, Welfare Quality, AWIN Protocol, AssureWell, AWARE protocol)*	■	■	■	■
Evidence of painful husbandry practices (castration, tail-docking, dehorning, etc.)/ **lack of use of analgesics/anaesthesia in mutilation** (*Sources: Welfare Quality, AWIN Protocol, AssureWel, AWARE protocol)*		■	■	
Locomotion score (Assessment of lameness: animals are scored according to a scale system which may differ depending on the types of farm animals and protocols[90]) (*Sources: Welfare Quality, AWIN Protocol, AWARE protocol)*		■	■	
Mortality rate (*Sources: Case studies: DK for pigs, NL, AT, ES-Catalonia for pigs, FR, IT-Friuli Venezia Giulia, IT-Veneto* *Welfare Quality, AWIN Protocol, AssureWel, AWARE protocol)*		■	■	
Observations on the level of animals' cleanliness (*Sources: Welfare Quality, AWIN Protocol, AssureWel, AWARE protocol)*		■	■	■
Absence of disease – Health status ((i) clinical observations (e.g. cough, nasal, ocular or vulval discharge, diarrhoea, bloated rumen, abscesses, hair condition, respiratory, organ, joint and claw/hoof health, carcass integrity, presence of lung lesions for calves; Cattle: udder consistency) (ii) medical biology (e.g. milk production/ cattle: somatic cell count, fat and protein content, urea content)). *(Sources: Welfare Quality, AWIN Protocol, AssureWel, AWARE protocol)*		■	■	
Good human-animal relationship: check based on escape distance when facing unknown human (*Sources: Welfare Quality, AWIN Protocol, Assurewel)*			■	■

Source: case studies and EU projects and protocols: Welfare Quality, AWIN, AWARE and AssureWel

As shown in the table above, most indicators relate to absence of pain, injuries, disease, fear and distress, which mostly relate to health issues. Only one indicator (BCS) documents on the absence of hunger and thirst.

To lower collection costs and ensure data reliability, good practices for the compilation of indicators identified through interviews with stakeholders consider four criteria: simplicity, transparency, representativeness and consistency (see Q8). Hence, **CAP contribution to animal welfare should be considered through impact indicators already documented during mandatory veterinary inspections in slaughterhouses (e.g. health status, evidence of painful husbandry practices, presence or number of lesions on the carcass at the slaughterhouse) or on-farm and gathered at national level.**

The following table provides information to analyse the level of practicability of the indicator, considering the four criteria identified in case studies and rounded out with specific information on the current availability of data and their relevance for animal-welfare components:

- SIMPLICITY: the current data availability and ease of collection and processing are assessed.
- TRANSPARENCY: level of acceptance and credibility is hardly linked to acceptance by stakeholders involved (Managing Authorities, operators of the supply chain, advisers, farmers and researchers). To assess it, the indicators most frequently cited in case studies and in the EU research projects, and the Welfare Quality, AWIN, AWARE and AssureWel protocols were selected and reported in Table 26 and Table 27**.** Nevertheless, further cross-checking with representatives of the EU Member States and researchers specialised in animal welfare is recommended.
- REPRESENTATIVENESS: the representativeness of the indicators was assessed considering the extent to which information is collected for all animals in the EU (sectors affected by the indicator). This therefore takes into account both the collection systems of the Member States and the presence or absence of sampling in this collection.
- RELEVANCE: The relevance is assessed through the analysis of the types of farm animals concerned, the indicator's contribution to the components of animal welfare and the existence of identified limitations.
- CONSISTENCY: the data accuracy was considered excellent if the collection was processed by trained personnel or laboratory analysts during a routine collection. Data collection by untrained farmers is considered to have a lower level of accuracy, as the information could be inconsistent due to possible ignorance of collection protocols by farmers and because no external assessment is done (a farmer assesses their own animals). Nevertheless, researchers pointed out that involvement by farmers in the monitoring of animal welfare is strongly recommended.

Six variables have thus been identified to qualify the practicability of each indicator (see table below). They are weighted from 1 (better score) to 3 (worst), and the total score indicates the overall level of practicability of the indicator (the lower the score is, the more practicable the indicator is).

[90] For instance, Welfare Quality suggest using a three-point scale for cattle and AWIN-protocol four-point scale for sheep.

Table 27 : Identification of the most suitable impact indicators

Indicator	Unit	Types of farm animals concerned	Reflect on:	Representativeness of all animals in the EU	Data availability / ease of collection and processing	Data accuracy	Limit to the indicator	Total score: level of practicability
		1 = all types concerned and 3 = only one type concerned	*1 = all components of AW and 3 = only one component of AW*	*1= Collected in all farms in most Member States 2=Collected in some MS /on some farms 3=Not collected or not sufficiently collected/no sufficient information on the collection*	*1-Collected and available for Managing Authorities 2-Collected and not readily available 3-Not available*	*1 = excellent (routine collection by independent trained personnel or laboratory analysts) 2= collection by trained farmers 3 = low (collection by untrained farmers)*	*1 = No limit to 3 = Very limited*	*the lower the score, the more suitable the indicator*
Metabolic health	Somatic cell count	(2) Milk production (dairy cows, dairy ewes, dairy goats)	(2) Two AW components: Pain/injury/ disease Fear/distress	(1) The collection of the data is an obligation for all operators collecting milk (Regulation 853/2004 under section IX)	(1) Tests of somatic cell count could be readily available to the authorities and useful to look at udder health[91]. Some MS have systems to collect data, which are mainly used by individual farmers to benchmark their performance and identify the areas they need to focus on, but in certain cases can be used by official services to identify risks for animal welfare. Availability of data (systematic compilation at national level) should be explored in Member States.	(1) Collection by milk processors and advisers (e.g. *contrôle laitier* in FR)	(1) No limit identified	8
Thermal stress	Percentage of lambs shivering Number of animals with signs of thermal stress	(1) All types of farm animals	(2) Two AW components: Pain/injury/ disease Fear/distress	3) The current collection conditions are unknown but may be carried out on-farm by trained assessors. Data are however collected during veterinary inspections on-farm (also transmitted to paying agencies in the context of cross compliance**) and concern all species: (Directive 98/58/EC) : information on temperature is collected. For pigs (Directive 2008/120/EC), more detailed elements are collected: 'comfortable temperature, source of heat and a dry comfortable lying area'.	(1) Data collected from veterinary and cross compliance on-farm inspections	(1)	(1) No limit identified	9

[91] https://op.europa.eu/en/publication-detail/-/publication/8950fa88-d651-11e7-a506-01aa75ed71a1

Indoor density rate	Square metre/ animal in buildings	(1) All types of farm animals	(2) Three AW components: Pain/injury/ disease Fear/distress Natural behaviour	3) The current collection is unknown but may be carried out on-farm by trained assessors. Data is however collected during veterinary inspections on-farm (also transmitted to paying agencies in the context of cross compliance**) and concern all species: (Directive 98/58/EC) : information on the presence of 'Enough space to avoid causing unnecessary suffering, injury or stress' is collected and may be used as a proxy. For calves (Directive 2008/119/EC) and pigs (Directive 2008/120/EC), the " Freedom of movement" is checked and may be used as a proxy	(1) Data collected from veterinary and cross compliance on-farm inspections	(1)	(1) No limit identified	9
Comfort when resting	Depend of the type of farm animal concerned. For instance, for cows: Time taken by the cow to lie down, Mean duration in seconds of movement to lie down, Percentage of cows getting hurt by something when lying down	(1) All types of farm animals	(2) Three AW components Pain/injury/ disease Fear/distress Natural behaviour	3) The current collection conditions are unknown but may be carried out on-farm by trained assessors. Data are however collected during veterinary inspections on-farm (also transmitted to paying agencies in the context of cross compliance**) and concern all species: (Directive 98/58/EC) : information on the presence of a 'well-drained lying area' are collected. For calves (Directive 2008/119/EC), more detailed elements are collected: the presence of 'unobstructed floor space; lying area that is clean, comfortable, well drained and dry appropriate bedding' is checked For pigs (Directive 2008/120/EC), more detailed elements are collected: 'clean, comfortable and adequately drained place in which to rest'.	(1) Data collected from veterinary and cross compliance on-farm inspections	(1)	(1) No limit identified	9
Absence of injuries: -Lesions -Swellings	Number of animals with lesion (type of lesion depend on animals)	(1) All types of farm animals	(2) Two AW components: Pain/injury/ disease Fear/distress	(2) Mandatory collection at slaughterhouse for broilers, based on a sample, or the collection can be processed on-farm by trained farmers/assessors. For broilers in particular: The severity and intensity of footpad dermatitis is evaluated and scored in around one third of the EU Member States audited[92].	(1) Data collection at slaughterhouses for broilers (2) Depends whether there is systematic collection at slaughterhouses or not for other types of farm animals. In addition, livestock identification has to be connected with the CAP identification.	(1) Checked at slaughterhouses during veterinary inspection (post-mortem inspection is required for broilers (Annex III of Directive 43/2007), not for other types of farm animals)	(2) Collection on-farm: no limit identified. Collection at slaughterhouses: animals are affected by the conditions of capture,	9 (broilers) to 10 (other types of farm animals)

[92] https://op.europa.eu/en/publication-detail/-/publication/f4ccd35e-d004-11e7-a7df-01aa75ed71a1

				(2) Other types of farm animals: Depends whether data collection is processed at slaughterhouse*.		(required for broilers but not systematic for other types of farm animals)	transport or slaughter. It does not reflect the conditions of rearing (e.g. 70-80% of wing fractures occur at slaughter) [2].	
Expression of social behaviour	Number of aggressive behaviours per pen/segment and observation period. - Mean number of cohesive behaviours per animal and hour	(1) All types of farm animals may be concerned	(2) Two AW components: Fear/distress Natural behaviour	(3) The current collection conditions are unknown but may be carried out on-farm by trained assessors. Data are however collected during veterinary inspections on-farm (also transmitted to paying agencies in the context of cross compliance**), concern calves and pigs and may be used as a proxy. For calves (Directive 2008/119/EC), information on the presence of "Physical contact" is collected For pigs (Directive 2008/120/EC): information on "Seeing other pigs, keeping sows and gilts in groups" is collected	(1) For calves and pigs: data are collected from veterinary and cross compliance on-farm inspections[93]: For other types of farm animals, collection on-farm is needed, which is time-consuming.	(1) (calves and pigs) to (2) (other types of farm animals)	(1) No limit identified	9 (calves and pigs) to 10 (other types of farm animals)
Antimicrobial use	Antimicrobial quantity used (mg/kg or mg/PCU)	(1) All types of farm animals	(3) One AW component: Pain/injury/ disease	(1) In many MS, collection is not carried out at farm level but at national level and gathered at EU level by the European Medicines Agency through antimicrobial sales.	(1) Data collected and available at EU level through the European Medicines Agency	(1)	(3) The link between AMU and AW is not clear, as low AMU may be a consequence of good health status as much as lack of treatment of ill animals. The indicator, based on antimicrobial sales, is only an approximation of AMU. Moreover, it is not collected at farm level in most MS, but at national level.	10

[93] https://www.fas.scot/publication/cross-compliance-checklists/

							For a relevant analysis, AMU should be considered by type of farm animals, as consumption varies greatly from one sector to another; this analysis is thus not possible with the data available. Some MS collect AMU data per sector.	
Body condition score (BCS)	Percentage of very lean animals (category 1 and 2 of the BCS)	(1) All types of farm animals	(1) All AW components	(3) The indicator is widely used in the EU in current AW research project or AW certification, but the number of farms and animals concerned is not available	(2) Data remain mainly at farm level (generally not compiled).	(2) collection on-farm (by trained assessors)	(1) No limit identified	10
Evidence of painful husbandry practices (castration, tail-docking, dehorning, etc.)/ lack of use of analgesics/ anaesthesia in mutilation	Percentage of animals with evidence of painful practices: -**Pigs**: Tail-docking, castration, nose ringing **-Cattle:** Dehorning **-Poultry:** Beak trimming The animal unit manager is asked about this practice on the farm with regard to the following: • Use of anaesthesia / analgesics	(1) All types of farm animals may be concerned	(2) Two AW components: Pain/injury/ disease Fear/distress	(3) The current collection conditions are unknown but may be carried out on-farm by trained assessors. Data are however collected during veterinary inspections on-farm (also transmitted to paying agencies in the context of cross compliance**), concern calves and pigs and may be used as a proxy. For calves (Directive 2008/119/EC), information on the presence of 'Physical contact' is collected For pigs (Directive 2008/120/EC): information on 'Seeing other pigs, keeping sows and gilts in groups' is collected	(1) Data collected from veterinary and cross compliance on-farm inspections	(1)	(2) This indicator does not observe possible injuries to animals (biting tails, injuring themselves with their horns, pricking themselves with their beaks, etc.) if no mutilation is carried out.	10
Locomotion score	Assessment of lameness	(1) All types of farm animals	(2) Two AW components: Pain/injury/ disease Fear/distress	(2) Depends whether data collection is processed at slaughterhouse* or if it is done only on-farm by trained farmers/assessors. Lameness scoring is widely used at farm level in the EU in current AW research	(2) Depends whether there is systematic collection at slaughterhouses (not mandatory at the EU level) or not (collection on-farm by trained assessors or not collected).	(2) Depends whether it is checked at slaughterhouses or only on-farm by trained farmers/assessors)	(1) No limit identified	10

				projects or AW certification, but the number of farms and animals concerned is not available.	In addition, livestock identification has to be connected with CAP identification. Lameness scoring data are often only available for the farmer and the person who determined the score. There is also a lack of systematic analysis.			
Mortality rate	**Pigs:** Mortality of piglets Number of animals which died on the farm, were euthanised due to disease or accidents, or were slaughtered in emergencies during the last 12 months All: Number of and percentage of dystocia or abortions	(1) All types of farm animals	(2) Two AW components: Pain/injury/ disease Fear/distress	(3) The current collection conditions are unknown, but may be carried out on-farm by trained assessors and compiled in national livestock register (e.g. in FR for the cattle sector). Data are however collected during veterinary inspections on-farm (also transmitted to paying agencies in the context of cross compliance**) and concern all types of farm animals: (Directive 98/58/EC): information on the presence of 'the presence of a record of the number of animal deaths is kept' is checked. Nevertheless, the effective collection of the number of death is unknown.	(1) On farms, records must be kept for at least three years from the date the death was identified[3]. Data are recorded in an electronic database in some MS (e.g. in the national livestock database 'BDNI' in FR) but the list of MS is unknown. As electronic data recording is not mandatory, broad consultation of MS is needed to verify the existence of electronic databases in EU MS. Data collected from veterinary and cross compliance on-farm inspections	(1)	(2) The mortality indicator clearly indicates the existence of a problem but does not provide information on the cause. Mortality rate is likely to be higher where antibiotic use is limited. These indicators should therefore be used in conjunction with other indicators.	10
Observations on level of animals' cleanliness	Percentage of dirty animals	(1) All types of farm animals may be concerned	(2) Three AW components Pain/injury/ disease Fear/distress Natural behaviour	(3) The current collection conditions are unknown, but may be carried out on-farm by trained assessors. Data are however collected during veterinary inspections on-farm (also transmitted to paying agencies in the context of cross compliance**), concern calves and pigs and may be used as a proxy. For calves (Directive 2008/119/EC), information on 'Disinfecting housing and equipment' is collected For pigs (sows) (Directive 2008/120/EC): information on 'Cleaning pregnant sows and gilts before they are placed in farrowing crates' is collected	(1) Data collected from veterinary and cross compliance on-farm inspections for calves and sows For other types of farm animals, collection on-farm is needed, which is time-consuming.	(1) calves and sows to (2) other types of farm animals.	(2) Some animals such as pigs like to be in the mud to cool off. Mud must therefore be differentiated from manure.	10 (calves and sows) to 11 (other types of farm animals)
Absence of disease – Health status	Number of sick animals and	(1) All types of farm animals	(2) Two AW components:	(3) For many MS, conditions of collection of these data are not known.	(2) Information is collected on-farm by farmers, but data remain mainly at farm level or are collected by	(2) collection on farm (by trained assessors or by farmers)	(1) No limit identified	11

	percentage of sickness for every disease		Pain/injury/ disease Fear/distress		advisory services or AW certification bodies.			
Good human-animal relationship	Percentage of animals that can be touched	(1) All types of farm animals	(2) Two AW components Fear/distress Natural behaviour	(3) The number of farms and animals concerned is not available.	(3) Visits to farms are time-consuming.	(2) information collected on-farm by trained assessors (e.g. AssureWel trained assessors)	(2) In extensive systems, animals may escape when facing unknown humans but do not suffer from chronic fear and distress.	13

* Representativeness, regarding indicators which may be collected at slaughterhouses (but not mandatory): as data collection is not mandatory, broad consultation of MS is needed to check the collection of data at slaughterhouses.

**Representativeness, regarding indicators which could be documented through cross-compliance spot checks: The coverage of farms checked for cross-compliance is very low (1% of CAP beneficiaries are subject to cross-compliance, and the number of farms having animals is even fewer (and remains unknown).

Source: Case studies, **Welfare Quality** (cattle, pigs, poultry): https://edepot.wur.nl/233467; http://www.welfarequalitynetwork.net/media/1018/pig_protocol.pdf; https://edepot.wur.nl/233471, **AWIN Protocol** (sheep and goat): https://www.researchgate.net/publication/275887069_AWIN_Welfare_Assessment_Protocol_for_Sheep; https://www.researchgate.net/publication/275341689_AWIN_welfare_assessment_protocol_for_goats; **AssureWel**: http://www.assurewel.org/layinghens.html (hens); http://www.assurewel.org/dairycows.html (dairy cows); http://www.assurewel.org/pigs.html(pigs); **AWARE protocol** (cattle, goat and sheep); https://www.organic-animal-welfare.eu/fileadmin/oaw/files/AnnexII.pdf

With the scoring system proposed above, **it was not possible to identify big differences in the practicability of the studied indicators** (see total score for each indicator in the last column). Therefore, it is difficult to make a relevant proposal for one single composite indicator. Nevertheless, the rankings shown above suggest that – with the current availability of data and current knowledge in the data collected in the EU – six animal-related indicators could be considered as the most promising (those with a score of 8 or 9).

One indicator is deemed the most practicable (score 8): metabolic health. However, thermal stress is already collected for only a few farms (but all sectors are concerned), as this concerns checks conducted as part of cross-compliance, while the collection of somatic cells (documenting the indicator 'metabolic health') is an EU obligation for all operators collecting milk (but concerns only dairy farms whose milk is collected).

Five indicators have a score of 9: thermal stress, comfort when resting, presence of injuries (for broilers), indoor density rate and expression of social behaviour (for calves and pigs, as data are already collected on some farms).

Most of these indicators present limitations for immediate use. For some, data are currently collected for only some types of farm animals (i.e. dairy animals for metabolic health, broilers for presence of injuries, and calves and pigs for expression of social behaviour) or on only some farms (thermal stress, expression of social behaviour, indoor density rate, comfort when resting). Furthermore, for some indicators, only proxy variables are currently collected, as in the case of indoor density rate. Moreover, the data collected to check cross-compliance does not allow for monitoring of indicators on a constant sample[94], while the collection of somatic cells (documenting the indicator 'metabolic health') is an EU obligation for all operators collecting milk (but concerns only dairy farms whose milk is collected).

Considering the difficulty of producing a set of useful and existing indicators of animal welfare, our recommendation for this question would be to establish, with the relevant stakeholders involved in the evaluation and management of the CAP at the EU level and in the EU Member States, as well as with a pool of animal-welfare experts, **a weighting of the criteria used in order to determine the most suitable indicators, considering a set of three to five indicators.**

Three different categories of indicators can be determined, with different uses:

- **Category A**: A simple and small set of indicators (3 to 5 indicators) which can be easily collected with little additional time and effort at slaughterhouses, during cross-compliance checks (indicators limited by potential absence of a constant sample) or with existing national databases for instance. Preference should be given to animal-based indicators. The check should allow a quick and more risk-oriented overview of the animal-welfare situation.
- **Category B**: A set of indicators which can be used for in-depth analysis on farms, possibly in collaboration with producer organisations and/or certification bodies, or with specific on-farm surveys. Where animal-based indicator use is too time-consuming, they can be replaced by farm-based indicators or result indicators, (such as the presence of enrichment, the number of animals with pasture access or the presence of an on-farm infirmary[95]). Their use can be linked to specific CAP measures or instruments. These analyses should give the basis for developing improvement programmes. For instance, in Czechia, a qualitative assessment of the benefits of individual operations on livestock supported by M14 was carried out. The data for the indicators were provided by a study of the Institute of Agricultural Economics and Information and a questionnaire survey carried out targeting M14 beneficiaries. More than 30 indicators were used to assess improvement of the welfare of dairy cows, sows and piglets concerned by supported practices under M14.
- **Category C:** Indicators for comparative studies on animal welfare of different livestock systems with a high number of both animal- and farm-based indicators. They could be based on previous EU research projects such as WelfareQuality. These studies should address animal-welfare aspects scientifically and in a multi-stakeholder approach.

Focus on collection and cross-checks of data

To establish simple and robust collection of data, **different sources must be considered according to their simplicity of implementation and relevance to the information provided**. As far as possible, cross-checks of information from the different sources should be established to guarantee the reliability of these indicators. Animal-based indicators can thus be documented:

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[94] for the programming period 2014-2020, checked farms were selected according to risk analysis, and the same farm is not necessarily checked again in the following years.

[95] see examples provided in SQ8, based on case studies.

- **At slaughterhouses: some data are already collected during veterinary examination of animals' general body state and production and could be easily gathered at national level**. These are data on lesions, evidence of painful rearing procedures, broken wings, evaluation of wounds, chest condition, leg lesions, mortality during transport, time of departure and arrival of the group, treatments carried out, vaccinations, salmonella, age of the groups' pulmonary lesions, etc. Data exchange with the European Commission already exists for prices and production. An additional exchange of information could be easily processed, especially on data regarding post-mortem inspection, which are already required for broilers at the EU level. In addition, livestock identification must be connected with CAP identification.
- **Through existing national databases on animal registration: data on the number of births and deaths registered on farms** are already monitored for some types of farm animals (notably cattle). They could be gathered to assess the mortality rate on farms. Nevertheless, broad consultation of all Member States through their Managing Authorities is needed to check the existence of numeric databases in all EU Member States. In addition, for data collected at slaughterhouses, livestock identification must be connected with CAP identification.
- **Collection by milk processors: somatic cells are already collected by milk processors at the EU level, as it is an EU obligation.** As these data are already collected in all Member States, consultation of all Member States on the feasibility of data collection at national level and exchanges with the European Commission could be carried out. In addition, for data collected at slaughterhouses and in existing national databases, livestock identification must be connected with CAP identification.
- **On-farm: indicators could be collected on the behaviour of living animals** (e.g. escape/avoidance distance test). However, collection of such indicators would be difficult and would rely on inspections carried out by experts and/or self-assessment carried out by farmers, which could lead to issues of representativeness and consistency of data collected.

Currently, no common methodology exists to set the indicators, collect them, gather them or interpret them, so that they can be used to assess animal welfare. Researchers interviewed emphasised that a common methodology, detailed with specific guidelines and based on a multi-stakeholder approach, is crucial to ensure the robustness of the data collected, and that work is still necessary to make it operational.

6.5.4 Summary of findings

Taking into consideration SQ4 findings on farm practices and housing conditions effectively driven by the CAP measures, the analysis considered **to what extent the CAP helped to address animal-welfare components in Member States studied**. For each component, successful examples were identified as fostering specific practices, which contributed to positively addressing animal-welfare issues. As a whole, **the CAP appears to have helped improve animal welfare locally, in specific sectors and/or Member States and regions, depending on the implementation choices**. The overall effect is, however, not significant, as the successful cases identified remained limited.

The CAP has helped address hunger and thirst through implementation of M14-Animal welfare, M11-Organic farming and SMRs 11 and 13, promoting good nutritional balance and high fibre intake. Examples of CAP measures that supported feed and water safety management, as well as mother's milk consumption and later weaning, were also identified as contributing to limit hunger and thirst.

The CAP also helped to tackle discomfort, fear and distress, by supporting a great variety of practices in the Member States studied, most especially increased space allowance, outdoor access and/or grazing. M14-Animal welfare significantly supported those practices, mostly in the cattle and sheep/goat sectors, but some examples can be found in the poultry sector and even in the pig sector. The CAP instruments also appeared relatively effective in ensuring the provision of minimum housing conditions at EU level, as minimum enrichment is required through the regulatory provisions for the pig sector included as part of cross-compliance and the CMO regulation on egg marketing standards in the laying hens' sector. The development of organic farming supported by M11 also helped to reduce density and ensure permanent access to open-air areas.

Pain, injury and disease were mainly tackled by the CAP through the promotion of increased space allowance, good nutritional balance management, fibre intake, and the provision of enrichment for animals. Whereas SMR strengthened compliance with the minimum standards required in EU Directives, M11-Organic farming and M14-Animal welfare were the main CAP instruments supporting commitments going beyond the regulatory baseline (notably regarding increased space allowance that is about 10 to 15% greater than that specified in

legislation). **Better hygiene management was also promoted by the CAP locally, through M11-Organic farming or M14-Animal welfare.** Depending on implementation choices, M14-Animal welfare can also target mutilation practices, especially castration, such as in Finland (pain relief for calves and piglets), Cyprus (elimination of castration for sheep and goats) and Slovenia (surgical castration of male piglets using anaesthesia and/or analgesics). However, examples at EU level remain limited.

SMRs and M14-Animal welfare were the CAP instruments and measures identified as being more effective to promote animals' natural behaviour in the Member States studied. It should be noted that M11-Organic farming and M04-Investments also contributed to natural behaviour through many aspects (e.g. increased space allowance, provision of enrichment, outdoor access and grazing), as did the CMO Regulation on marketing standards for eggs in the laying hens' sector. However, specific practices such as group housing, avoidance of mutilation and the promotion of maternal behaviour (i.e. late weaning) were promoted only to a limited extent in the Member States studied, although they could highly benefit expression of natural behaviour.

No example of CAP measure effectively addressing the killing of unproductive animals on-site, notably of male chicks, was identified in the Member States and regions studied**.**

Few potential negative effects of CAP instruments or measures were identified through interviews with stakeholders. **NGOs interviewed in France and Spain indicated that VCS could favour intensive livestock systems** when no threshold is set on maximum number of animals supported. Nevertheless, VCS is limited because Member States choosing to implement it must demonstrate that the target sector is under difficulty. Also, RD measures might have negative effects when not managed properly by farmers.

Other factors that might affect animal welfare by increasing hunger and thirst, discomfort, fear and distress, pain, injuries and diseases or by hindering natural behaviour must also be taken into account (e.g. natural events, sanitary crises). Indeed, these risks **must be addressed by farmers, and compensation measures must be implemented to maintain good housing conditions for animals.**

Impact indicators should contribute to supporting CAP assessment by measuring the long-term impact of policy interventions. However, **no context/impact indicators related to animal welfare were available at EU level under the CAP 2014-2020 programming period.** In the studied Member States, few animal-based indicators were collected to assess animal welfare. **These indicators can either be used to document the welfare of all types of farm animals or can be specific to the different sectors.** Nevertheless, no common indicator was identified at EU level; for this reason, as mentioned by all farmers representatives and researchers interviewed, a set of indicators should be used. A scoring for each indicator, based on its transparency, simplicity, robustness, representativeness and relevance, should make it possible to identify the most suitable set of indicators. A methodology was proposed, associating a score to variables documenting these five criteria from 1 (satisfactory) to 3 (not sufficient). With this method, six indicators appear to be the most promising and the most practicable: metabolic health, thermal stress, comfort when resting, expression of social behaviour, presence of injuries, and indoor density rate. Nevertheless, most of these indicators present limitations for immediate use. For instance, for some indicators, data are currently collected for only some types of farm animals (i.e. dairy animals for metabolic health, broilers for presence of injuries, and calves and pigs for expression of social behaviour), or only in some farms (thermal stress, expression of social behaviour, indoor density rate, comfort when resting). Furthermore, for some indicators, only proxy variables are currently collected. This is the case for instance for indoor density rate.

Nevertheless, the proposed scoring **did not make it possible to identify big differences in the practicability of the indicators. Thereby, we recommend establishing, with relevant stakeholders involved in the evaluation and management of the CAP at the EU level and in the EU Member States, as well as with a pool of animal-welfare experts and farmers representatives, a weighting of the criteria used, in order to determine a small but suitable set of animal-related indicators.**

In order to establish a simple and robust collection of data, **different sources must be considered according to their simplicity of implementation and the relevance of the information provided** (collection at slaughterhouses, collection through on-farm visits by trained inspectors, or data recorded by farmers). To lower collection costs and ensure data reliability, contribution to animal welfare should be considered through **impact indicators already documented during mandatory veterinary inspections in slaughterhouses** (e.g. health status, evidence of painful husbandry practices, presence or number of lesions on the carcass at the slaughterhouse), collected by milk processors, and using data recorded in existing national animal-registration databases. As far as possible, cross-checks of information from the different sources should be established to guarantee reliability of the indicators, including the cross-compliance spot-checks.

Currently, no common methodology exists to set the indicators, collect them, gather them or interpret them, so that they can be used to assess animal welfare properly. Researchers interviewed emphasised that a common methodology for animal welfare monitoring of CAP, detailed with specific guidelines and based on a multi-stakeholder approach, will be crucial to ensure the robustness of the data collected, and that work is still necessary to make it operational.

6.6 SQ 6 on effectiveness - To what extent have CAP instruments and measures (taken together) addressing the reduction of antimicrobial use contributed or not to achieving the objective of viable food production?

6.6.1 Understanding and method

This SQ considers to what extent the **changes in practices driven by the CAP actually contributed to reduce antimicrobial use in the agricultural sector at EU and Member State level**. It draws on SQ4 results that describe farm practices and housing conditions fostered by the CAP. The analysis also relies on theoretical contribution of practices to antimicrobial use, as established in SQ1. A table was set up to **synthesise the actual effects of CAP interventions on practices and appraise the expected effects on antimicrobial use**.

As this question examines the overall effect of the CAP on antimicrobial use, it considers **both positive and negative effects** associated with the implementation of the CAP instruments and measures. For this purpose, the analysis investigates whether specific CAP instruments and measures have influenced the **implementation of practices and housing conditions with unexpected negative impacts on antimicrobial use**. Opinions of managing authorities, farmers representatives, researchers and NGOs were used to complement findings from previous SQs.

Available data on antimicrobial use were also examined to establish whether the CAP had an influence over the observed **trends in antimicrobial consumption**. Opinion collected in Member States/regions studied helped to determine the role played by the CAP on overall antimicrobial use by the farming sector.

6.6.2 Effect of CAP instruments and measures on practices related to antimicrobial use

As developed in SQ1, a whole set of practices can impact antimicrobial use. The table below presents the **effect of the CAP instruments and measures on the practices having a clear positive impact on antimicrobial use reduction** (as established in SQ4). The effect of the CAP instruments and measures on antimicrobial use is assessed by considering its overall contribution to the implementation of such practices.

Table 28: Examples of instruments and measures impacting antimicrobial use

Farming practices	SMRs	CMO	M01/M02	M03	M04	M10	M11**	M14	M16	VCS
Adapted feed quantity	PL, RO, etc.*									
Good nutritional balance management	PL, RO, etc.*				EE		EL, AT, LV, RO, UK, LU, BE	FI, CY, SE, HR, IT, HU	ES	
High fibre intake	PL, RO, etc.*			NL		IT, AT, ES	EL, AT, LV, RO, UK, LU, BE	IT, SI		
Appropriate supply of feed additives	PL, RO, etc.*									
Feed safety management	PL, RO, etc.*				ES			ES, SE, HR		
Water safety management	PL, RO, etc.*				ES			FI, ES		
Increased space allowance	PL, RO, etc.*	FR, IT, etc	AT	NL	PL, DE, FR, RO		EL, AT, LV, RO, UK, LU, BE	RO, FI, SK, EE, CZ, SI, IT, HR, HU		FR, NL, IT
Microclimate control	PL, RO, etc.*				FR, RO			RO, FI, CZ	IT	

Farming practices		SMRs	CMO	M01/M02	M03	M04	M10	M11**	M14	M16	VCS
Holding and gear hygiene		PL, RO, etc.*		NL	NL				CY, CZ, IT		
Quarantine and avoiding infections from the outside		PL, RO, etc.*		NL	NL	SE			FI, CY, SE, IT		
Treatment management	Prophylaxis and alternative treatment (other than antimicrobials)	PL, RO, etc.*		FR, AT				EL, AT, LV, RO, UK, LU, BE	FI, EE, CY, CZ, SE, IT, HU	DE, IT	
	Targeted curative treatment with AMU[96]	PL, RO, etc.*						EL, AT, LV, RO, UK, LU, BE	SI		
	Curative AMU avoiding HPCIA[97]										
Breed choice and genetic selections (to improve robustness, longevity and adaptability)							AT, ES	EL, AT, LV, RO, UK, LU, BE	SK	DE	
Promotion of maternal behaviour: colostrum intake, mother milk consumption and later weaning		PL, RO, etc.*						EL, AT, LV, RO, UK, LU, BE	IT		
Maintenance of stable groups				AT							
Farmer training		PL, RO, etc.*		FR, NL, AT, DE, ES, IT,					EE, CY, HR, IT	IT	

Source: based on SQ1 and SQ4 results from case studies, questionnaires and RDP reviews. *it was considered that SMRs have positive effects in all MS as potential penalties for non-compliance were said to be highly dissuasive **MS showing an increase in organic LSU exceeding 5% in at least one livestock sector

Positive effect of the CAP instrument/measure identified in at least two Member States
Positive effect of the CAP instrument/measure identified in one Member State or to a limited extent in several Member States
Positive effect of the CAP instrument/measure spatially restricted or vague and depending on implementation choices
No example of positive effect identified in Member States/regions studied

[96] As opposed to metaphylaxis and group treatment.
[97] In this case, the reduction of AMU is qualitative, and not necessarily quantitative, and refers to the use of alternative treatments versus the use of Highest Priority Critically Important Antimicrobials (HPCIA), based on WHO's and AMEG's classifications.

Most supported practices contributing to antimicrobial use reduction

Increased space allowance is clearly the one practice contributing to the reduction of antimicrobial use that was the most supported by the CAP through a set of measures/instruments. EU directives fix the minimum requirements in terms of space allowance for calves, pigs, laying hens and broilers, and cross-compliance worked as an incentive for compliance with these minimum requirements for **calves and pigs** (but especially for calves). Marketing standards for eggs improved space allowance for laying hens in the six Member States with the highest population. Voluntary coupled support may also have improved space allowance, but only concerned ruminants[98]. However, NGOs sometimes pointed out possible adverse effects of voluntary coupled support on antimicrobial use, depending on their implementation (i.e. when no threshold is set on the maximum number of animals supported, therefore possibly increasing density).

Increased space allowance was supported through M14-Animal welfare for **pigs and poultry** (e.g. supported practices required an increase by 10% to 15% compared to the minimum requirements in Romania, by 10% for pigs in Slovenia), and also for **ruminants** (e.g. Czechia required an increase for dairy cows by a minimum 15% compared to the national legislation baseline). M04-Investment support also contributed to increase space allowance, for instance in Denmark and Germany for **sows**, and in Poland for **cattle**.

Other practices supported by the CAP were feeding practices (quality and safety) and **microclimate control** with potential positive effects on animal health (*also see SQ5, for which a comprehensive analysis of the effects of the CAP has been carried out*).

Generally, **M14-Animal welfare** is the measure that contributed to foster the implementation of the **highest number of important practices related to antimicrobial use reduction**. However, German Managing Authorities emphasised the risk associated with the implementation of specific operations targeting animal welfare when not properly managed by farmers (e.g. the risk of tail biting in Lower Saxony and respiratory diseases due to low straw quality in North Rhine-Westphalia).

Insufficient support for some important practices contributing to antimicrobial use reduction

Some practices of high interest in reducing antimicrobial use received only a **limited support**.

Hygiene management practices were moderately supported. Basic principles set by EU directives[99] (i.e. provide clean environment, ensure prophylactic measures which may include hygiene) have been strengthened by SMRs. Few examples were found of M14-Animal welfare contributing to the **establishment of nursing stalls or quarantine zones** on-farm (e.g. in Finland for cattle and pigs, in Italy-Marche for ruminants and pigs), as well as of M04-Investment support (e.g. for cattle in Sweden). M14 also supported the implementation of **cleaning and disinfection measures** in the sheep and goats in Cyprus. M01-Knowledge transfer, M02-Advisory services and M03-Quality scheme may also have improved hygiene practices (e.g. the Netherlands supported training and a branch quality scheme for the veal sector, which included hygiene practices).

Among **treatment management** practices, SMR 4 has probably contributed to the implementation/respect of rules from the EU directives on the '**correct use of veterinary medicinal products'**. However, the effects are difficult to measure and depend on the implementation of the provision by Member States. **Prophylaxis and alternative treatments** were supported by M11-Organic farming, through the restriction of antimicrobial use in organic farming, and by M14-Animal welfare, through pasture rotation to avoid parasite infections (e.g. sheep and goats in Estonia and Italy-Lazio), vaccination programmes (e.g. sheep and goats in Cyprus) and foot care/trimming (e.g. sheep and goats in Cyprus, dairy cows in Sweden, ruminants and pigs in Italy-Marche). However, researchers interviewed highlighted that **outdoor access** (also supported by measures such as M11-Organic farming and M04/M14 for non-organic systems) **can increase the need for antiparasitic use** if not carefully managed with prophylaxis and alternative treatments (including pasture rotation). M01/M02 may have positively impacted treatment management practices, but the only example available is for prophylaxis and alternative treatments in France. Although **targeted use of antimicrobials** and **avoidance of HPCIA** is seen as essential to reduce antimicrobial use, the only example of support for targeted treatment was found through M14 in Slovenia, which requires preliminary coprological analysis before antiparasitic treatment.

[98] Eligible sectors are beef and veal, dairy, sheep meat and goat meat.

[99] Regulation (EC) No 178/2002 (SMR4), Council Directive 2008/119/EC (SMR11), Council Directive 2008/120/EC (SMR12), and Council Directive 98/58/EC (SMR13).

The ruminant sector was the most targeted by hygiene and treatment management measures, notably the sheep and goats sector. However, this last sector seems to be less targeted by measures on increased space allowance, compared to all other sectors. There is no example of measures targeting the rabbit sector.

Breed choice and genetic selection was not significantly supported. In case-study areas, M10-AECM contributed locally to foster the conservation of endangered and native breeds more adapted to their environment (e.g. in Austria and Spain), while M14 may have indirectly fostered this practice (e.g. through the prolongation of the fattening period for broilers in Slovakia). The selection of appropriate breeds and husbandry practices is also promoted by organic farming systems supported by M11.

Regarding **maternal behaviour practices**, the EU directives[100] fix the **minimum requirements in terms of colostrum intake of calves** and of **minimum weaning age for pigs**. Therefore, SMR 11 and 12 may have worked as an incentive for the implementation/respect of these practices. M14 supported practices going beyond these requirements, for instance in Italy-Campania, with a longer period of mother's milk consumption for calves (30 days instead of around seven days). M11-Organic farming may also have supported later weaning (e.g. in Spain, organic husbandry of pigs includes later weaning requirements). **Colostrum intake for dairy sectors**, in quantity, quality and in time, is the practice with the most potential impact on antimicrobial use, but **was only partially targeted through cross-compliance** since no quantity and quality requirements are mentioned and only calves are concerned.

Maintenance of stable groups is a practice that does not seem to have been specifically targeted through the CAP, despite its significance. Nevertheless, it may have been covered in M01/M02 training on antimicrobial use reduction.

6.6.3 Effect of CAP instruments and measures on antimicrobial use at EU and Member State level

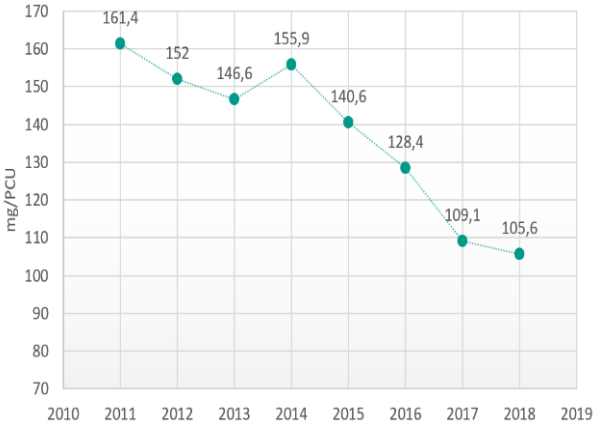
Whereas it is difficult to assess the overall effect of CAP instruments/measures on antimicrobial use, consumption trends reported at EU and Member State level by the European Medicines Agency can be considered to **indicate whether antimicrobial use actually decreased in Member States where successful changes in practices driven by the CAP were reported**.

Trends in antimicrobial use reported by the European Medicines Agency

Each year, the European Medicines Agency publishes the **European Surveillance of Veterinary Antimicrobial Consumption report** (ESVAC report), which presents data on sales of veterinary antimicrobial agents in Europe.

According to ESVAC data, from 2011 to 2018, **antimicrobials sales** at the European level declined by 34.6%. Most individual EU countries also recorded a downward trend in sales of veterinary antimicrobials. Some exceptions are Cyprus, Greece, Portugal, Poland, Slovakia and Slovenia (see figure below).

Figure 20: Trends in total sales of veterinary antimicrobials for food producing species, in mg/PCU at European level[101] (2011-2018)

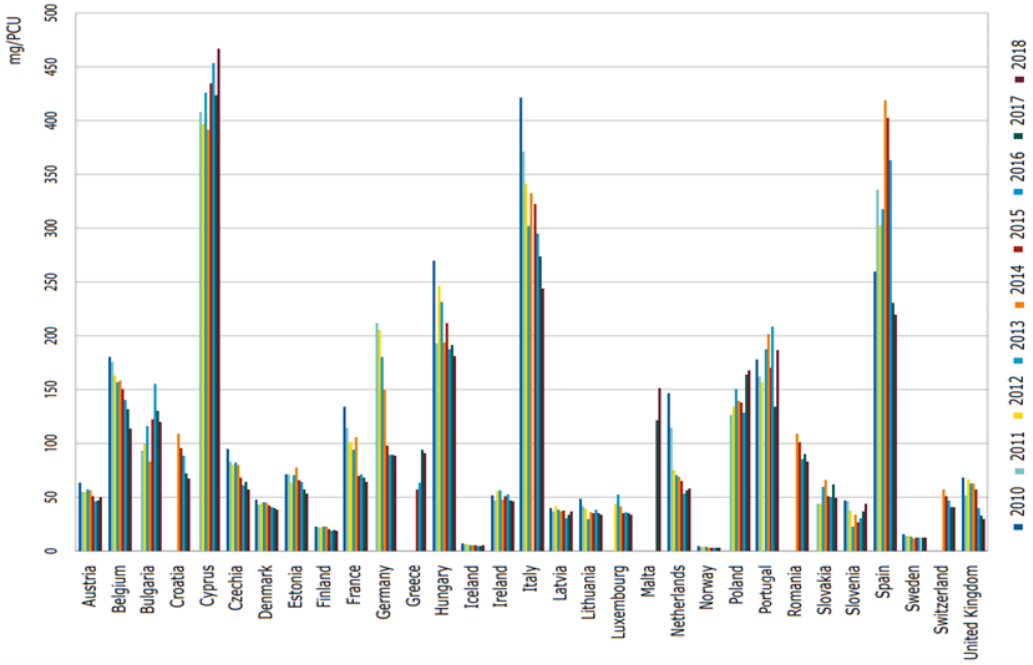


[100] Council Directive 2008/119/EC (SMR11), Council Directive 2008/120/EC (SMR12).

[101] For 25 EU/EEA countries: Austria, Belgium, Bulgaria, Cyprus, Czechia, Denmark, Estonia, Finland, France, Germany, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden and the United Kingdom.

Source: Agrosynergie based on EMA's data (European Medecines Agency, 2020)

Figure 21: Trends in total sales of veterinary antimicrobials for food producing species, in mg/PCU by country (2010-2018)



Source: (European Medecines Agency, 2020)

EMA's data also provides information on the type of antimicrobials used:

- Between 2010 and 2018, there was no significant change in the share of sales of pharmaceutical forms adapted for metaphylaxis[102] and **group treatment** at European level, which **accounts for 87.7% of total sales of antimicrobials in 2018**. However, the ones with the highest risk of antimicrobial resistance (i.e. premixes and oral powder) decreased in favour of alternative practices of group treatments (i.e. oral solution). Also, significant variations in the share can be observed between countries (from 2.3% in Iceland to 95.0% in Cyprus).
- **HPCIA (category B[103]) sales** show a clear decrease at European level, in absolute value (mg/PCU) and in percentage of total sales, from 2015 to 2018. It represents 5.85% of sales in 2018.

CAP overall effect on antimicrobial use at EU and Member State level

The analysis did not identify a correlation between the CAP implementation and antimicrobial use trends observed at EU and Member State level. Most stakeholders interviewed in Member States/regions generally confirmed that **the CAP had only a marginal effect on antimicrobial reduction observed at Member State level**. Other factors identified in SQ4 were highlighted as the main source for this reduction, in particular the existence of **national policies and action plans**. In particular, while **targeted antimicrobial use and avoiding HPCIA were limitedly covered by the CAP**, HPCIA sales decreased significantly from 2015 to 2018.

The particular case of Cyprus shows how difficult it can be to change consumption patterns through the CAP. **M14-Animal welfare in Cyprus is probably the best example of the CAP measure targeting antimicrobial use among Member States studied**, with biosecurity operations and vaccination programmes. In addition, the Managing Authority decided to **implement M14 in combination with mandatory training financed under M01**.

[102] The term 'metaphylaxis', refers to the administration of the product at the same time to a group of clinically healthy (but presumably infected) in-contact animals, to prevent them from developing clinical signs, and to prevent further spread of the disease (European Commission, 2015).

[103] Category B of AMEG classification: https://www.ema.europa.eu/en/news/categorisation-antibiotics-used-animals-promotes-responsible-use-protect-public-animal-health.

Despite this proactive policy, no effect can be observed through EMA's data, which show a significant increase of 19.1% in antimicrobial sales in Cyprus from 2014 to 2018, this Member State being the highest consumer in Europe in 2018. In this Member State, other factors influenced the use of antimicrobials, e.g. **conflicts of interest in prescribing antimicrobials were pointed out by the Managing Authority** as the main reason for high antimicrobials sales in Cyprus (see SQ4).

The Netherlands is also an interesting example to consider, as it did not implement any CAP measure affecting antimicrobial use but succeeded in reducing antimicrobials sales by 49% between 2011 and 2018. The case-study revealed the positive effect of the Dutch policy on antimicrobial resistance, which encompassed specific measures improving veterinarians' responsibility when prescribing antimicrobials (see SQ4).

6.6.4 Summary of findings

The effect of the CAP on antimicrobial use was assessed by considering the types of practices successfully fostered by CAP instruments and measures, based on the most significant examples highlighted in SQ4.

M14-Animal welfare is the measure that contributed to fostering implementation of the highest number of important practices related to antimicrobial use reduction. **Cross-compliance** also demonstrated its ability to foster compliance with EU requirements by farmers benefiting from CAP support; however, these requirements are sometimes vague. **M11-Organic farming** surely had a positive effect on antimicrobial use by fostering conversion by farmers to organic production systems, which favour a series of practices helping to encourage antimicrobial reduction. **M04-Investments** very likely promoted investments needed to improve on-farm biosecurity, as this was emphasised in the Member States/Regions studied. **M01-Knowledge transfer and M02-Advisory services** can contribute to antimicrobial use reduction according to Managing Authorities and farmer representatives interviewed, by raising farmers' awareness and knowledge. Some **Pillar I instruments** have supported increased space allowance (VCS and marketing standards for eggs under the CMO regulation), but NGOs sometimes pointed out possible adverse effect of VCS on antimicrobial use depending on their implementation.

The analysis showed that **the CAP particularly fostered increased space allowance**, at levels 10 to 15% higher than those required by legislation, which generally helps to reduce antimicrobial consumption, according to SQ1 findings. Other successful examples were identified, in which the CAP fostered implementation of improved **feeding practices, microclimate control and maternal behaviour practices,** which can also contribute to antimicrobial use reduction.

Other **important practices were not sufficiently supported by the CAP** and would need to be better targeted in order to tackle antimicrobial use issues. Among treatment management practices for instance, prophylaxis and alternative treatment were the most supported, but **targeted AMU and avoiding HPCIAs** received very limited support despite their high importance. **Colostrum intake** was fostered only to a limited extent, through cross-compliance and M14, despite its significance for antimicrobial use reduction, in particular in dairy sectors. **Hygiene management**, **breeding choice and genetic selection**, as well as **maintenance of stable groups** would also benefit from a stronger targeting/support, although they are part of the organic production system. Considering the importance of these practices in achieving antimicrobial use reduction, the **contribution of CAP instruments and measures is considered as insufficient in reducing antimicrobial use** in Member States and regions studied.

According to EMA data, from 2011 to 2018, **antimicrobial sales** at the European level declined by 34.6%. Targeted treatment did not progress from 2010 to 2018, but among **group treatment** pharmaceutical forms, the ones with the highest risk of antimicrobial resistance (i.e. premixes and oral powder) decreased in favour of alternative practices of group treatments (i.e. oral solution). HPCIA (category B[104]) sales show a clear decrease at the European level from 2011 to 2018. However, **no correlation can be established between these trends and the CAP measures implemented**. According to all the stakeholders interviewed, **the CAP probably had a marginal effect on antimicrobial use, as the practices supported remained limited and those with the highest potential were not targeted** Moreover, other factors such as national policies and action plans probably had a huge effect on reduction trends at Member State level.

[104] Category B of AMEG classification: https://www.ema.europa.eu/en/news/categorisation-antibiotics-used-animals-promotes-responsible-use-protect-public-animal-health.

6.7 SQ 7 on efficiency - To what extent have the CAP instruments and measures as implemented by the Member States generated the best possible results towards the objective of viable food production, with a focus on improving the response of EU agriculture to animal welfare and reducing antimicrobial use.

6.7.1 Understanding and method

This SQ examines the efficiency of the set of measures and instruments directly related to animal welfare and the reduction of antimicrobial use (SMR, M04-Investments, M11-Organic farming, M14-Animal welfare). Its analysis focuses on the efficiency achieved in the case-study Member States/regions. The efficiency of the CAP instruments and measures implemented, i.e. their capacity to achieve the best possible results for the budget spent, was investigated through the following two angles:

- Efficiency of the mix applied between voluntary support measures and regulatory instruments. The analysis in particular considers the synergies between SMR 11, 12, 13 and M14-Animal welfare on animal welfare.
- Whether the combination of instruments/measures implemented to foster integrated approaches or projects is more efficient than individual measures. This builds on the results identified in SQ4.

In addition, the analysis considers whether the payment rate delivered under M14-Animal welfare was high enough to compensate for the additional costs incurred by farmers to take up the measure and implement practices beneficial for animal welfare: this is indeed a condition for the measure to generate positive results at an appropriate cost.

Finally, as monitoring systems are key to assess effectiveness and efficiency of policies, the SQ also considers whether the monitoring systems implemented made it possible to provide sufficient, detailed and reliable information.

Efficiency of instruments and measures is difficult to assess, as it requires documenting the means engaged to implement CAP instruments and measures (i.e. costs associated with administrative management and checks). The EU monitoring systems do not provide such information, and the cost data available are most of the time dedicated to the administrative management of a group of measures. Hence, efficiency has been assessed through a qualitative approach based on information collected in case-study areas.

6.7.2 Efficiency of the mix applied between voluntary support measures and regulatory instruments

Management costs of the different types of measures and instruments

In the administrative systems of Managing Authorities, **it is not always possible to disaggregate the costs of managing specific measures. Notably, costs of checking compliance with SMRs and sectorial legislation are difficult to distinguish: most monitoring authorities perform them together** Some case-study Managing Authorities attributed a weighting to the level of administrative costs for managing SMR checks and voluntary support measures. Although the information gathered is very limited, the answers tend to show that **costs for administrative management are roughly the same size as for regulatory instruments and voluntary measures**. A few Member States were nonetheless able to provide the specific management costs related to M14-Animal welfare (Germany-North Rhine Westphalia, Estonia and Romania). The few available figures show that **the share of management costs varies greatly, from 4% in Estonia to 12% in Romania, independently of the level of budget granted for M14**.

Effectiveness and complementarity of support measures and regulatory instruments

- Uptake and effectiveness of animal welfare/antimicrobial use instruments and measures

Given that regulatory instruments cover the whole sector, especially SMR13, they may potentially have a higher impact than RD measures. Nevertheless, as indicated in SQ4, many producers with indoor systems (notably pig, poultry and rabbit producers) are less concerned by cross-compliance because they do not receive payments subject to it. All stakeholders in the Netherlands **complained that the standards set by the EU regulation are minimal** and not high enough. In addition, some Managing Authorities and farmers' representative reported that cross-compliance **should be better enforced** in some Member States and /or that the level of fines currently

does not provide sufficient incentive to respect the rules: Estonian Managing Authorities raised the need for more effective control and detection of violations, and a **farmers'** representative from Sweden underlined the heterogeneity of control systems in the EU, which can lead to distortion of competition. In France, a farmers representative pointed that cross-compliance suffers from strict checks and issues of proportionality (to the payment granted). (ECA, 2016)

On the contrary, the effectiveness of M14-Animal welfare is impaired by its very low uptake and thus the very low share of the animal sectors covered (except in a few cases, see §**4.7.4).** In addition, the Managing Authority in Italy-Veneto reported that M14-Animal welfare is not relevant in the case of fully integrated supply chains: farmers will not invest to change their practices without value-added consideration by the retailer.

- Complementarity of regulatory instruments and voluntary measures

Most interviewees agreed that **there was generally a good balance between cross-compliance and voluntary measures.** However, several NGOs underlined that **the solution for greater efficiency of the whole CAP with regard to animal welfare/antimicrobial use objectives was, instead, to be found in a higher budget devoted to Pillar II measures and a better targeting of Pillar I** towards extensive breeding systems (by capping payments, more convergence, allowing support to grazed areas, targeting VCS to extensive systems, etc.).

6.7.3 Efficiency of support combination to foster integrated approaches

Although **combining measures should in theory provide greater effectiveness and might lower costs**, no data are available to support this hypothesis. The only tangible example is Austria, where **the M14-Animal welfare premium was halved when the farmer also received payment for M11-Organic farming**.

Finally, based on the Italian experiences, **some conditions under which combinations of measures might be more efficient can be outlined**:

- Combining M14-Animal welfare with any other measure relevant for an animal-welfare/antimicrobial-use objective should involve **simplifying administrative procedures** (on reporting and checking of the measures).
- In the case of highly integrated supply chains, M01-Training and M02-Advisory services should be operated by stakeholders of the supply chain (advisers, veterinarians, etc.);
- M16-Cooperation should be financed only in the case of sectors that are already organised and where the social capital is high (existence of strong cooperatives, etc.).

6.7.4 Adequacy of payment rate delivered under M14–Animal welfare

The payment rates delivered under M14–Animal welfare are calculated to take account of the costs associated with carrying out the selected actions. It may in no way bring profit to farmers. The calculation is based on **additional costs** and **income foregone**. **Transaction costs** can also be considered for up to 20 % of the premium paid for the animal-welfare commitments (e.g. time to familiarise themselves with the measure and its requirements, acquiring information, and preparing for checks); these are usually higher the first year[105].

Table 29: Example of factors used to calculate M14–Animal welfare payment

MS	Factors
CZ	Improvement of stable environment in dairy farming and enhancement of living conditions in pig breeding (prices of products used for alkalisation of litter and disinfection of stables, costs and income foregone by postponing the first insemination of sows).
CY	The time the breeder will devote to the implementation of the requirements of the measure and the keeping of the registers.
HU	Loss of income due to fewer livestock (compliance with the stocking density obligation), additional costs of littering, increase in wages due to the additional care of animals, increase in the cost of labour for milking technology, additional costs of putting up fences or electric fences, the increasing price or the increasing production costs of hay, or the price of its storing, additional cost of the salt with selenium.

[105] Article 33 of Regulation (EU) 1305/2013.

SK	Reduction in the number of livestock in the housed unit (e.g. in the case of broiler poultry, the weight of the broilers is monitored after removal from fattening and compared with the size of the housing area), and extension of the weaning period by 30 days on average.
FI	Development of a written feeding plan and a written contingency plan kept up to date to prepare for disruptions on beef and pig farms, improvement in the conditions in which animals are kept (outdoor access and grazing, pens for sick and injured animals, enrichment materials for pigs and poultry), medical and other treatment and improved conditions for farrowing and lambing. Calculations are separate according to species. **A specific feature in Finland is the taking into account of benefits to farmers** (e.g. improved yields and reduced use of medicine) that reduce the costs and losses of income.

Source: Questionnaires to Managing Authorities

The lack of information available on the uptake of M14– Animal welfare by sector (see SQ4) has been rounded out by opinions of case-study stakeholders to assess the level of payment rates. **Payment levels are generally judged to be insufficient in most cases to foster changes in practices which induce new technologies or structural changes (e.g. grazing), or to only partially cover those costs**. Indeed, for M14-Animal welfare, the payment amount needs to cover the switch from conventional to more animal-friendly husbandry practices in a sufficient proportion of the farms for it to be effective (as explained in §**4.7.2).** In Germany-North Rhine Westphalia, although the payment rate for cattle grazing is relatively high compared to other Member States, the measure requires the longest period of grazing among the studied Member States. The uptake was low, and the measure was insufficient in preventing a decrease in summer pasture grazing; that becomes more difficult the bigger the farm (Bergschmidt, 2019).

In some cases, payment rate amounts proved sufficient to maintain an existing practice but not to foster a switch in husbandry practices. Most interviewees in Austria agreed that the payment rate for cattle grazing is sufficient to foster maintenance of practices (i.e. access to pasture for dairy cows for at least 120 days/year for about 40% of all dairy cows) but not to induce a change of practices for the 60% remaining cows. The payment amount is nonetheless roughly the same as in the other Member States and regions. In Estonia, payment rates are judged to be sufficient to maintain practices or to foster changes in practices if there is no need in new technology.

Only **in some rare cases do support rates seem to have been sufficiently well calibrated to reach a significant proportion of the farms**. For instance, In Spain-Castilla La Mancha, 50% of the sheep and goat farms were concerned by the measure. The Managing Authority and farmers representatives agree that the payment rate was sufficient for sheep and goats. In 2020, additional budgetary allocation was made to satisfy new demands.

Other aspects can additionally explain the low uptake and limited scope of the measures. Payment rates vary greatly among Member States, although this is not necessarily explained by the level of constraints or the living standards in the Member States. In addition, in some regions studied, although the payment rate is relatively high compared to other M14 supporting equivalent practices, the uptake is lower. It is the case for instance with M14 supporting cattle summer grazing in Germany - North Rhine Westphalia. A recent study conducted by the Thünen Institute reported that payments does not hold up structural change of dairy farms and that pasture grazing – in spite of the payment - becomes less important in the future because managing pasture grazing gets more difficult the bigger the farm In Germany-Lower Saxony, the Thünen Institute carried out an assessment to identify the reasons that negatively affected uptake of curly-tail premium (Bergschmidt, 2019). Its results give us good insight into the reasons for the limited incentive for the farmers:

- A change of husbandry practice often requires **investments** that might cause certain farmers to lose interest.
- The premium was based on **obligations for result** (minimum 70% of intact curly tails), and many farmers did not want to run the risk of failing to reach the minimum objective and thereby face additional costs. The premium amount does not cover all costs associated with the implementation of the practice. The assessment calculated additional costs of close to EUR 30, while the premium is set to only EUR 16.50.
- Farmers had to commit to the programme for three years **without any testing period**.

Against this background, several **Managing Authorities interviewed consider the level of payment rate to be fair, considering the budget limitations**. For instance, the Managing Authorities of Italy–Friuli Venezia Giulia indicate that the budget was limited because it was the first time the measure was introduced. In Sweden, the Managing Authorities stated that planned budget planned was fully used. In Poland, the envisaged budget was even overshot.

6.7.5 Sufficient provision of information by the monitoring systems

Analysis of the available monitoring systems in the Member States/regions studied

Information from the case studies revealed that **Member States/regions generally did not set up any specific monitoring system targeting animal welfare/antimicrobial use objectives, except for some few and partial initiatives.** These initiatives are presented below for reference, along with sources of information that could be of use in setting up an effective monitoring system.

- Regarding the existence of context indicators for setting of the baseline, several databases could provide valuable inputs to a monitoring system.

  The agricultural census can potentially provide uniform information on the rearing practices of farmers all over the European Union. For instance, the last available version from 2010 (an updated dataset is to come in 2022) contains variables such as the type of housing and bedding according to species, grazing and its duration, the quantity of processed feed purchased, etc. Unfortunately, the agricultural census is updated only every ten years, but its data can be usefully rounded out by the **Farm Structure Survey (FSS)**, which gives a more regular picture of changes at stake. In the most recent FSS survey of 2016, some variables detail the livestock production rate and organic farming.

  National livestock registers also offer a potentially useful tool for information on practices related to animal welfare/antimicrobial use, based on the declaration of famers, but the type of information registered is quite variable from one region to another and no exhaustive list of indicator recorded in the EU Member States is available. Interviews with farmers representatives and managing authorities in case study areas provided the following examples of information available:

  - The Managing Authority of Spain-Catalonia records the type of pig farming system (intensive, extensive).
  - In Denmark, the Central Livestock Register (CHR) details animal husbandry systems (conventional, organic, or 'Friland' (free-range pigs)).
  - The Italian public register of livestock contains more precise information on farming systems per species/sector: for laying hens (organic, free-range, barn, enriched-cage), for pigs ('wild', 'semi-wild', housed), as well as the number of cattle pastured during the year.

- Regarding the existence of a system monitoring the outputs and results of CAP measures on animal welfare/antimicrobial use, studied Member States/regions did not set up any system specific to the monitoring of animal welfare/antimicrobial use. **Managing Authorities generally reported that they monitored only the level of compliance with relevant SMRs (information provided by veterinary services, based on veterinary inspections)**. Although this is not sufficient, it already provides an indication of the degree of implementation of basic practices at the EU level.

  Apart from M14-Animal welfare, Managing Authorities did not systematically monitor indicators related to the number of animals concerned, their species, or the practices fostered. Indicators mentioned in the case studies are common to all RD measures and, concerning animal welfare/antimicrobial use, provide very little detail on: number of applications submitted, rate of participation, number of farms supported, or value of payments (i.e. indicators provided by the CMEF – also see SQ8 for more information).

  In the case of M04-Investments, the number of farms and livestock units concerned are collected but generally without differentiating operations with positive effects on animal welfare or antimicrobial use from other investment operations. **Some interviewed Managing Authorities record a few indicators but almost never a complete set**:

  - The Swedish Managing Authority flags in the database if investment supported (it concerned support under M04 and M06) is expected to contribute to increase animal welfare and collects information on animal species in applications.
  - The Danish Managing Authority finances investment in functional farm buildings and farrowing pens for pigs but collects data only on the number of loose farrowing sows in supported operations.

In the case of M03-Quality schemes, the only information monitored is the number of farms involved although information related to the species and livestock units concerned as well as practices could also be monitored, especially as part of certification checks (feeding regimes, density, etc.). Regarding **M11-Organic farming, the number of farms involved, and the number of hectares (total and under conversion)** are identified, but the livestock unit concerned and production sector are not monitored.

In the case of other RD measures such as M01-Knowledge transfer, M02-Advisory service and M16-Cooperation, the monitoring of animal welfare/antimicrobial use objectives is also poor due to the fact that

these are rarely the sole objective of the operations financed and concern the whole farm. In Sweden, support within M01 and M02 is flagged if they are expected to contribute to focus area 3a, which includes both animal welfare and a shorter food chain and, in the Netherlands, the projects under M01 and M16 which related to animal welfare and health are clearly identified and possible to extract from a database of projects.

Regarding M02, for an effective monitoring system, it would be necessary to track the number of farmers trained, ideally per given practice, as well as their number and type of animals. One exception is the case of **Italy-**Veneto (see box below).

Box 8: AW/AMU monitoring system set up as part of M02-Advisory services in Veneto

The Veneto Managing Authority intends to systematise the data collected within the framework of two M02-Advisory services projects targeting beef and dairy cattle farms. Data about the farm situation at the starting point is collected by advisers supported, both from farmers and the national livestock register, to determine corrective actions together with the farmer. The same indicators are collected at the end of the period of intervention to compare the situation and evaluate the effectiveness:

- For dairy cattle: production parameters (quantity and quality of milk), reproductive activity and longevity.
- For beef cattle:
    - Mortality and early slaughter.
    - Severe respiratory diseases (cattle arrived at least 8 days before).
    - Severe respiratory diseases (cattle arrived at least 41 days before slaughter).
    - Respiratory and / or enteric diseases (cattle arrived at least 8 days before).
    - Respiratory and / or enteric diseases (cattle arrived at least 41 days before slaughter).

Source: Case study

In addition, among the case-study Member States/regions, none has made use of the possibility to link national animal registers to CAP payments (via the IACS system) to monitor animal welfare/antimicrobial use practices and objectives (although many use this possibility to check the payment). The electronic national animal register is not yet widespread throughout Member States, and in several of them the two databases are not managed by the same administrative body. That is the case in Italy and Romania, where the Paying Agency oversees the IACS system, while the animal register is managed by the Ministry of Health and the National Sanitary Veterinary and Food Safety Authority, respectively. This makes exchange of data monitoring animal welfare/antimicrobial use more difficult between the two databases.

- Although case-study Member States/regions have not set up any specific monitoring system encompassing all their measures targeting animal welfare/antimicrobial use, they monitored M14-Animal welfare outputs and results, and some also tried to monitor impacts on animal welfare/antimicrobial use. A thorough analysis of the indicators drawn up by the Managing Authorities for this programming period are detailed in SQ9 (impact indicators) and SQ8 (result and output indicators).

  However, four Member States/Regions (Denmark, Germany, Italy and the Netherlands) mentioned the difficulty in determining reliable indicators, because **animal welfare is multifactorial and cannot be directly measured** and is therefore currently impossible to measure through a few key and easy-to-monitor indicators.

Private/research initiative to monitor animal welfare/antimicrobial use

In addition with research projects already cited in SQ5, several research projects aim at determining a relevant animal welfare indicator in case studies, but no results are available yet or few detailed information was provided.

- In Italy–Emilia Romagna, the Research Centre for Animal Production (CRPA) together with the Universities of Bologna and Firenze had developed an animal-welfare indicator named Indicatore di Benessere Animale (IBA) in the past programming period (2007-2013). But this method turned out to be too expensive because a specific monitoring software had to be developed.
- In Germany, based on the observation that animal welfare is a multifactorial construct and that no single indicator seems to be suitable, the Federal Office for Agriculture and Food and the Thünen Institute are currently developing the interdisciplinary project 'Nationales Tierwohl Monitoring' (National Animal Welfare Monitoring). This project seeks to develop appropriate indicators for measuring animal welfare and to establish a monitoring system. The project started in June 2019 and will run for three years.
- In the Netherlands, a pig welfare check has been developed by a **producers'** organisation (POV) together

with the Staarten supervisory committee. Wageningen University carried out the implementation in close collaboration with pig farmers, veterinarians and feed representatives. It includes several indicators, both animal and non-animal, and different age categories: suckling piglets, weaned piglets, fattening pigs and breeding sows. It gives insight into the extent to which biting behaviour occurs on a pig farm and into which risk factors on the farm increase the chance of biting behaviour.

In addition, various voluntary and/or private schemes attempts exist to monitor animal welfare and antimicrobial use. **They do not involve all farmers of a region/Member State but provide at least some information on the practices and state of animal welfare at farm level. These schemes could be replicated or inspire broader systems.**

Table 30: Voluntary and/or private monitoring schemes in case-study Member States/regions

MS	Voluntary and/or private monitoring schemes
ES	**BDCuni is a voluntary service, managed by el Centro de Tecnología Animal del Instituto Valenciano de Investigaciones Agrarias**, to support rabbit farmers in carrying out technical and economic management by comparing their results with reference groups. Indicators used for monitoring AW are: number of abortions, of stillborn, of dead in nest, of dead in fattening. Data are collected by farmers.
FR	**Boviwell is a diagnostic test to assess cow welfare.** The indicators are similar to Welfare Quality Project ones and are animal-based. However, it is simpler than the Welfare Quality assessment (in particular, less indicators) and can be performed quickly by trained technicians. For example, gait and escape distance (i.e. the minimum distance that a cow can accept between it and a human before escaping) are assessed.
	EBENE is an auto-diagnostic tool developed in the poultry and rabbit sectors with the sole goal of informing farmers. It is used as a continuous improvement tool and has only on-farm indicators (e.g. density and mortality rate). Data is collected on-farm by trained farmers or advisors.
IT	Italian central and regional Health Authorities are working together to implement an **integrated information system named Classyfarm**. It is a voluntary benchmarking system at farm level that provides a categorisation of risk on farms, based on active participation of operators with the involvement of farm veterinarians. It enables collection of data from multiple sources (self-control, official control, slaughterhouse, electronic prescription). Classyfarm will be able to provide an actual representation of farms in terms of level of biosecurity and animal health, animal welfare, consumption of medicines in terms of Defined Daily Dose (DDD) and feeding system. **The system validates the data processing and returns an overall value that measures the level of risk on the farm**. The regional veterinary service of Italy-Lombardy implements a scoring evaluation related to the level of risk in terms of AW/AMU in the farms, using the livestock register and the results of veterinary inspections. Currently, it concerns only pigs and dairy cattle, and the programme is being tested for white-meat calves. **However, it is costly for farmers, thereby hindering widespread participation in the scheme.**
NL	**The Dutch veal sector has already developed data systems** (Vitaal kalf, the KVS, InfoKalf, and in the long term the Kalf OK system for the dairy farms). The next project is a 'Health Score Vitaal Kalf' that will be developed in 2020-2023. The first step is to gather available data on calves and then measure new indicators on individual animals, partly based on the WelfareQuality® protocol (systematic clinical assessment of the live calf). A precondition for the development of the health score is that it is practical and economically feasible from an operational point of view.
AT	**The Austria private initiative ZuchtData (ZAR)** collects information on animal-based measures (e.g. treatment frequency, findings from hoof trimming).
SE	**The Swedish programme Kokontrollen (cow control) is a voluntary system with monitoring and surveillance of health and welfare** provided by Växa Sverige, a farmers' association. The farmer can also follow their own data by logging into the system**. A similar monitoring system exists for pigs called PigWin**; half of the pig producers are affiliated with it.

Source: Case studies

Monitoring of antimicrobial use at farm level

In the case of antimicrobial use, all Member States have reporting and monitoring procedures but with varying degrees of accuracy. **In five out of eleven case-study Member States (Denmark, Spain, France, the Netherlands, Romania), managing authorities and farmers representative reported that there are procedures which provide sufficiently detailed and reliable information**, in line with EU recommendations. **On the other hand, in the six other Member States (Germany, Estonia, Italy, Austria, Poland and Sweden), the antimicrobial use monitoring system was reported to be insufficient**. In particular, data are not specific to the farm (they include other animals than farm ones), or they are not detailed per species or type of animal, or they include only prescriptions but not direct use by veterinarians.

Table 31: Missing elements in the AMU monitoring system in the case-study MS/regions

MS	Missing elements in the AMU monitoring system
DE	The German monitoring system does not differentiate farm animals and others.
EE	The monitoring system does not detail the use of antibiotics per species and age group (type of animals).
IT	Currently, data are not sufficiently detailed to determine Defined Daily Doses by specific categories of animals.
AT	The monitoring system does not include antibiotics applied by veterinarians, but only those applied by farmers.
PL	Poland is preparing to apply EP and EC Regulation (EU) No 2019/6.
SE	Sweden has a system that gives full coverage, but it is not specific to the farm and detailed at species level.

Source: Case studies

6.7.6 Summary of findings

Information gathered in the case studies shows that **administrative management costs are roughly the same for regulatory instruments and voluntary measures**. In addition, the share of M14-Animal welfare management costs compared to the measure's budget **varies greatly, independently of the level of budget** (from 4% in Estonia to 12% in Romania).

Most interviewees agreed that **there was generally a good balance between cross-compliance and voluntary measures**. However, several NGOs underlined that **the solution for greater efficiency of the whole CAP with regard to animal welfare/antimicrobial use objectives was instead to be found in a higher budget devoted to Pillar 2 measures and a better targeting of Pillar 1** towards extensive breeding systems.

The M14–Animal welfare payment rates vary greatly among Member States. Although Managing Authorities consider the level of payment rate to be correct, given their generally limited budget (**Italy-Friuli Venezia Giulia, Poland, Sweden**), some farmers representatives and researchers assess them **as insufficient or as only partially complementary in most cases** (**Germany** (pig sector), **Estonia** (cattle grazing), **Italy-Friuli Venezia Giulia, Austria, Poland, Sweden**). Only in Spain–Castilla La Mancha did sheep and goat support rates seem to have been sufficiently well calibrated to reach a significant proportion of farms. **In Austria, payment rate amounts proved sufficient to maintain an existing practice but not to foster a switch in husbandry practices**. Low uptake can also be explained by other factors: the demand that investments enable change in husbandry practices, the risk represented by support conditioned on ex post results, and the three-year commitment without any testing period.

Member States/regions generally did not set up any specific monitoring system targeting animal welfare/antimicrobial use objectives, except for a few partial initiatives. **They monitored only the level of compliance with relevant SMRs.** Apart for M14-Animal welfare, Managing Authorities did not systematically monitor indicators related to the number of animals concerned, their species, or the practices fostered. In addition, among the case-study Member States/regions, none has made use of the possibility to link national animal registers to CAP payments (via the IACS system) to monitor animal welfare/antimicrobial use practices and objectives.

Indeed, animal welfare is multifactorial and its monitoring at the EU level is a recent subject of interest, therefore there is little hindsight on its measurement Several research projects are aimed at determining a relevant animal welfare indicator, but no results are available yet. In addition, various voluntary and/or private scheme attempts exist. They do not involve all farmers of a region/Member State but provide at least partial information on the practices and state of animal welfare at farm level and could be replicated or inspire broader systems.

In the case of antimicrobial use, all Member States have reporting and monitoring procedures, but with varying degrees of accuracy.

6.8 SQ 8 on relevance – To what extent are Member State's implementation choices addressing animal welfare relevant for achieving the objective of viable food production? To what extent are the output and result indicators used by Member States for animal welfare support relevant to depicting the entire Member State strategy to improve animal welfare?

6.8.1 Understanding and method

This SQ examines the relevance of the following:

- Implementation choices of Member States/regions to address needs associated with animal welfare and antimicrobial use, which were identified by researchers, veterinarians and farmers representatives interviewed in case studies for each sector concerned and based on the previous SQs (SQs 1, 3 to **6**).
- Output and result indicators used by Member States and their capacity to provide sufficient information to quantify the contribution of the CAP towards improvement of animal welfare and reduction of antimicrobial use. For each set of indicators implemented, the analysis will consider whether they make it possible to provide sufficient insight into the output (e.g. number of beneficiaries/animals concerned by the measure) and the results achieved (e.g. number of farms/animals with improved housing conditions, reduced livestock density, improved feeding practices, lower antimicrobial use, etc.) through CAP instruments and measures implemented. The indicators documented as part of the requirements imposed by the EU-level CMEF are identified in case-study Member States. When such indicators have been put in place, the analysis identify the best examples of indicators providing sufficient insight of the output and the results achieved through CAP instruments and measures implemented. Opinions of managing authorities and researchers interviewed in the studied Member States/Regions help to identify successes and shortcomings.

The SQ also considers good practices of output and result indicator targeting animal welfare, identified in Member States/regions. These output and results indicators set by Member States/regions must:

- make it possible to indicate the share of livestock units covered by CAP commitments and investments targeting animal welfare; and
- be documented based on detailed and reliable information, ensured by simple and efficient collection of data and avoiding double counting and other possible bottlenecks. Hence, the robustness of such indicators must be assessed taking into account the quality assurance strategy implemented.

However, in the event no good practices/lessons learnt were available in the Member States/regions studied, relevant indicators documented by private initiatives set by the livestock sectors were collected. Indeed, stakeholders of specific animal husbandry sectors might already be involved in projects led by technical institutes, private companies or research centres to document the practices implemented on farms directly or indirectly related to animal welfare.

6.8.2 Relevance of implementation choices of Member States and regions

6.8.2.1 Needs identified in the RDPs in relation to animal welfare / antimicrobial use

In each RDP, a SWOT analysis was performed to determine priorities in the EAFRD allocations. Case studies show that animal welfare and the reduction of antimicrobial use is generally not explicitly addressed in the RDPs studied. Out of the 23 RDPs considered in case studies (7 national and 16 regional RDPs) in the 11 Member States studied, only two national RDPs (**Romania** and **Estonia**) explicitly mentioned animal welfare among the needs to be addressed. In particular, the Estonian RDP refers to the improvement of housing conditions and freedom of movement. As demonstrated in SQ3, both RDPs allocated significant share of RDP budget to implement M14 (Estonia 4.28% and Romania 8.40%).

In other RDPs, the analysis revealed that other needs identified can have an influence on animal welfare/ antimicrobial use . They mostly relate to the development of organic farming or practices with a high degree of sustainability (**France-**Brittany, Alsace and Pays de la Loire, **Spain-**Catalonia), the conservation of local breeds (**Spain-**Catalonia), the modernisation of livestock buildings (**France-** Brittany) or the preparation of food industries to upgrade through quality schemes (**France-**Pays de la Loire).

The issue of antimicrobial use is never addressed as a direct need in the RDPs studied, according to the case studies. However, in France – Midi-Pyrénées, the use of risk management tools linked to sanitary and environmental incidences in agriculture indirectly address the issue of antimicrobial use reduction. In the Netherlands as well, while the reduction of antimicrobial use is not mentioned in the needs assessment, it is mentioned as one of the challenges faced by the calf sector.

6.8.2.2 Comparison of the crucial needs related to animal welfare identified in case-study areas and local implementation choices, by sector

The comparisons presented below focuses on the presence of measures/operations targeting animal welfare needs in the RDPs but do not assess the effectiveness of these measures/operations.

Pig sector

Specific issues related to pigs' welfare were mentioned in Germany, Spain, the Netherlands and Sweden by researchers and farmers representatives[106], **mostly regarding housing conditions** (increased space allowance, microclimate conditions, flooring with vegetal litter, provision of enriched environment) **and prevention of tail biting**. At Member State level, the analysis of the local implementation choices in the case-study areas revealed that implementation choices by Member States and Managing Authorities are unevenly aligned with the needs identified at local level for the pig sector (see table below).

Table 32: Scoring matrix of the relevance of local implementation choices in the case-study areas to the needs identified locally by farmers representatives and researchers for the pig sector

	DK	DE				ES	NL	SE
		Baden-Württemberg	Mecklenburg-Western	Lower Saxony-Bremen	North-Rhine Westphalia	Catalonia		
Better nutritional balance (including free access to food)								
Water safety management								
Increased space allowance								
Loose housing for farrowing sows								
Mutilations with pain-avoiding practices/ no mutilation (tail docking, castration)								
Microclimate conditions								
Flooring with vegetal litter								*
Provision of enriched environment								

*National regulation covers the implementation of partially slatted but not fully slatted floors on the whole surface are allowed, and sows must always be provided with straw before and during farrowing. However, these requirements are not linked to the CAP.

Legend:

The RD measure objectives **sufficiently address** the need	The RD measure objectives **do not address** the need
The RD measure objectives **partially address** the need (no specific eligible criteria or commitment targeting it)	Not identified as a need by farmers representatives and researchers interviewed in case studies or no sufficiently robust information collected

Source: Case studies and previous study questions

In case-study areas, **four RDPs (in Germany and Sweden) implemented M14, especially for the pig sector**. The analysis of the RDP and complementary information collected through interviews with the Managing Authorities showed that the main issues addressed in Germany with M14 are space allowance, microclimate conditions (separation of defecation, rest and activity areas, with different temperature zones), reduction of mutilation (tail docking), flooring with vegetal litter and provision of enriched environment. In Sweden, M14 is focused on

[106] The pig sector was studied in the following areas: Denmark, Germany–Lower Saxony-Bremen and North Rhine-Westphalia, Spain-Catalonia, the Netherlands, Sweden-West Sweden.

supporting the planning and monitoring of production, routines for feeding, analyses of feed, water and straw, and global assessment of body conditions.

It should be noted that, in the areas studied, only Germany – Lower Saxony, North-Rhine Westphalia, Mecklenburg-Western Pomerania and Baden-Württemberg established **specific requirements related to pig welfare**[107], **for support of investments in stables through M04**. The Danish RDP implemented **a specific operation** targeting loose housing for farrowing sows through M04.

In the other areas studied, needs for the pig sector identified by researchers and farmers representatives are not explicitly targeted by the CAP measures. Nevertheless, M04 and M10 have supported some improvement or maintenance of practices:

- M04 (especially M04.4 "Support non-productive investments to achieve agri-environmental-climate objectives") has supported a few investments improving pigs' welfare (e.g. improved ventilation) in the Netherlands, Sweden, and Spain-Catalonia, even if the objective of the measure was to reduce livestock emissions.
- M10 was not identified as a relevant measure to address the main animal welfare issues of the pig sector in Spain-Catalonia, but it was useful for the conservation of native breeds, which are better adapted to specific local conditions.

Cattle sector

At Member State level, **the major issues cited**[108] **were outdoor access and grazing, flooring with vegetal litter, stopping mutilations or mutilations with pain-avoiding methods, holding and gear hygiene and good nutritional balance management (for veal**).
The analysis of local implementation revealed that, as in pig sector, they are unevenly aligned with the needs identified at local level (see table on next page).

[107] Specific requirements are defined regarding space, floor, drinking devices (pig sector), animal feeding place ratio, handleable material and daylight-permeable area, etc. The requirements are higher than in the "Order on the protection of animals and the keeping of farm animals" (national regulation "Tierschutz-Nutztierhaltungsverordnung"), especially regarding space (20% more) and drinking devices.

[108] Cited in two or more case-study areas by researchers or farmers representatives interviewed.

Table 33: Scoring matrix of the relevance of local implementation choices in the case-study areas to the needs identified locally by farmers representatives and researchers, for the cattle sectors

	DE				EE	FR		IT		NL*	AT	PL	SE
	Saxony-Lower Bremen	Mecklenburg-Western-Pomerania	North-Rhine Westphalia	Baden-Württemberg		Brittany	Pays de la Loire	Lombardy	Friuli-Venezia-Giulia				
Good nutritional balance management (veal)													
Outdoor access and grazing													
Loose housing (no tethering)													
AW-friendly flooring (e.g. with vegetal litter or rubber flooring)													
Microclimate control													
Stopping mutilations or mutilations with pain-avoiding methods													
Holding and gear hygiene													
Provision of enriched environment													
Health management													
Farmers' education/ training													

* In the Netherlands, several researchers recommend a complete change in the farming model in the veal sector, to improve animal welfare (including an increase in space allowance, better nutritional balance management, improvement of health practices). ** Through M11-Organic farming.

Legend:

	The RD measure objectives **sufficiently address** the need
	The RD measure objectives **partially address** the need (no specific eligible criteria or commitment targeting it)
	The RD measure objectives **do not address** the need
	Not identified as a need by farmers representatives and researchers interviewed in case studies or no sufficiently robust information collected
	The sector was not studied in the case-study area

Source: Case studies and previous study questions

In the Member States/regions studied, M14 for the beef sector was implemented in Germany–Lower Saxony-Bremen, Mecklenburg-Western-Pomerania, North-Rhine Westphalia and Baden-Württemberg, Estonia, Austria, Italy-Friuli-Venezia-Giulia.

In several Member States, only outdoor access and grazing were targeted in the RDP, through M14 (**Germany**–North Rhine-Westphalia and Mecklenburg-Western Pomerania, **Estonia** and **Italy**–Friuli Venezia – Giulia), M10 (**France**–Brittany and IT–Friuli-Venezia-Giulia), M11 or M04 through the support of investments increasing grass and sensitive grassland use in **France**–Brittany. Other issues were also identified (**Poland**: flooring with vegetal litter, **France**–Brittany and Pays de la Loire: implementation of mutilation with pain-avoiding methods). Flooring with vegetal litter was supported in Germany–North-Rhine Westphalia through M14, and improved flooring with rubber was supported in the Netherlands through M04, but not in the other case studies areas (in **France**–Brittany, **Poland** and **Sweden**). **Avoiding pain during mutilation, the provision of an enriched environment, and holding and gear hygiene have not been addressed** by CAP measures.

Poultry sector

The main issues identified in the areas studied[109] regarding the poultry sector are **outdoor access, the reduction of beak trimming, improving/phasing out culling of male chicks, the increase in space allowance and the selection of more robust genetic strains**.

[109] The poultry sector was studied in France–Pays de la Loire and Brittany, Italy–Veneto and Friuli-Venezia Giulia, the Netherlands, Romania and Sweden–East middle Sweden.

Table 34: Scoring matrix of the relevance of local implementation choices in the case-study areas to the needs identified at the local level for the poultry sectors

	FR		IT		NL	SE	RO
	Brittany	Pays de la Loire	Veneto	Friuli-Venezia-Giulia			
Mutilations with pain-avoiding practices/ no mutilation (beak trimming)							
Outdoor access							
Loose housing							
Microclimate control and light							
Better management in loading and moving animals on-farm							
Practices improving/phasing out culling of male chicks							
Increased space allowance							
Genetic selection to improve robustness							
Better feeding management							
Provision of enriched environment							

Legend:

	The RD measure objectives **sufficiently address** the need		The RD measure objectives **do not address** the need
	The RD measure objectives **partially address** the need (no specific eligible criteria or commitment targeting it)		Not identified as a need by farmers representatives and researchers interviewed in case studies or no sufficiently robust information collected

Source: Case studies and previous study questions

The framework of M14-Animal welfare made it possible to deal with the issue of poultry outdoor access in Estonia through the promotion of alternative systems (perch, free range). In addition, in Romania, all the interviewees considered the practices supported by M14-Animal welfare (reduction of livestock density and improvement of microclimate conditions) relevant to addressing the specific issue of poultry welfare.

Other CAP measures were found relevant to tackle outdoor access issues (M04 in **France**-Brittany, M11 especially in **France**-Brittany and **Sweden**), and genetic selection targeting the use of slow-growth breeds for organic production was reported in France–Brittany (M11). However, **no RD measures tackled beak trimming**.

Sheep and goat sector

The table below examines the relevance of local implementation choices to address the main needs identified by researchers and farmers representatives in case studies for the sheep and goat sector. **Outdoor access, the provision of enrichment and the reduction of suffering mutilation / stopping mutilation (dehorning and tail docking)** are the major need identified.

Table 35: Scoring matrix of the relevance of local implementation choices in the case-study areas to the needs identified at the local level for the sheep and goat sector

	ES	FR			
	Castilla la Mancha	Brittany	Lorraine	Midi-Pyrénées	Pays de la Loire
Outdoor access and grazing					
Provision of enriched environment (for climbing)					
Mutilations with pain-avoiding practices/ no mutilation (dehorning and tail docking)					

Legend:

	The RD measure objectives **sufficiently address** the need		The RD measure objectives **do not address** the need
	The RD measure objectives **partially address** the need (no specific eligible criteria or commitment targeting it)		Not identified as a need by farmers representatives and researchers interviewed in case studies or no sufficiently robust information collected

Source: Case studies and previous study questions

Outdoor access was supported by the CAP through specific commitments on the duration and the recording of pasture time under M14 in Spain–Castilla La Mancha and indirectly through the fostering of grass use under M10 (In **France**–Brittany and **Spain**–Castilla La Mancha), even though the measure targeted primarily environmental objectives. In Spain-Castilla La Mancha, Managing Authorities built M14 on the results of a specific Spanish scientific field study dedicated to the welfare of small ruminants in extensive systems to ensure the relevance of

the commitments, which included outdoor access and pasturing (minimum of 120 days a year) and its recording. In France, farmers representatives also outlined the importance of the measure dedicated to areas of natural or other specific constraints (ANC) (M13) to maintain mountain pasture areas.

No relevant CAP measures have been targeted to limit tail docking (used to limit myasis) **or dehorning**, to foster pain-avoiding method, or to provide an enriched environment, even though these issues were identified as crucial in France.

Rabbit sector

In Spain-Catalonia and the Netherlands, where the rabbit sector was studied, **no CAP measure has been implemented in the sector**. Nevertheless, researchers and farmers representatives pointed out, especially in Spain–Catalonia, that improvements are needed in terms of housing conditions (group housing, provision of enriched environment, increased space allowance, better microclimate control), feeding practices (better nutritional balance management) and health management (biosecurity practices).

6.8.2.3 Comparison of the crucial needs related to antimicrobial use identified in case-study areas and local implementation choices

Although some practices previously described addressed both animal welfare and antimicrobial use (see SQ1), other key issues related to the latter were identified in case-study areas. However, few are addressed by CAP measures (see table below).

Table 36: Scoring matrix of the relevance of local implementation choices in the case-study areas to the needs identified at the local level for antimicrobial use.

	EE	AT	DE				ES	FR		IT		PL	SE	NL
			Lower Saxony-Bremen	Mecklenburg-Western-Pomerania	North-Rhine Westphalia	Baden-Württemberg	Catalonia	Brittany	Pays de la Loire	Veneto	Friuli-Venezia-Giulia			
Farmers' education/ training														
Food safety and diversity														
Improvement of health monitoring														
Improvement of biosecurity, including hygiene management														
Improvement of health diagnosis														
Better use of prophylaxis and alternative treatment														
Genetic selection to improve robustness														
Later weaning and colostrum intake														

Legend:

The RD measure objectives **sufficiently address** the need	The RD measure objectives **do not address** the need
The RD measure objectives **partially address** the need (no specific eligible criteria or commitment targeting it)	Not identified as a need by farmers representatives and researchers interviewed in case studies or no sufficiently robust information collected

Source: Case studies and previous study questions

Information gathered in case studies showed that the **development of training and advice to farmers as well as the implementation of biosecurity practices and a better use of prophylaxis and alternative treatment were the main issues** related to the reduction of antimicrobials. It was shown in the previous SQs that although the CAP does not appear as the most relevant instrument to directly limit the use of antimicrobial (this issue being generally addressed through national voluntary action plans or other instruments, see examples in SQ6), **some RD measures helped to improve health management practices and biosecurity through improved awareness, knowledge and training of farmers**:

- M01-Knowledge transfer and M02-Advisory services were used to this end (for instance in Italy and Austria for M01 and in Estonia and Germany for M02).

- In Cyprus, M14-Animal welfare was directly used to address health issues by fostering biosecurity and preventing diseases transmitted by parasites such as mites, ticks, fleas and lice.
- M04-Investment support: Regarding the improvement of buildings, although no examples of relevant implementation choices addressing biosecurity were identified in case studies through M04 (investments), this measure gave Managing Authorities the opportunity to tackle these challenges[110]. A few examples of investments improving biosecurity and sanitary conditions of livestock buildings (supported by M04) were identified in the case studies (Spain-Catalonia, France-Brittany and Pays de la Loire and Italy-Veneto and Friuli-Venezia-Giulia).

6.8.2.4 Typology of best choices to deal with animal welfare and antimicrobial use reduction issues

As previously explained, antimicrobial use is rarely directly addressed by the CAP, but in most case-study Member States M01-Knowledge transfer and M02-Adivisory services were found relevant for training farmers on this issue. Concerning animal welfare, case studies showed that the more relevant implementation choices for addressing animal welfare, regardless of the sector concerned, involved implementation of M14 and M04. These implementation choices are described in detail in SQ3.

A second category of implementation choices can be established by RDPs where M14 was not implemented, but where interesting combinations of other measures such as M04, M10 and M11 (in France-Brittany or Pays de la Loire) or even other measures on their own such as M03 (calves in the Netherlands) made it possible to address the animal welfare issues at stake. For this category, holistic approaches with a limited number of measures were generally favoured in order to optimise implementation and running costs. It should nevertheless be noticed that some specific animal welfare issues (such as mutilations) cannot be directly addressed by such cross-cutting measures.

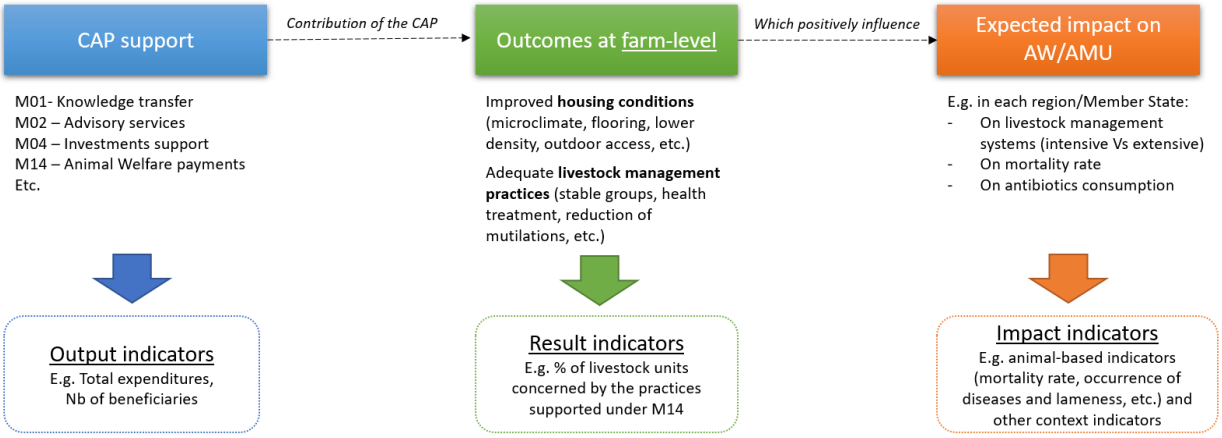
Finally, Managing Authorities sometimes fail to address the issues at stake through CAP measures, according to case- study interviews and a review of implementation choices. This may be due to the use of alternative instruments such as national regulations (e.g. in Sweden), but it also highlights the importance of stakeholder consultation (farmers representatives, NGOs and researchers) during the design of the national and regional CAP implementation, so that Managing Authorities can clearly identify what the main issues are. Indeed, none of the RDPs studied entirely neglected the issue of animal welfare, but some address only some of the animal welfare issues at stake.

6.8.3 Relevance of the set of output and result indicators set up by Member States in their strategy to improve animal welfare

The relevance of the set of indicators must be examined according to its capacity to provide sufficient information to quantify the contribution of the CAP to improvement of animal welfare and reduction of antimicrobial use. The indicators must be considered as a set and reflect the CAP delivery model implemented at Member State/regional level. Theoretically, three types of indicators would be needed to reflect CAP actions implemented towards animal welfare and reduction of antimicrobial use (see figure below). As illustrated by the figure, effective monitoring would require implementing result indicators to assess the outcomes on practices implemented on farms and impact indicators to assess overall effect on AW/AMU. However, the current Common Monitoring and Evaluation Framework does not encompass impact indicator related to animal welfare or antimicrobial use.

[110] It should be noted that in the framework of the COVID recovery plan in France, the biosecurity and animal welfare plan leaned toward M04. It made it possible in particular to target and support investments improving biosecurity on farms.

Figure 22: Adequate set of indicators reflecting MS strategy to improve animal welfare



Source: Agrosynergie

6.8.3.1 Output and results indicators implemented to assess the implementation of measures addressing animal welfare/ antimicrobial use

The monitoring system implemented in case-study Member States/regions is described in SQ7. As demonstrated, the case studies revealed that **Member States/regions generally did not set up any specific monitoring system targeting animal welfare or antimicrobial use objectives**, except for a few and partial initiatives, which are described in SQ7. The analysis below examines to what extent output and result indicators, as provided by the CMEF and implemented by Member States, were relevant to document the CAP effect on animal welfare/ antimicrobial use.

List of output indicators provided by the Common Monitoring and Evaluation Framework (CMEF)

Under the CAP 2014-2020, the output indicators do not provide a sufficient overview of the achievements of CAP instruments/measures implemented targeting animal welfare and antimicrobial use issues.

- Pillar I instrument

The monitoring framework does not make it possible to assess the share of livestock units belonging to holdings subject to cross-compliance.

- RD measures

Output indicators are most often available at the level of the measure (e.g. O.1 Total public expenditures, O.2 Total investments and O.3 Number of actions/operations supported under M04 Investments support). When specific sub-measures or types of operations are targeting animal welfare or antimicrobial use issues, then output indicators (i.e. budget, total investments amount, number of operations supported, etc.) **are not available at the level of the type of operations, thereby making it not possible** to assess the progress made in implementing such specific support.

In the case of M14, which targeted animal welfare and supported the implementation of specific livestock management practices by farmers, **sub-measures and types of operations are designed by Member States/regions to target specific sectors and/or practices**. Hence, detailed output on the number of holdings/beneficiaries supported (O.4) and number of LSU supported (O.8) under each type of operation/sub-measure would significantly help **to assess the efforts achieved in each sector and/or practice.**

In addition, **expressing the output indicator in livestock units does not make it possible to identify the number of animals concerned**: it does not reflect the welfare of animals, which is an individual issue, and may skew the analysis when comparing different sectors. For instance, it would mean that the welfare of a milking cow is equivalent to the welfare of 142 broilers.

The table below establishes the list of output indicators documented by Member States/regions in the CMEF and explains how these indicators should be complemented to provide sufficient information on the effects of the CAP on animal welfare/ antimicrobial use .

Table 37: Analysis of the output indicators provided by the CMEF

CAP instruments/measures	Output indicators implemented in 2014-2020	Need for complementary indicators to document AW and AMU strategies
Pillar I	O.29_PI Number of beneficiaries of VCS (broken down by sector)	-
	O.30_PI Quantities eligible for VCS (number of hectares / number of animals broken down by sector)	-
	O.32_PI Number of animals concerned by VCS	-
Cross-compliance	Share of CAP payments subject to cross-compliance	Share of livestock units subject to cross-compliance (broken down by type of sector)
Organic farming	O.54_PI Number of hectares (total and under conversion)	Number of head per main species/sector (total and under conversion)
	O.55_PI Number of certified registered organic operators	Number of certified registered organic operators broken down by sector
Farm advisory system	O.58_PI Number of farmers advised	Number of breeders advised by type of sector
All RD measures	O.1 Total public expenditure	Total public expenditure by type of operations related to AW or AMU
M4, M5, M6.4, M7.2 to M7.8, M8.5 and M8.6	O.2 Total investment	Total investments by type of operation related to AW or AMU
M1, M2, M4, M6, M7, M8.5 and M8.6, M9, M17.2 and M17.3	O.3 Number of actions/operations supported	Number of actions/operations supported by type of operations related to AW or AMU
M3.1, M4.1, M5, M6, M8.1 to M8.4, M11, M12, M13, M14, M17.1	O.4 Number of holdings/beneficiaries supported	Number of holdings/beneficiaries supported by type of operations related to AW or AMU
M14, M4	O.8 Number of Livestock Units supported (LSU)	Number of head supported broken down by sector and type of operation
M1.1	O.11 Number of training days given	Number of training days given on AW/AMU issues
M1.1	O.12 Number of participants in trainings	Number of participants in trainings on AW/AMU issues
M2.1	O.13 Number of beneficiaries advised	Number of beneficiaries advised on AW/AMU issues
M2.3	O.14 Number of advisers trained	Number of advisers trained on AW/AMU issues
M16.1	O.16 Number of EIP operations supported	Number of EIP operations addressing AW/AMU

Source: CMEF data and own analysis

List of result indicators provided by the Common Monitoring and Evaluation Framework (CMEF)

Result indicators are used for setting targets and assess the progress achieved through CAP support toward those targets. Under the CMEF implemented over 2014-2020, **no result indicator makes it possible to quantify the coverage of actions implemented to support animal welfare and/or reduce antimicrobial use.**

Some indicators, expressed in percentage of livestock units, seek to document the share of organic livestock in each sector or the livestock units concerned by specific investments in view of reducing GHG and/or ammonia.

However, **no result indicator is available to quantify the potential results of M04 Investment or M14 Animal welfare**, which might have significantly contributed to improvement in housing conditions and livestock management practices at farm level.

Table 38: Analysis of the results indicators provided by the CMEF

CAP instruments/measures	Result indicators implemented in 2014-2020	Need for complementary indicators to document AW and AMU strategies
Pillar I	R.10_PI – Share of organic livestock among total livestock broken down by type of category (cattle/goat/sheep/pig)	
M4 - Investments in physical assets	R16/T17 – Percentage of Livestock Units (LSU) concerned by investments in livestock management, in view of reducing GHG and/or ammonia emissions	Percentage of number of head concerned by investments in livestock management, in view of improving AW/reducing AMU (without breakdown per sector)
M03 – Quality schemes for agricultural products and foodstuffs **M09 - Setting-up of producer groups and organisations** **M16.4 - Cooperation among supply chain actors**	R4/T6 - Percentage of agricultural holdings receiving support for participating in quality schemes, local markets and short supply circuits, and producer groups/organisations	Number and percentage of agricultural holdings receiving support for participating in quality schemes
M14 – Animal welfare	-	Percentage of number of head concerned by improved practices fostered by M14 broken

CAP instruments/measures	Result indicators implemented in 2014-2020	Need for complementary indicators to document AW and AMU strategies
		down by sector and category of practices (outdoor access, density, health, etc.)
M1.1, M2.1, M3.1 – Knowledge transfer and advisory services		Increased awareness of farmers towards AW/AMU issues and increased technical capacity to address them

Source: CMEF data and own analysis

However, at EU level, out of the 35 RDPs having implemented M14, **eight Managing Authorities have implemented, on a voluntary basis, a results indicator to set targets and monitor the progress achieved toward this target under M14** (also see SQ9 for more information). These result indicators are documented in the CMEF and consider either the **percentage of farms receiving support for animal welfare (**Germany – North-Rhine Westphalia, **Lower Saxony**-Bremen and Baden-Württemberg, Ireland and Italy – Sardinia) or the **percentage of livestock units concerned by the measure** (Italy – Valle d'Aosta, Cyprus and Sweden).

6.8.3.2 Analysis of the relevance of the set of output and result indicators to depict animal welfare/ antimicrobial use strategy

As highlighted in the previous part and SQ7, the current set of indicators does not make it possible to provide sufficient insight of the effects achieved on the implementation of farming practices beneficial for animal welfare and reduce antimicrobial use .

As a consequence, it is not possible to rely on the monitoring system to assess the following:

- The share of animals concerned by M14-Animal welfare in a given sector, except if M14 targets one sector only (e.g. M14 targeting sheep/goats in Cyprus). Indeed, output indicator O.8 on the number of LSU supported by M14 is not broken down by sector.
- The types of practices implemented by CAP beneficiaries (e.g. type of housing systems, feeding regime, access to pasture, etc.).
- The overall impact of these changes in practices on animal welfare and antimicrobial use, as no animal-based indicator is monitored inside the CAP framework (e.g. occurrence of lameness or other injuries, mortality rate, etc.).

Output indicators

To be effective, the monitoring framework should make it possible to collect output data at the level of the types of operation. This would however rely on the setting of an accurate delivery model by Member State, i.e. when a given measure is implemented targeting several objectives, then sub-measures and types of operations must be designed to reflect such a strategic approach. For example, if training on animal welfare/ antimicrobial use is supported under M01.1 Trainings, then effective reporting would require:

1. the setting of a specific type of operation for training addressing animal welfare / antimicrobial use issues and
2. the collection of output data at the level of the type of operation.

This would make it possible to monitor the **share of actions supported by RD measures addressing animal welfare/antimicrobial use**. In addition, it could help to distinguish to what extent specific practices or species targeted by the different types of operations under M14 have been effectively supported.

Results indicators

Under M04-Investment support and M14-Animal welfare, as well as other potential RD measures, **types of interventions addressing animal welfare and/or antimicrobial use should be quantified in number of head per sector**. This would make it possible to gather the overall quantity of units concerned by different measures/types of interventions addressing animal welfare / antimicrobial use under the CAP (e.g. investments, animal welfare commitments, etc.) and provide a comprehensive view of the share of animals concerned at regional/national level. In this regard, **particular attention should be paid to avoid double counting in the financial year concerned** (in the event animals/holding are concerned by different types of interventions).

Box 9: Management of double counting for indicators linked to livestock

Several CAP interventions may relate to livestock, including animal welfare support, investments, organic farming, VCS, and others. To monitor and evaluate the policy, indicators on the number of head or livestock units (LSU) concerned by the different interventions are needed.

In order to avoid double counting of LSU concerned by many interventions and to obtain a clear picture of the herd concerned by CAP measures at a given point in time, the use of the beneficiary ID needs to be considered. For each farm committed or requiring support, the number of animals concerned is either reported by farmers directly in the payment claim or calculated based on the overall payment granted/unit amount per animal.

Cumulative indicators stand for result indicators that take into account the number of LSU in farms benefiting from CAP support over the programming period, independently of the number of interventions.

National initiatives to assess the effects of M14 on animal welfare / antimicrobial use

At national level, different approaches were, however, implemented to assess actual improvements achieved on animal welfare (see also SQ7). Three Member States among the Member States studied decided to carry out qualitative evaluations to assess the progress made towards animal welfare objectives (**Cyprus, Czechia, Sweden**) (see table **below**). No information was available on double counting issues and the quality assurance strategy implemented.

Table 39: Examples of national assessment of the effects on animal welfare / antimicrobial use

MS	Methodology used to assess the effects on AW/AMU	Data collection	Bottlenecks
CY	AW: Under M14, sheep/goat farmer must monitor data on the welfare of their herd, which is used by the MA to determine the next CAP strategic plan (these indicators are thus used to establish the new baseline for 2023). The evaluation of M14[111] examined the effects on the following aspects: genetic improvement, livestock management, feed improvement, licensing of livestock units, support for training, maintenance of financial records and production data, establishment of producer organisations, application of new technologies, innovation and investments in new farms. AMU: To document the effects of the national Action Plan to tackle antimicrobials launched by the Ministry of Health, the veterinary services are required to collect detailed data on the use of antibiotics at farm level. Data collection distinguishes antibiotics used by animal species, and they helped to set specific indicators to monitor improvements achieved by the Action Plan.	AW: Monitoring of data by farmers AMU: Data collection by veterinary services on the use of antibiotics on farm by species	Not available
CZ	AW: In addition to the CMEF indicators of M14 of the RDP 2014-2020, a specific qualitative assessment of the benefits of individual operations on livestock was carried out (sub-measure Improving the stable environment in dairy farming, specifically the elimination of unwanted insects in dairy stables). The data for the indicators were provided by the Institute of Agricultural Economics and Information (IAEI) and a questionnaire survey carried out among a sample of beneficiaries of M14. The following are examples of criteria/indicators considered to assess the enlargement of the lying area in dairy farming: animals lying down outside the lounge area, differences in the level of dairy cow cleanliness, reduction in animal aggressions, increase in dairy cow performance, increase in total daily time spent lying down. AMU: In the current RDP, there is no measure aiming at reduction of AMU.	AW: Questionnaire survey to beneficiaries (selected sample of holdings). Examples of indicators considered to assess the enlargement of the lying area in dairy farming: - Number of animals lying down outside the lounge area - Differences in the level of dairy cow cleanliness - Reduction in animal aggressions - Increase in dairy cow performance	The breeders who participate in the IAEI questionnaire survey gave subjective evaluations. It is therefore not an expert evaluation of the impact of the introduced measures on AW, but the subjective view of the breeders on the situation in their farm.

[111] http://www.paa.gov.cy/moa/paa/paa.nsf/All/4DA53ABDA17D95DBC22584FC003FDF11/$file/%CE%91%CE%BE%CE%B9%CE%BF%CE%BB%CF%8C%CE%B3%CE%B7%CF%83%CE%B7%20%CE%9C%CE%AD%CF%84%CF%81%CE%BF%CF%85%2014%20%CE%9A%CE%B1%CE%BB%CE%AE%20%CE%B4%CE%B9%CE%B1%CE%B2%CE%B9%CF%8E%CF%83%CE%B7%20%CE%B1%CE%B9%CE%B3%CE%BF%CF%80%CF%81%CE%BF%CE%B2%CE%AC%CF%84%CF%89%CE%BD.pdf

MS	Methodology used to assess the effects on AW/AMU	Data collection	Bottlenecks
		-increase in total daily time spent lying down	
SE	AW: As highlighted by the Managing Authority, the evaluation of the AW measure recommends introducing indicators to document changes in AW, notably on the longevity and health of sows, for example measures of early slaughtering or the presence of shoulder lesions. According to studies by **Ivarsson et al. (2009) and (Alvegard, 2014), up to 34% of lactating sows have shoulder lesions.** In addition, it should be considered in the next programming period to include parasite sampling as a requirement for sheep. Another suggestion for improvement is to make hoof health reporting mandatory. AMU: Veterinarians in Sweden report which type of antimicrobials they use and prescribe to farmers. The Swedish Board of Agriculture gathers the statistics. For the CAP in the upcoming period, the new impact indicator for antimicrobial use will be based on data reporting carried out under the Veterinary Directive.	AMU: Veterinarians report the type of antimicrobials they use and prescribe to farmers	Not available

Source: case studies and questionnaire sent to additional Managing Authorities

6.8.4 Good practices and lessons learnt for the compilation of an output and result indicator showing real improvement of animal welfare

The analysis of the monitoring systems implemented by Member States/regions revealed the lack of relevant and comprehensive monitoring to properly assess the effects achieved in animal welfare / antimicrobial use. Consequentially, no good practice was identified that could be used for the calculation of animal welfare / antimicrobial use output and result indicators and be replicated across the EU.

However, the managing authorities, famers representatives, veterinarians and researchers interviewed gave their opinion on how to ensure simple and efficient collection of data. This section thus describes the key factors for setting efficient and robust monitoring, based on the interviews. It also provides a list of indicators of animal welfare / antimicrobial use set by private initiatives from the livestock sectors, identified in case studies, which could help provide new indicators for consideration within the CAP.

6.8.4.1 Good practices for the compilation of output/results indicators on animal welfare / antimicrobial use

The interviews carried out in case studies revealed that four criteria may impact data reliability for the compilation of output/result indicators: simplicity, transparency, representativity and consistency.

- **Simplicity** – Simplicity is required to ensure proper coverage and reliability of the collected data. It is also needed to avoid extra costs. Data collection could therefore rely on **existing databases** (veterinary inspections, animal registers, slaughterhouse data, accounting data[112], research projects, data collected from private audits for quality schemes, etc.) **or on data reported by farmers** in the application forms. As recommended in Austria, the use of **spatial remote-sensing data** might complement checks for specific indicators, e.g. on outdoor access of animals throughout the year.
- **Transparency** – Researchers and farmers representatives interviewed in Italy and France highlighted that transparency is necessary **at all levels of the production chain** (i.e. from the farm to the slaughterhouse). Any information collected by these operators and deemed as relevant should be made accessible to the Managing Authorities or disclosed publicly. In France, voluntary initiatives supported by interbranch organisations gathered self-diagnosis data carried out by farmers to assess the level of animal welfare on their farm (e.g. Boviwell or EBENE initiative described in SQ7). In France, such self-assessment on biosecurity was also required as part of M04.
- **Consistency** – Consistency of data is necessary to **enable comparisons**. Therefore, **definitions of the**

[112] Italian stakeholders recommend looking at accounting data, such as invoices or VAT registers, etc., to verify the use of straw and handleable material, as well as the sufficient number of operators.

indicators and expected data need to be provided to ensure reliable information collection. Generic terms, e.g. the term "animal-friendly stables", need to be avoided or **specified with the list of equipment considered**. As mentioned in Denmark, data collected during inspections by public administrations are more reliable than data reported by the project owner. Given that data collection at the time of application is easier, **cross-checks by inspectors of a percentage of farmers** could be implemented to verify the accuracy of the information reported by farmers. Connection of existing databases in an integrated system also helps to cross-check the information reported and ensure data reliability.

- **Representativeness** – Data collected under a specific project must be **representative of the general situation, and bias should be identified and corrected**. In Austria, the researchers emphasised that existing databases generally cover only members/participants of private/voluntary programmes or a share of the stock, and their use would thus raise issues of representativeness.

6.8.4.2 Complementary indicators identified in case studies

As current indicators are not sufficient for a comprehensive evaluation of the outcomes on animal welfare, there is a need to establish a new set of indicators providing a global picture of the changes achieved at farm level (documented through farm-based indicators), as well as the corresponding effects on animals' welfare (documented through animal-based indicators – see SQ5).

The indicators listed below are monitored in studied Member States and regions, at different scales and by different stakeholders. They are examples of indicators that could be developed under the CAP framework to follow progress achieved in animal welfare.

Generally, **farm-based indicators** aim to assess the improvement of animal housing conditions. In Denmark for example, the indicators assess available space, stable climate, ventilation, feed and water supply and stable floors of pig husbandry systems. There are also indicators that document farmers' management practices on animal health, their feeding or expression of animals' natural behaviour.

Labels have also been created to assess animal welfare through a set of criteria and indicators, in order to inform consumers of the practices implemented on farms and the corresponding level of animal welfare. They make it possible to inform consumers. For example, in France, in the poultry sector, the animal welfare label "Etiquette bien-être animal" (developed only for poultry so far) is based on 230 measured criteria from birth to death of the animal. Among these indicators, the means implemented by farmers (e.g. density, cage enrichment, natural light indicators) and the results (behaviour, state of the litter, etc.) are assessed. Some criteria are given more importance than others.

Table 40: Examples of animal welfare / antimicrobial use indicators identified in case studies used in labels

	Farm-based indicators
Housing	Density of animals indoors (total number of animals raised indoors/size of buildings) broken down by sector Structure of pens Size of farrowing boxes Number of animals for each type of floor (by sector) Quantity of nesting materials Number of animals with stable climate (climate zone) and/or ventilation (by sector) Access to natural light Number of animals with pasture access (for each sector) Average available outside area per animal (m^2/animal – for each sector) Number, type and width of openings Enrichment of the environment (e.g. perches, straw bales)
Feeding	Sufficient access to safe water and food (Number of animals per water trough), i.e. absence of prolonged hunger/thirst Percentage of fibre in the diet or ratio of maize (or cereals) to grass, related to the type of feeding regime No genetically modified feed Conditions of food storage Cleanliness of water points
Health	Number of treatments per animal and per day (by sector) (consumption of antibiotics / mass in kg of animal killed Antimicrobial consumption, degree of antibiotics substitution with other preparations or percentage of antimicrobial reduction Pest monitoring and control Implementation of a quarantine for new animals Conditions of cadaver storage Cleaning and disinfection measures and frequency of milking machine maintenance Handling of litter and manure Presence of an infirmary in the farm
Livestock management systems	Number (share) of livestock holdings qualified as extensive vs Number (share) of livestock holdings qualified as intensive (free range, free stables, fixed stables with pasture, rearing without cages, etc.) Number (share) of holdings engaged in quality schemes with higher standards for AW/AMU Rate of farmers trained in animal welfare Number of livestock holdings with veterinarian advice Farm size related to upper limit of stock Absence of electric sticks Duration of breastfeeding and fattening Transport time to slaughterhouse

Source: case studies

These indicators can either be documented for all CAP beneficiaries or rely on an extensive robust survey to document the general situation in the agricultural sector at the beginning or the end of the programming period.

6.8.5 Summary of findings

Throughout the case studies, **famers representatives, veterinarians and researchers from almost all Member States/regions expressed needs associated with animal welfare**, thereby reflecting increased awareness on animal welfare / antimicrobial use issues in the animal husbandry sectors. In all studied sectors, the **main challenges concern housing conditions** of animals (sufficient density, outdoor access and grazing, vegetal litter) and the **reduction of animal suffering** (no mutilation or with measures to avoid pain). However, **animal welfare appears clearly in only two national RDPs (Estonia, Romania) out of the 23 RDPs considered in case studies**, as a need to be addressed by RD measures. In the other RDPs, some needs are indirectly related to animal welfare and antimicrobial use (e.g. needs to develop sustainable practices and **organic farming**, to **modernise livestock buildings** and to **support quality schemes**).

Not all needs identified in the case studies are targeted by CAP instruments/measures, in particular for the poultry, sheep/goat and rabbit sectors. **M14–Animal welfare is the most relevant measure** implemented to meet the needs of the pig and cattle sectors. But **other measures can address animal welfare needs, either individually or in combination** to favour a holistic approach on farms: M04–Investments, M10–Agri-environment and climate, and M11–Organic farming. But some specific practices (no mutilations for instance) cannot be implemented by cross-cutting measures.

Regarding the **reduction of antimicrobial use**, few needs are reported by **famers representatives, veterinarians and researchers** in the Member States/regions studied, and **this issue is not directly addressed in the RDPs studied**. Most of the time, reduction of antimicrobial use is addressed at national level by national plans or specific legislations. The identified needs are mainly related to farmers' education and training and health management practices, as well as to biosecurity and the sanitary conditions of livestock buildings. The CAP

measures relevant to theses aspects are **M01–Knowledge transfer and M02–Advisory services, while M04-Investment can support investments necessary to improve animal health and biosecurity**.

The analysis of indicators provided in the CMEF revealed that the current output and result indicators implemented by Member States/regions **do not provide sufficient information to quantify the contribution of the CAP** towards improvement of animal welfare and reduction of antimicrobial use. Notably, output indicators **are not available at the level of the type of operations,** thereby making it not possible to assess the progress made in implementing specific **sub-measures or types of operations targeting animal welfare or antimicrobial use issues**.

Under the current programming period, **no result indicator makes it possible to quantify the coverage of actions implemented to support animal welfare and/or reduce antimicrobial use**. However, some Managing Authorities have implemented a **voluntary result indicator for M14–Animal welfare**, which considers the uptake of the measure (i.e. percentage of farms or LSU concerned by M14). Nevertheless, the current set of indicators does not make it possible to provide **sufficient insight into the effects achieved in the implementation of farming practices** beneficial for animal welfare / antimicrobial use (e.g. type of housing systems, feeding regime, access to pasture, etc.).

Thus, **no good practices were clearly identified that can be used to determine output and result indicators**. However, interviews with managing authorities, researchers and farmers representatives carried out in case studies revealed that **four criteria may impact data reliability** for the compilation of output/result indicators: **simplicity, transparency, representativeness and consistency**. While no example of national initiative was found to be replicable at EU level, case studies provided a **list of indicators of** animal welfare / antimicrobial use **set by private initiatives from the livestock sectors** that could be taken into account when designing new indicators inside the CAP.

6.9 SQ 9 on relevance - Based on the targets set by Member States for the result indicators on animal welfare, what are the good practices and lessons learnt which could guide the setting of ambitious targets by Member States for animal welfare and antimicrobial use reduction result indicators for the next CAP?

6.9.1 Understanding and method

In this SQ, a simple and robust methodology built on existing practices was required to **draw up the different methodological steps necessary to end up with ambitious but also realistic and achievable targets**.

As demonstrated in SQ8, there are currently no target indicators to measure the CAP contribution to animal welfare and antimicrobial use. Only eight Member States have implemented, on a voluntary basis, such target indicators to assess the progress achieved under M14. Consequently, very few good practices were observed in the Member States studied, and, **to set the targets, the analysis had to consider the available literature on good methodological practices and shortcomings**.

Once a proper methodological approach is set, the SQ **suggests relevant quantified targets to be set at Member State level** under the next CAP for antimicrobial use. These targets must be expressed in share of livestock units covered by CAP interventions to improve antimicrobial use, as required under the next CAP programming period. The national targets must be set according to the overall objective to achieve a reduction of 50% in the sale of antimicrobials for farmed animals at EU level by 2030.

The suggested targets were set according to the specific situations of each Member State (e.g. size and types of livestock sector, actual trends in antimicrobials' sales) and corresponding effort to be undertaken to achieve overall EU objective. However, **they do not reflect the potential contribution of the CAP strategies implemented** by Member States for the next programming period (as no information regarding the interventions programmed or the corresponding budget was available at the time of this study).

Contrary to the reduction in the sale of antimicrobials for farm animals for which a target of 50% by 2030 is set, there is no common target defined at the EU level regarding animal welfare for the next CAP programming period. Therefore, Member States are required to establish their own targets nationally, according to their specific situations. This SQ provides **guidance to assess the level of ambitions of the targets which will be presented by Member States in their CAP Strategic Plans** for the next programming period. As the content of

CAP Strategic Plans are not known to date, indicators are proposed, based on information collected in case studies and analyses conducted in SQ5 and SQ8.

6.9.2 Targets set by Member States on result indicators related to animal welfare in the 2014-2020 programming period

Currently, no result indicators make it possible to quantify the coverage of the different actions implemented to support animal welfare and/or reduce antimicrobial use under the current CMEF implemented over 2014-2020.

However, as mentioned in SQ8, at EU level, out of the 35 RDPs having implemented M14, **eight Managing Authorities have implemented, on a voluntary basis, a result indicator to set targets and monitor the progress achieved under M14 (see table below).** As described in the table below, set targets vary greatly: for instance, it covers 35% of total livestock units in Italy-Aosta Valle, but only 3% in Sweden.

Table 41: Voluntary result indicators set by Managing Authorities for M14-Animal Welfare, for 2014-2018

RDP	Sector targeted	Target indicator name	Achieved in 2018	% of the target achieved (completed)	Target 2023 and representativeness of all LSU / livestock farms
DE-North Rhine - Westphalia	Dairy cows, beef and pigs	Percentage of farms receiving support for animal welfare (M14)	0	0.00%	11.00 *(corresponding to 7% of the total number of livestock farms)*
DE-Lower Saxony-Bremen	Pigs and laying hens	Percentage of farms receiving support for animal welfare (M14)	1.1	57.29%	1.92 *(corresponding to 0.55% of the total number of livestock farms)*
DE-Baden-Württemberg	Dairy cows, pigs and broilers	Number of farms receiving support for animal welfare (M14)	2 015	101.77%	1 980.00 *(corresponding to 16% of the total number of livestock farms)*
Ireland	Sheep and goats	Percentage of farms receiving support for animal welfare (M14)	14.4	60.08%	24.00 *(corresponding to 5% of the total number of livestock farms)*
IT-Sardinia	Sheep and goats	Percentage of farms receiving support for animal welfare (M14)	20.5	113.54%	18.02 *(corresponding to 8% of the total number of livestock farms)*
IT-Valle d'Aosta	Dairy cows, beef, veal, sheep and goat	Percentage of livestock units concerned by the measure	92.2	263.31%	35.00 *(the sectors targeted cover 99% of livestock units)*
Cyprus	Sheep and goats	Percentage of sheep and goat livestock units concerned by the measure	11.7	56.80%	20.60 *(corresponding to 13% of the total number livestock units)*
Sweden	Sheep and goats	Percentage of livestock units concerned by the measure	16.9	131.31%	12.84 *(corresponding to 3% of the total livestock units)*

Source: European Commission, Eurostat database (online data code: ef_lsk_bovine, ef_lsk_poultry, ef_lsk_gpig and ef_lsk_main)

These targets make it possible to assess the coverage of the measure, in order to appraise the potential effects achieved through the measure. However, they do not make it possible to identify the effective changes in practices implemented by the beneficiaries, the sector(s) concerned, or the impact at animal level (i.e. no hunger or thirst; lower discomfort, fear and distress; lower rate of pain, injuries or diseases; higher expression of natural behaviour).

Outside the CMEF, the studied Member States have sometimes set **national targets for animal welfare and/or antimicrobial use reduction**, either within the RDP strategy or at national level. Examples are shown as follows.

- In Denmark, the objective was to reach 10% of farrowing sows in loose housing systems by 2020 on the total number of farrowing sows[113].

[113] Statistics on Danish pig population are available here: https://www.dst.dk/da/Statistik/nyt/NytHtml?cid=31810 (consulted on 17/11/2021).

- In Germany, specific targets were set for intact curly tails in the pig sector (in Lower Saxony, at any time 70% of undocked pigs must have an intact tail on-farm) and for the share of animal-friendly produced meat in canteens (however, quantified targets were not available for this indicator in the case study).
- In Estonia, antimicrobial use must decrease from 64 to 37 mg/PCU in 2020-2030 (i.e. reduction of 58% over 10 years).
- In Spain, targets were set in the national plan[114] against antibiotic resistance on specific molecules, (e.g. targets on the use of colistin in each farm on a voluntary basis/neomycin and apramycin in the pig sector), use of medicated food and consumption of all antibiotics.
- In France, an initial target was set under the first 'ecoantibio plan' to decrease animal exposure to antibiotics by 25% between 2012 and 2016. Another target of 25% reduction of critical antibiotics use was set between 2014 and 2016 by a national law[115]. A second 'ecoantibio plan' implemented in 2017 set a target of 50% reduction of colistin exposure over 5 years for poultry, cattle and pig sectors.

6.9.3 Good practices for setting ambitious targets for animal welfare and antimicrobial use reduction for the next CAP

This part examines the **good practices to guide the setting of relevant targets** by Member States for animal welfare and antimicrobial use reduction. First, it summarises **opinions from stakeholders in case studies on relevant aspects to consider in the process of setting targets**. Then, it describes the general methodological steps to set targets as part of the CAP and provides **examples applied to the objective of improved animal health and welfare** to be determined for the next CAP.

6.9.3.1 Good practices identified in case studies for the setting of targets

Case studies did not provide sufficient and clear information on the methodology carried out to set the targets. Nevertheless, managing authorities and researchers interviewed in case studies brought to the fore the **following elements that should be considered to help set targets on animal welfare / antimicrobial use**:

- Identify the **initial situation** and the **potential beneficiaries.** Most of the stakeholders mentioned that it is necessary to determine the initial situation before setting targets. In Denmark, the Managing Authorities noticed that only a few farmers implemented loose-housing systems for sows in 2014. Also, national targets on **antimicrobial use** were based on an analysis of trends in monthly consumption calculated at herd level. In Cyprus, the design of M14 and the setting of the target was based on the number of sheep and goats over seven months old in 2013. As highlighted by an Italian researcher interviewed, **the target will differ depending on the specificities of the context and the practices commonly adopted** in the area/region. In Spain as well, the **organisation of the sector** is mentioned, as it plays a significant role in achieving **antimicrobial use** reduction. Integrated sectors (i.e. rabbit and pigs) were identified as sectors where leading companies can significantly influence farmers' practices regarding optimised uses of antibiotics.
- Consider **the consequences for farmers** of implementing the targeted practices. For example, implementation of loose housing for sows in Denmark requires **significant investment** by farmers. Any factors hindering farmers to join the support scheme must also be assessed. For instance, **increase of indoor/outdoor surfaces and access to open air are not always possible**, as they depend on the holding situation. The **overall context**, such as the presence of veterinarians to guide and advise farmers on management practices, will also determine whether the set target is actually reachable. From this perspective, combinations of CAP measures (e.g. M14/M02) may be relevant for setting ambitious strategies on animal welfare and **antimicrobial use reduction**.
- Examine the **existing measures / available means** to achieve the set targets. As indicated by a German expert interviewed, targets on reduction of **antimicrobial use** are easy to set but difficult to implement. The **challenge is to develop and implement relevant measures**. Also, the content of the measures (i.e. the practices concerned and the changes expected) must be clearly established, and farmers might need **guidance on practices and proper management of livestock** that are fostered by the measures. Technical handbooks could be developed for this purpose, according to the veterinary services interviewed in Italy–

[114] This plan is a private initiative at first. For 2019-2021, it gathered 9 ministries, more than 70 scientific societies, organisations, professional associations and universities, and around 300 expert collaborators.

[115] Loi d'Avenir pour l'Agriculture, l'Alimentation et la Forêt.

Emilia Romagna. In Slovakia, the Managing Authority indicated that discussion with farmers is essential to clarify the content of the measure and the expected benefits in animal welfare during implementation.

- Consider the **budgetary constraints**. Targets must be **ambitious but realistic** to guide the setting of budgetary allocation. At the same time, ambitions are limited by the budget allocated, as highlighted by the Estonian Managing Authority.
- Define the **right indicator**. As outlined in the Spanish and Dutch case studies, the setting of relevant target(s) is closely related to the definition of an appropriate indicator. This indicator must **reflect the situation at farm level and be accepted by the stakeholders involved**, in order to enable constructive discussion and to support the policy. Effective monitoring undertaken at national level, as well as **simple and efficient monitoring on-farm** was also mentioned as decisive for the setting of targets in the Netherlands (in this Member State, stakeholders mentioned the setting of targets for **antimicrobial use reduction** as a good example to follow).

In some case studies, **research projects are currently carried out to monitor animal welfare and identify relevant practical indicators/targets.**

- In Germany, in 2020, the 'Board of Trustees for Technology and Construction in Agriculture' (KTBL) developed **practical guides for pigs, cattle and poultry**, based on several animal welfare measurement projects; another large project on animal welfare monitoring is led by the Thünen Institute.
- In Italy-Lombardy, the Managing Authority stated the necessity of carrying out **research** projects **and innovations on traceability of veterinary products used by farmers**. As highlighted by the Polish case study, it can be very challenging to **monitor the use of antimicrobials by farmers**, depending on the control system implemented.
- The Hungarian Rural Development Programme has launched a **special survey to assess the potential impact of antimicrobial reduction** through digital technologies.

6.9.3.2 Methodological steps for the appraisal of quantified targets

In 2019, the Thematic Working Group No 7 'Preparing for the Ex-ante Evaluation of the CAP' issued four guidance documents to support the appraisal of the intervention strategy, targets and milestones of the CAP Strategic Plan[116].

These documents emphasise the significance of the **establishment of a sound delivery model to set ambitious and realistic targets in relation to the types of interventions programmed**, the input and output indicators available and the identified needs.

[116] https://enrd.ec.europa.eu/appraisal-intervention-strategy-targets-and-milestones_en

Identification of the relevance of targets in relation to the identified needs

The needs are identified through a SWOT analysis, which can refer to:

- the analysis of the **economic context** of the agricultural sector (business environment, farm structure) and the potential gap between supply and demand for agricultural and rural development operations' funding,
- the analysis of relevant **common context indicators** (e.g. livestock units, livestock density, sales/use of antimicrobials in food producing animals, etc.).

In the current CAP, among the Member States/regions studied, very few mentioned specific needs associated with animal welfare and/or **antimicrobial use** (see also SQ8). The future CAP integrates a **new specific objective on 'health, food and antimicrobial resistance'** to '*improve the response to society's demands on food and health, including safe, nutritious and sustainable food, reducing food waste, and improving animal health and animal welfare*'[117]. The setting of an objective specifically related to **animal welfare** and **antimicrobial use** will require Member States to carry out a SWOT analysis and **encourage Managing Authorities to identify their current needs as regards the EU objective** to be achieved. The intervention strategy will then be produced to match those needs, setting out the necessary interventions targeting **animal welfare and antimicrobial use** reduction, as well as the corresponding budgetary allocations. The set targets must then **meet the identified needs**.

Identification of interventions linked to relevant result indicators for which targets are set

Based on SQ8, **potential result indicators can be identified to set animal welfare / antimicrobial use targets under the future CAP**. The table below is an example of CAP interventions that could potentially contribute to the results expected in terms of animal welfare and **antimicrobial use**.

Table 42: Links between interventions and result indicators (example)

Result indicators	M01 / M02 Training and advisory services for farmers	M04 Investment support	M11 Organic farming	M14 Animal welfare
Usable area per animal[118]	X	X	X	X
Number of animals kept under confined farming systems (to be split per species)		X	X	X
Number of pigs with intact tails (no biting, no docking)	X	X		X
Number of animals with outdoor access		X	X	X
Antimicrobial use	X	X		X

Source: Example from Agrosynergie based on recommendations from European Evaluation Helpdesk

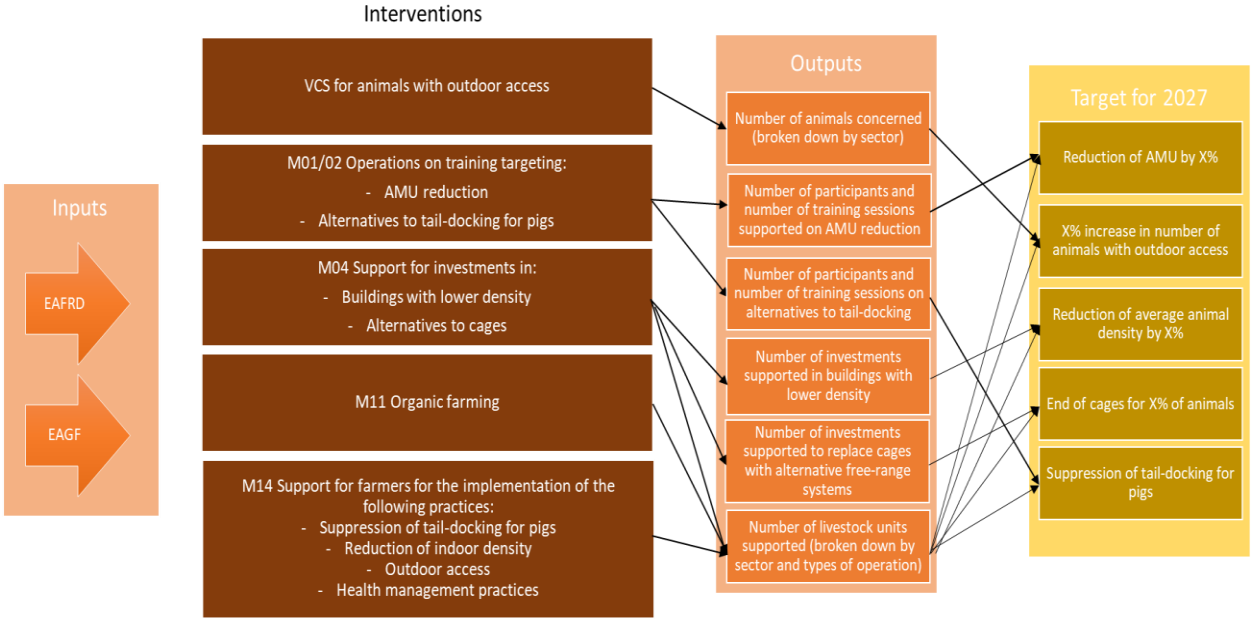
Assessment of causal relationships from inputs and outputs to target values for results

The analysis of the **links between financial inputs, expected outputs and result indicators** is needed to check **consistency between the delivery model and the target values** of result indicators. The figure below is an example of a delivery model that could potentially contribute to the achievement of targets set under result indicators associated with animal welfare and antimicrobial use.

[117] https://ec.europa.eu/info/sites/default/files/food-farming-fisheries/key_policies/documents/cap_briefs_9_final.pdf

[118] Based on areas actually available for animals, in particular indoor areas.

Figure 23: Links between inputs, outputs and target values for results (example)



Source: Agrosynergie

6.9.4 Suggestion of relevant quantified targets for the reduction of antimicrobial use

Based on the good practices described in the previous section, suggestions of quantified targets are developed here on antimicrobial use reduction for the next CAP.

A target is already set at EU level and consists in **reducing sales of antimicrobials by 50% for farmed animals by 2030**. This section thus examines how to achieve this EU target through the setting of relevant targets at Member State level.

Disclaimer: As the relevance of a target is linked to the interventions and dedicated budget planned under the specific objective, it is not possible to determine realistic targets for the next CAP for as long as the CAP strategic plans implemented by Member States are not known. Consequently, indicative targets were set considering the current situation of Member States and the expected changes at EU level.

Step 1: Determine initial situation

The Farm to Fork Strategy sets the target of 50% reduction in overall EU antimicrobial sales by 2030. This SQ requires the setting of ambitious but realistic targets at Member State level to reach the overall EU target. Therefore, the model presented here intends to **classify Member States according to their current consumption and relative ability to contribute to the overall reduction in antimicrobial sales** at EU level.

For this purpose, **the methodology used is based on indirect standardisation procedure and calculation of standardised treatment ratios (STRs)** (Hommerich et al., 2020), which enable comparisons of the antibiotic consumption of different populations based on their composition. It is a robust methodology, used in many fields of standardisation within human populations. Indirect standardisation and computing standardised ratios are a method used to control potential confounding effects when comparing rates from different populations, here Member States. In this case, they are based on a set of species-specific rates from a standard population, together with the observed proportion of the species in each of the Member States. Using the indirect standardisation method, it is assumed that the treatment regime of the species in the different Member States is the same as the OECD countries average.

Also, it should be noted that each antibiotic treatment is composed of different drugs and components. Because a total of the applied amounts of active ingredients is used, these differences in potencies are not considered in

the outcome, nor are the AMEG categories[119]. Despite these limits, applying the standardisation technique leads to a **decrease of confounding biases resulting from different livestock demographics**. As (Hommerich *et al.*) explain, as long as more detailed country-specific antibiotic consumption data are not available, the proposed standardisation method could serve as an interim solution to improve the comparison of antimicrobial use of livestock in different countries. Their study also underlines that, comparing countries and disregarding the corresponding proportions of the individual animal species may lead to biased results in terms of the overall assessment of antibiotic consumption. The significant effect of the composition of the animal stock on the antimicrobial consumption of a country is also pointed out by the (European Medecines Agency, 2020).

The following values were used for the calculation (see Table 44):

- **Estimated and adjusted[120] weight of the population of food-producing species, by country, for 2018** (value A). Calculated based on European Medicine Agency data of estimated population correction units (PCU) [121] per species in each country, it represents the ratio of cattle, poultry and pig PCUs respectively, over the sum of these three values. Since no values were available for antimicrobial consumption for sheep, goats and rabbits, the rates were adjusted as if the populations were composed of only cattle, poultry and pigs, which brings an approximation into the approach, in particular for Member States with high weights for other species (e.g. Greece for sheep and goats).
- In the absence of average EU antimicrobial consumption per species or sector, the **standard species-specific consumption rates** (value B, see Table 43) are based on 2010 OECD average consumptions (Van Boeckel et al., 2015)[122], for cattle, poultry and pigs. If more recent references are preferred, the broad set of data used for the calculation of these consumption rates gives a good indication of the differences between species in high-income countries. No representative data for sheep, goats and rabbits were found.
- **Generated antimicrobial consumptions**, in mg/kg (value C). These are artificial measures **that cannot be interpreted on their own** but only make sense in comparison with another rate. They are calculated by weighting the species-specific consumption rates (B) with the calculated proportions of animal species in the country (A) (e.g. for Austria (AT) $C_{AT}=(A_{AT\ cattle} \times B_{cattle})+(A_{AT\ poultry} \times B_{poultry})+(A_{AT\ pig} \times B_{pig})$)
- Since not all sectors were considered in the calculation, due to lack of species-specific consumption rates, an **accuracy indicator** was calculated. This indicator represents the proportion of the cattle, poultry and pig sectors combined, over the total PCUs (including other species). For instance, Greece, which has a significant sheep and goat population, has a low accuracy rate, i.e. the cattle, poultry and pig populations combined represent only 27% of the total Greek food-producing animal population (PCU) in tonnes. The corresponding classification of the Member States might thereby be affected.
- The observed values correspond to the **actual sales of antimicrobials in each Member State** in 2018 in mg/PCU (value D).
- The **standardised treatment ratio (STR, value E)** is obtained by comparing non-standardised antimicrobial consumption (value D) with the generated antimicrobial consumption (value C) (e.g. for Austria, $E_{AT} = D_{AT}/C_{AT}$). **This value makes it possible to compare the consumptions of Member States**, by reducing the bias of their animal populations.

Table 43: Standard species-specific consumption rates - Average AMU in OECD countries* in 2010 per species (B)

Species	Average AMU per species in mg/kg
Cattle	45
Poultry	148
Pigs	172

[119] AMEG's classification identifies categories of antibiotics based on the risk of antibiotic resistance, on their importance for human health and on the need to avoid their use veterinary medicine.

[120] The adjusted values consider the absence of data for some sectors, i.e. instead of calculating the ratios based on total PCUs in each countries, it calculates the ratios based on the sum of the cattle, poultry and pig PCUs.

[121] Population correction unit: The PCU is a technical unit of measurement that provides an estimate of the weight at treatment of livestock and slaughter animals and enables the normalisation of sales data by the animal demographics in each country.

[122] This study excludes USA consumption from the calculation to avoid overestimating species' consumptions.

*except the USA. Source: (Van Boeckel et al., 2015)

Table 44: Calculation of standardised treatment ratios per Member States[123]

Member State	Estimated and adjusted weight of the population of food-producing species, by MS, for 2018 (A)			Generated AMU in mg/kg (C)	Accuracy rate of the generated AMU	Antimicrobial sales 2018 in mg/PCU (D)	Standardised treatment ratio STR (E)
	Cattle	Poultry	Pigs				
Austria	0.50	0.09	0.41	106.18	0.92	50.15	**0.47**
Belgium	0.30	0.15	0.55	130.27	0.91	112.96	**0.87**
Bulgaria	0.44	0.20	0.36	110.97	0.66	119.60	**1.08**
Croatia	0.44	0.19	0.37	111.71	0.75	70.76	**0.63**
Cyprus	0.25	0.17	0.58	136.32	0.67	466.52	**3.42**
Czechia	0.47	0.21	0.33	107.71	0.88	56.96	**0.53**
Denmark	0.17	0.05	0.78	149.23	0.95	37.84	**0.25**
Estonia	0.59	0.03	0.38	96.48	0.91	52.86	**0.55**
Finland	0.49	0.19	0.32	105.12	0.89	18.18	**0.17**
France	0.52	0.19	0.30	101.64	0.86	64.16	**0.63**
Germany	0.39	0.13	0.48	119.18	0.92	88.41	**0.74**
Greece	0.27	0.41	0.32	128.14	0.27	91.23	**0.71**
Hungary	0.23	0.29	0.48	136.07	0.83	180.50	**1.33**
Ireland	0.77	0.06	0.17	72.79	0.78	45.91	**0.63**
Italy	0.50	0.24	0.27	103.28	0.79	243.98	**2.36**
Latvia	0.61	0.14	0.26	91.74	0.93	35.91	**0.39**
Lithuania	0.58	0.20	0.22	93.66	0.93	32.72	**0.35**
Luxembourg	0.79	0.00	0.21	71.45	0.95	33.57	**0.47**
Malta	0.40	0.21	0.39	116.17	0.79	153.40	**1.32**
Netherlands	0.35	0.13	0.52	124.25	0.96	57.42	**0.46**
Poland	0.37	0.31	0.33	118.10	0.96	168.31	**1.43**
Portugal	0.27	0.30	0.42	129.99	0.79	186.60	**1.44**
Romania	0.43	0.29	0.28	110.38	0.62	82.71	**0.75**
Slovakia	0.42	0.27	0.30	111.69	0.86	49.16	**0.44**
Slovenia	0.61	0.27	0.11	87.45	0.88	43.16	**0.49**
Spain	0.15	0.15	0.70	148.78	0.74	219.00	**1.47**
Sweden	0.50	0.17	0.33	104.69	0.77	12.06	**0.12**

Legend: the lighter the green the less accurate the generated value; Sources: Agrosynergie based on (European Medicines Agency, 2021; Van Boeckel *et al.*, 2015; Hommerich *et al.*, 2020)

Step 2: Set specific targets for each Member State

The **standardised treatment ratio is set for each Member State, which is then used to classify them** (see Table 45), i.e. the lower the ratio (in green), the lower are the Member State's antimicrobial sales compared to the standard values (e.g. a ratio of 1 would indicate that the consumption of the Member State is equivalent to the OECD average considering its animal population). Therefore, **Member States with STR values in red are those with the highest capacity to achieve significant reduction in antimicrobial sales** (the darker the red, the higher the capacity to reduce).

[123] See the limitations of the method and values in the text above.

Table 45: Classification of Member States according to their standardised treatment ratio and percentage of reduction

Member State	STR	% of reduction
Cyprus	3.42	70%
Italy	2.36	60%
Spain	1.47	55%
Portugal	1.44	55%
Poland	1.43	55%
Hungary	1.33	50%
Malta	1.32	50%
Bulgaria	1.08	50%
Belgium	0.87	45%
Romania	0.75	45%
Germany	0.74	45%
Greece	0.71	45%
Croatia	0.63	40%
France	0.63	40%
Ireland	0.63	40%
Estonia	0.55	40%
Czechia	0.53	40%
Slovenia	0.49	30%
Austria	0.47	30%
Luxembourg	0.47	30%
Netherlands	0.46	30%
Slovakia	0.44	30%
Latvia	0.39	20%
Lithuania	0.35	20%
Denmark	0.25	10%
Finland	0.17	5%
Sweden	0.12	5%

Source: Agrosynergie calculation

We made the arbitrary assumption that the greatest effort possible for these Member States will not lead to more than a 70% reduction in antimicrobial sales by 2030. Hence, the **targets are set between 70% for Member States with a high standardised treatment ratio and 5% for Member States with a low standardised treatment ratio.**

The overall EU target is set at 50% of reduction in antimicrobial sales in 2030. This represents a reduction in antimicrobial sales from 6 236.29 tonnes in 2018 to 3 118.14 tonnes in 2030. **With the targets set in the various Member States** (see Table 46), **sales would be reduced to 3 110.53 tonnes, representing 50% reduction compared to 2018 consumption**.

Table 46: Percentage reduction in antimicrobial use sales for each Member State with sales reduction by 2030

Member State	Total antimicrobial sales in tonnes 2018	% reduction	Antimicrobial sales after the reduction in tonnes
Austria	48.66	30%	34.07
Belgium	196.74	45%	108.21

Member State	Total antimicrobial sales in tonnes 2018	% reduction	Antimicrobial sales after the reduction in tonnes
Bulgaria	47.96	50%	23.98
Croatia	22.13	40%	13.28
Cyprus	53.48	70%	16.04
Czechia	41.11	40%	24.66
Denmark	93.36	10%	84.02
Estonia	6.17	40%	3.70
Finland	10.09	5%	9.59
France	471.21	40%	282.73
Germany	762.66	45%	419.46
Greece	113.45	45%	62.40
Hungary	150.40	50%	75.20
Ireland	99.17	40%	59.50
Italy	942.17	60%	376.87
Latvia	6.10	20%	4.88
Lithuania	10.81	20%	8.64
Luxembourg	1.94	30%	1.36
Malta	2.18	50%	1.09
Netherlands	186.96	30%	130.87
Poland	788.28	55%	354.73
Portugal	193.05	55%	86.87
Romania	234.39	45%	128.91
Slovakia	12.41	30%	8.69
Slovenia	8.19	30%	5.73
Spain	1 723.05	55%	775.37
Sweden	10.20	5%	9.69
Total EU-27	**6 236.29**	**50%**	**3 110.53**

Source: Agrosynergie

To achieve this reduction in antimicrobial use, **each Member State should reduce its share of animals treated by the same percentage**, e.g. if a Member States must reduce its antimicrobial consumption by 20%, it must either:

- reduce the treatment made to each livestock unit on its territory by 20% or
- reduce the number of livestock units receiving treatment by 20%.

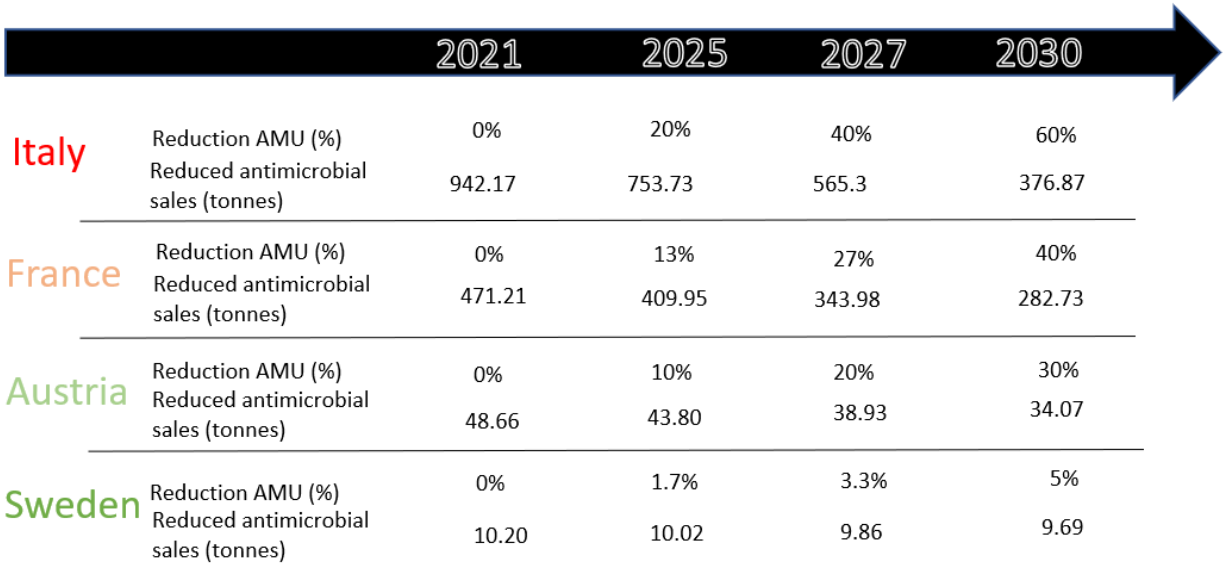
Therefore, it is considered that **the percentage of livestock units concerned by CAP interventions is equivalent to the percentage of antimicrobial use to be achieved by 2030**.

Step 3: Set milestones for 2027 and 2025

As national targets have currently been set for 2030, it is necessary to break down these targets into milestones for 2027 (i.e. the end of the CAP 2022-2027 programming period), as well as for 2025 (for mid-term assessment of target achievement).

NB In the table below, the amount reported for 2021 is actually the amount of sales in 2018. It is highly probable that the actual amount of sales in 2021 is lower and closer to the 2030 target.

Figure 24: Milestones for antimicrobial use reduction



Source: Agrosynergie

6.9.5 Suggestion of indicators which could be considered to assess the level of ambition of targets set by Member States regarding animal welfare

Animal welfare can be improved through operations targeting the various sectors. Hence, even though no target is defined at EU level as it is the case for antimicrobial reduction, targets could be set to enhance CAP support toward such operations. However, as **setting realistic and ambitious targets requires a good overview of the initial situation**, it is not possible to define targets for sectors/practices not sufficiently documented. According to the good practices identified for setting ambitious targets (see Section 4.9.3.1), assessment of the level of ambition of targets proposed by Member States should first be based on analysis of the context. As CAP Strategic Plans are currently not available, this section proposes a general analysis, considering relevant data available at the EU level as a priority.

- **First**, **the size of the sectors in each Member State, in term of number of animals,** can provide useful information to get a clear picture of the importance of the sector(s) covered by the CAP Strategic Plans. Table 47 and **Table 48** present data available to assess the size of each sector for the pig, cattle, poultry, sheep, goat and rabbit sectors.

Table 47: Examples of indicators related to the animal population of the pig and cattle sectors

MS	Porcines			Bovines					
	Nb of live swine 2020 (thousand)	Nb breeding sows 2020 (thousand)	Nb fattening pigs >50kg 2020 (thousand)	Nb of dairy cows 2020 (thousand)	Suckler cows herd 2020 (thousand)	Nb bovines <1y.o. 2020 (thousand)	Heifers >1y.o. not for slaughter 2020 (thousand)	Heifers >1y.o. for slaughter 2020 (thousand)	Nb male bovines >1y.o. 2020 (thousand)
BE	6 218.3	395.3	3 084.0	541.1	383.3	712.0	541.8	36.4	124.0
BG	592.1	65.8	265.7	242.0	139.7	111.6	55.0	11.2	29.5
CZ	1 546.0	134.1	566.7	357.0	202.7	404.7	252.5	13.8	109.4
DK	13 391.0	1 273.0	3 344.0	565.0	80.0	524.0	235.0	60.0	35.0
DE	26 069.9	1 694.7	11 946.1	3 921.4	626.3	3 404.5	2 197.5	228.4	923.7
EE	316.6	27.3	130.1	84.3	31.6	72.1	52.2	2.0	11.0

MS	Porcines			Bovines					
	Nb of live swine 2020 (thousand)	Nb breeding sows 2020 (thousand)	Nb fattening pigs >50kg 2020 (thousand)	Nb of dairy cows 2020 (thousand)	Suckler cows herd 2020 (thousand)	Nb bovines <1y.o. 2020 (thousand)	Heifers >1y.o. not for slaughter 2020 (thousand)	Heifers >1y.o. for slaughter 2020 (thousand)	Nb male bovines >1y.o. 2020 (thousand)
IE	1 678.6	146.9	667.5	1 456.1	922.7	2 056.6	575.2	610.5	908.4
EL	743.0	93.0	267.0	86.0	171.0	154.0	64.0	12.0	52.0
ES	32 796.1	2 635.3	14 111.4	810.7	2 098.5	2 541.3	633.1	149.9	402.9
FR	13 737.0	1 035.0	5 423.0	3 434.2	4 020.0	5 089.5	3 263.4	835.4	1 126.0
HR	1 033.0	110.0	456.0	129.0	34.0	146.0	62.0	10.0	61.0
IT	8 543.0	568.6	4 907.9	1 639.2	371.7	1 773.6	1 353.1	364.2	666.1
CY	359.4	32.4	126.4	36.7	0.1	25.4	13.2	0.1	1.3
LV	306.8	34.7	123.9	136.0	60.0	111.5	65.4	11.0	15.1
LT	580.4	45.3	265.2	232.9	61.8	168.6	114.4	3.8	48.0
LU	82.1	4.3	37.4	54.2	23.9	49.8	44.4	5.8	12.6
HU	2 850.0	243.0	1 322.0	226.0	188.0	266.0	164.0	21.0	67.0
MT	35.5	3.6	17.5	6.1	0.3	4.2	2.2	0.2	1.0
NL	11 541.0	923.0	4 045.0	1 569.0	43.0	1 510.0	466.0	47.0	56.0
AT	2 806.5	226.8	1 171.8	524.8	190.7	598.6	266.8	98.5	176.1
PL	11 727.4	815.0	5 077.2	2 125.7	265.6	1 734.6	1 123.2	51.4	978.4
PT	2 259.2	230.9	776.3	232.8	506.6	525.6	257.2	27.9	141.4
RO	3 750.4	308.3	1 999.5	1 122.2	24.8	376.0	267.0	15.6	87.7
SI	229.5	15.7	118.7	99.1	67.7	153.1	69.9	23.5	72.1
SK	538.3	50.0	186.0	121.8	69.5	126.1	86.1	7.1	31.4
FI	1 103.9	88.7	450.6	255.6	60.8	291.7	110.2	20.6	96.5
SE	1 383.2	126.4	543.7	304.4	194.2	464.4	245.9	40.2	141.9

Sources: Eurostat database (online data code: APRO_MT_LSPIG, APRO_MT_LSCATL)

Table 48: Examples of indicators related to the size of the poultry, sheep, goat and rabbit sectors

MS	Poultry			Ovines			Goats		Rabbits
	Nb of laying hens 2020 (thousand)	Nb of chicks hatched of meat broiler breeds for fattening 2020 (thousand)	Live broilers 2016 (thousand)	Nb of dairy ewes and ewe lambs put to the ram 2020 (thousand)	Nb of non-dairy ewes and ewe lambs put to the ram 2020 (thousand)	Sheep flock 2020 (thousand)	Goat flock 2020 (thousand)	Goats mated and having already kidded 2020	Nb of rabbits and hares 2018 (thousand)
BE	10 735.9	272.4	27 830	n.a	n.a	72.7	64.5	n.a	184.0
BG	5 505.6	67.5	7 980	1 008.1	140.0	1 307.8	253.4	216.3	215.0
CZ	7 111.6	206.3	13 620	n.a	n.a	173.0	31.5	n.a	n.a
DK	4 366.5	111.4	11 750	n.a	n.a	126.2	20.8	n.a	n.a
DE	56 260.3	648.1	89 300	12.8	1 047.0	1 483.7	161.0	n.a	57.0
EE	1 122.2	n.a	1 210	n.a	n.a	70.3	5.2	n.a	41.0
IE	3 651.5	98.2	7 690	0.0	2 642.5	3 877.2	9.9	n.a	n.a
EL	4 616.6	133.9	21 860	6 260.0	243.0	8 260.0	3 568.0	2 694.0	843.0
ES	47 130.0	611.3	126 450	2 354.8	8 726.6	15 439.2	2 651.0	1 890.5	n.a
FR	48 255.7	842.7	165 580	1 604.5	3 796.7	7 301.1	1 432.5	1 193.4	714.0
HR	2 316.4	52.8	7 020	95.0	400.0	662.0	86.0	66.0	n.a
IT	41 047.9	454.4	96 210	4 851.2	1 258.9	7 034.2	1 065.7	826.4	6 282.0
CY	535.9	13.4	2 040	n.a	n.a	282.5	263.7	n.a	n.a
LV	3 255.2	22.3	1 560	0.0	57.7	91.9	11.5	7.9	29.0
LT	2 837.7	n.a	7 010	0.0	80.8	140.6	14.7	8.9	121.0
LU	103.7	0.0	20	n.a	n.a	8.0	3.1	n.a	3.0
HU	7 501.1	261.4	15 140	17.0	738.0	944.0	47.0	29.0	1 169.0
MT	360.6	n.a	440	11.7	0.0	13.2	5.5	4.6	233.0
NL	33 126.1	498.2	49 190	16.0	579.0	710.0	557.0	513.0	326.0
AT	7 119.7	84.9	7 670	n.a	n.a	393.8	92.8	59.7	204.0
PL	50 150.2	1 362.2	126 890	n.a	n.a	319.0	45.7	n.a	350.0
PT	8 732.6	248.5	24 090	263.3	1 307.2	2 181.0	301.2	246.8	n.a
RO	8 741.4	193.6	34 520	7 908.3	1 064.6	10 464.4	1 630.4	1 310.0	1 849.0
SI	1 450.6	n.a	3 940	n.a	n.a	82.5	29.9	n.a	90.0
SK	3 155.0	n.a	6 190	n.a	n.a	283.4	35.6	n.a	991.0
FI	4 504.9	97.1	10 820	n.a	n.a	173.9	4.8	n.a	n.a
SE	8 725.6	n.a	9 000	0.0	260.4	369.9	10.3	n.a	n.a

n.a.: not available ; Sources: (European Commission, 2021) ; Eurostat database (online data code: APRO_EC_POULA, EF_LSK_POULTRY, AGR_R_ANIMAL); (FAOstat, 2020)

- **Secondly**, information **on animals concerned by the specific practices** addressed by the intervention is needed to get a clear picture of the potential number of beneficiaries. The target will differ depending on the specificities of the context and the current uptake of practices supported.
  Based on the information collected in the case studies and the previous SQ, the table below presents

examples of operations which could be supported by the CAP and specific data that could be analysed to study the level of ambition of the proposals presented in the CAP Strategic Plans.

Table 49: Example of practices and data available

Sector	Examples of practices that could potentially be supported by the CAP that could significantly improve AW	Availability of data
Examples of practices already supported by the CAP in some case-study MS		
Pig	Increased space allowance	No data available at the EU level
	Reduction of tail-docking	Survey from the EC, FVE and EAPHM (De Briyne *et al.*, 2018)[124]
	Use of vegetal litter	No data available at the EU level
	Loose housed farrowing sows	No data available at the EU level
Poultry	Increased space allowance	No data available at the EU level
	Outdoor access	No data available at the EU level
Cattle / sheep and goat	Outdoor access	No data available at the EU level
Important practices that could be supported by the CAP		
Pig	Reduction of castration	No data available at the EU level
Poultry	Reduction of beak trimming	No data available at the EU level
	Use of slow growing breeds for broilers	No data available at the EU level
	Phasing out of enriched cages	Percentage of laying hens in enriched cages available for 2020 (EU Eggs dashboard)
	Provision of enrichment	No data available at the EU level
Sheep and goat	Provision of enrichment	No data available at the EU level
	Reduction of dehorning and tail docking	No data available at the EU level
Rabbits	Increased space allowance	No data available at the EU level
	Provision of enrichment	No data available at the EU level
	Improved flooring	No data available at the EU level

Source: Agrosynergie

Only **the percentage of laying hens in enriched cages and the number of tail-docked pigs** are available at the EU level to characterise the initial situation for each Member State. Data on the initial situation (in 2020 for laying hens and in 2017 for tail-docked pigs) could be used to assess the level of ambitions of targets for CAP measures addressing these issues in the CAP Strategic Plans (see tables below).

Table 50: Share of laying hens in enriched cages in 2020, by Member State

MS	Nb laying hens in MS	% in cages	Nb laying hens in cages	Laying hens in cages (LSU)
BE	10 735 941	37.2%	3 993 770.1	55 912.8
BG	5 505 594	71.0%	3 908 971.7	54 725.6
CZ	7 111 571	67.6%	4 807 422.0	67 303.9
DK	4 366 464	12.6%	550 174.5	7 702.4
DE	56 260 281	5.6%	3 150 575.7	44 108.1
EE	1 122 167	81.7%	916 810.4	12 835.3
IE*	3 651 519	51.5%	1 880 532.3	26 327.5
EL*	4 616 611	77.3%	3 568 640.3	49 961.0
ES	47 129 970	77.6%	36 572 856.7	512 020.0
FR*	48 255 709	54.1%	26 106 338.6	365 488.7
HR	2 316 358	61.9%	1 433 825.6	20 073.6
IT	41 047 911	42.0%	17 240 122.6	241 361.7
CY	535 865	71.4%	382 607.6	5 356.5
LV	3 255 160	75.2%	2 447 880.3	34 270.3
LT	2 837 711	83.2%	2 360 975.6	33 053.7
LU	103 720	0.0%	0.0	0.0
HU	7 501 107	71.0%	5 325 786.0	74 561.0
MT	360 585	99.4%	358 421.5	5 017.9
NL	33 126 050	15.2%	5 035 159.6	70 492.2
AT	7 119 691	0.0%	0.0	0.0
PL	50 150 219	81.0%	40 621 677.4	568 703.5
PT	8 732 646	86.2%	7 527 540.9	105 385.6
RO	8 741 379	58.8%	5 139 930.9	71 959.0

MS	Nb laying hens in MS	% in cages	Nb laying hens in cages	Laying hens in cages (LSU)
SI	1 450 580	24.3%	352 490.9	4 934.9
SK	3 154 986	76.7%	2 419 874.3	33 878.2
FI	4 504 894	50.5%	2 274 971.5	31 849.6
SE	8 725 649	5.5%	47 9910.7	6 718.7
Total EU-27	**372 420 338**	**48%**	**178 857 267.5**	**2 504 001.7**

*2019 data; Source: Agrosynergie based on (European Commission, 2021)

Table 51: Share of tail-docked pigs in 2017, by Member State

MS	Nb live swine	% of tail-docked pigs	Nb tail-docked pigs	Nb tail-docked pigs (LSU)
BE	6 178 980	97%	5 993 610.6	1 461 615.4
BG	638 410	n.a	n.a	n.a
CZ	1 542 210	90%	1 387 989.0	318 681.0
DK	12 383 000	98%	12 135 340.0	2 703 545.6
DE	28 652 960	89%	25 501 134.4	5 762 750.0
EE	279 870	45%	125 941.5	25 456.5
IE	1 603 900	98%	1 563 802.5	378 972.8
EL	769 130	n.a	n.a	n.a
ES	23 946 460	95%	22 653 351.2	5 369 221.7
FR	13 599 220	95%	12 919 259.0	2 914 619.0
HR	944 880	n.a	n.a	n.a
IT	8 375 520	95%	7 914 866.4	1 924 152.3
CY	265 040	n.a	n.a	n.a
LV	361 090	90%	324 981.0	85 275.0
LT	627 310	n.a	n.a	n.a
LU	92 310	95%	87 694.5	20 206.5
HU	2 978 840	70%	2 085 188.0	518 154.0
MT	41 640	56%	23 318.4	5 857.6
NL	12 478 590	92%	11 455 345.6	2 228 206.3
AT	2 883 860	93%	2 667 570.5	646 945.0
PL	10 982 810	95%	10 433 669.5	2 511 030.5
PT	1 875 110	n.a	n.a	n.a
RO	4 142 790	100%	4 142 790.0	991 710.0
SI	273 360	n.a	n.a	n.a
SK	483 980	98%	474 300.4	116 100.6
FI	1 234 860	2%	18 522.9	3 680.7
SE	1 354 290	0%	0.0	0.0
Total EU-27	**138 990 420**	**88%**	**125 726 391.4**	**28 934 322.6**

Source: Agrosynergie based on "Phasing out pig tail docking in the EU - present state, challenges and possibilities" (De Briyne et al., 2018) and Eurostat database (online data code: APRO_MT_LSPIG)

The possibility of using livestock density data from Eurostat was also considered in order to document increased space allowance. However, the following points must be considered with regard to the calculation of this indicator by Eurostat (i.e. a ratio of the number of LSUs by the UAA, which includes arable land, permanent grassland, permanent crops and kitchen gardens):

- It does not take into account indoor space allowance, which is the biggest issue regarding space allowance in animal husbandry, in particular in sectors for which outdoor access is an exception (e.g. pig, poultry; rabbit).
- In addition, it may not take into account outdoor access areas of pigs and poultry.
- On the contrary, it does take into account areas that animals do not have access to.
- For this reason, it gives no information on the space animals have actually access to.

As pointed out in the good practices for the setting of targets, the indicator must make it possible to reflect the situation on farms and be considered as reliable by the stakeholders involved, in order to enable constructive discussion and to support the policy. The analysis concluded that this would not be the case for this indicator.

- **Third, information on sector-specific issues would be needed**. For example, analysis of the previously mentioned indicators (percentage of tail-docked pigs and percentage of caged laying hens), even if the practice is not targeted by the plan, would enable confirmation of the extent to which these issues are or are not a priority. Other specific information could be analysed to go deeper into the specific national or

local contexts (e.g. number of dairy cows with tethering systems in Austria, Germany and Estonia considering also the possibility to pasture, number of beak-trimmed poultry, etc.). However, in the absence of additional data available at the EU level, the analysis should focus on data collected in the Member States (national database, technical institutes and research projects). They must relate to specific sectors and reflect the most important animal welfare issues for each sector concerned (see SQ1: notably outdoor access, space allowance, presence of enrichment).

The case studies did not provide sufficiently robust and detailed information (notably on the specific indicators collected in the databases mentioned or their representativeness) to identify further relevant indicators to complete the context analyses. Therefore, specific consultation (with Managing Authorities or technical institutes) would be necessary to identify the existence of these indicators and should be carried out on a case-by-case basis depending on the Member State and the sectors targeted by the CAP Strategic Plans.

6.9.6 Summary of findings

The analysis revealed that, although no result indicators make it possible to quantify the coverage of the various actions implemented to support animal welfare and/or reduce antimicrobial use under the current CMEF, **eight Managing Authorities have implemented a result indicator on a voluntary basis to set targets and monitor the progress achieved under M14.** These targets make it possible to assess the coverage of the measure, so that the potential effects achieved through the measure can be appraised. However, **they do not provide information on the effective changes in practices implemented by the beneficiaries, the sector(s) concerned or the impact at animal level**. Outside the CMEF, the studied Member States have sometimes set **national targets for animal welfare and/or antimicrobial use reduction**, either within their CAP strategy or at national level.

The following good practices for the setting of targets were identified through interviews in case studies:

- Get a clear picture of **the initial situation (context) as well as potential number of beneficiaries** of the interventions planned. The target will differ depending on the specificities of the context and the current uptake of practices supported.
- Consider the **necessary effort to be undertaken by farmers** to implement the targeted practices (e.g. the uptake requires increased knowledge and significant investments) as well as the general environment hindering/promoting farmers' adhesion to the scheme.
- Identify the **existing measures/interventions programmed** to achieve the targets. Discussions with farmers can help to determine the content of the measure and the expected benefits on animal welfare.
- Examine the **consistency of targets with the allocated budgetary resources.**
- Define the right indicator to **reflect the situation on farms and set targets. This indicator must be considered as reliable by the stakeholders involved**, to promote participation and enable constructive discussion.

Some case studies revealed that **research projects are currently being carried out to identify relevant practical indicators/targets on animal welfare and antimicrobial use** (in Germany, Italy and Hungary).

Overall, the literature review highlighted that the **establishment of a sound delivery model is essential to set ambitious and realistic targets in relation to the types of interventions programmed**, the input and output indicators available and the identified needs.

In the demonstration, **potential result indicators were identified based on previous SQs to analyse the level of ambition of targets regarding animal welfare / to set antimicrobial use targets under the future CAP** and its specific objective aiming to '*improve the response to society's demands on food and health, including safe, nutritious and sustainable food, reducing food waste, and improving animal health and animal welfare*'. Examples of causal relationships between interventions, output and result indicators were developed for the analysis.

Then, suggestions of quantified targets were developed on the reduction of **antimicrobial use** for the next CAP. As a target was already set at EU level on **reduction of antimicrobial sales by 50% for farm animals by 2030**, the methodology consisted in **setting relevant targets at Member State level** to achieve the EU objective. Literature highlighted that, relevant comparisons – and thereby targets – on antimicrobial sales can be set only by taking into consideration the weight of each animal-husbandry sector in each Member State. The indirect standardisation method was used to get around the lack of precise data on consumption per sector. Still, more accurate results could be obtained if antimicrobial consumption data per species, or even per sector (e.g. differentiating laying hens and broilers) were available at EU and Member State level. Suggestions of indicators to assess the level of ambition of the animal welfare targets proposed in the CAP Strategic Plans were also provided. They relate in priority to data available at the EU level, documenting the animal population of the

sectors, and to specific indicators on practices impacting animal welfare (percentage of tail-docked pigs and percentage of laying hens housed in enriched cages). Other specific indicators could be available at Member State level; to this effect, as case studies did not provide sufficient robust information, specific consultation of Managing Authorities and/or technical institutes on data available locally could be necessary, on a case-by-case basis, depending on the sector and the intervention proposed in the CAP Strategic Plan.

7. CONCLUSIONS

Herd management practices and housing conditions influencing animal welfare and/or reducing antimicrobial use

Generally, throughout the EU, animal-husbandry systems are organised into a range of production modes characterised by two opposing extremes. One is **extensive grass-fed systems**, in which animals live in a natural environment and can therefore express natural behaviour, notably grazing for ruminants. The literature review revealed the importance of appropriate feeding, shelter from climatic conditions and prevention of parasitism to ensure animal welfare under these systems. It also highlighted that outdoor access was beneficial for animal health. In contrast, **indoor production systems** gather animals in individual or group housing, which can increase distress and health problems when not managed properly. Space allowance, provision of enrichment, litter and manure management, as well as microclimate control and light are crucial to ensure the welfare of animals that are kept in such systems. In the EU, the type of production generally differs between species, with extensive systems found predominantly for ruminants, whereas pigs and poultry are mostly produced using the intensive indoor system.

The following all have a decisive influence on animal welfare and/or antimicrobial use: **feeding practices** (e.g. balanced diet, provision of roughage, etc.), **housing conditions and design** (e.g. density, space allowance, provision of enrichment, microclimate control, individual vs group housing, outdoor access, etc.), **practices enhancing the natural behaviour** of animals (later weaning, colostrum intake, etc.), **health management practices** (e.g. hygiene and treatment management, mutilations, etc.) and **practices related to on-site killing** of unproductive animals (e.g. culling of runts). **Good animal-human relationships** and farm staff training also determine the adequacy of practices implemented and ensure correct overall treatment and care of animals. Greater farmer awareness is indeed necessary to enable the implementation of a set of **practices combined in a systemic approach on-farm** to improve indoor climate management; biosecurity practices; animal-welfare-friendly stable design; and animal robustness, longevity and adaptability.

Animal welfare and antimicrobial use **also are inter-related**. Whereas animal welfare is generally associated with low antimicrobial use, low antimicrobial use can adversely affect animal welfare in the event that it leads to pain from injury and disease. The relevant health management practices for animal welfare thus require appropriate practices and treatment for animals that need antimicrobials.

Practices implemented and economic impact on farm viability

The analysis revealed **concentration of production**, characterised by increased production and fewer farms. This was found for all sectors (except rabbits) and in many regions at EU level. Such phenomena are often related to the trend toward **indoor systems with a focus on cost reduction** and productivity. These phenomena, often grouped under the term 'intensification', may suggest a **higher risk for poor animal welfare**.

The implementation of animal-friendly practices sometimes requires **significant investment**. FADN analyses of the **economic effects of new requirements for housing for pigs and poultry**, affecting building design, equipment and density of farms, did confirm that greater investments had been made over the period considered. However, these showed **no evidence of negative impact on the farm net added value** of holdings.

Further research confirmed that the **implementation of animal-friendly practices can have either a positive or negative effect on production volumes, costs, production value and farm overall viability**. In particular, some practices were identified as reducing feed- or health-related costs and/or increasing production to a certain extent, which may thereby help make up for the cost of implementation. However, examples of initiatives undertaken in the various sectors to promote the implementation of animal welfare and antimicrobial use reduction practices indicate that farmers' efforts and investments **do not necessarily result in higher selling prices or suitable economic return**.

Organic farming appeared to be a good example of suitable economic return. **Comparison of costs incurred by organic and non-organic farms** revealed significant differences in production costs in the poultry and pig sectors (e.g. higher feed costs and veterinary expenses in the pig sector for organic farms), whereas organic cattle farms have on average lower veterinary costs. However, while productivity in volume terms is generally lower, **profitability seems higher in organic farming, probably due to higher selling prices**. FNVA per annual working unit is also higher for organic systems, in all studied livestock sectors.

Another FADN analysis considered **the economic impact of extensive and intensive pig farming systems** in Spain. From the data analysed, Andalusian pig farms, characterised by a high proportion of extensive and partly outdoor systems, appear to have, on average, a lower number of livestock units and a higher livestock cost per livestock unit, but also better profitability, probably due to higher selling prices in response to a specific market demand. Catalonian intensive systems, on the contrary, show, on average, a higher number of livestock units and relatively low livestock cost per livestock unit, but also less profitability. This analysis did not lead to a clear conclusion since the two very different systems cannot be fully compared (different breeds, feed, outdoor access, densities). However, it highlighted the **predominant role of market demand in determining prices, which is key to ensuring adequate return to farmers through higher selling prices**.

CAP implementation choices

CAP instruments and measures have the ability to contribute to animal welfare and antimicrobial use reduction. The **analysis of Member States' and regions' implementation choices addressing animal welfare and antimicrobial use** considered direct payments and RDPs. These choices were influenced by the **existence of national regulations which are sometimes stricter than the standards of EU directives** on animal welfare and antimicrobial use, thereby increasing the minimum standards for farmers (e.g. as in **Denmark, the Netherlands, Austria, Finland** and **Sweden**).

Among Member States which decided to provide voluntary coupled support, **examples of specific eligibility criteria related to animal welfare were identified in Member States** (e.g. VCS targeting suckler cows in extensive grazing systems in Italy).

In most of the regions/Member States studied, **animal welfare and antimicrobial use were mostly addressed through RD measures**. One RD measure is specifically oriented toward improvement of animal welfare, by supporting extra costs associated with the implementation of voluntary practices. M14-Animal welfare was, however, not systematically implemented, and only **34 out of 118 RDPs (20 regional and 14 national) across 17 Member States had programmed it over the 2014-2020 period** to foster operations focusing on pasturing, housing conditions, health or sets of operations promoting a holistic approach to animal welfare. Although all animal husbandry sectors were targeted by the measure, **M14 was mainly implemented in the dairy cattle and pig sectors**.

Other implemented RD measures have contributed to addressing animal welfare/antimicrobial use issues, notably M01-Knowledge transfer, M02-Advisory services, as well as M03-Quality schemes, M04-Investment support, M10-AECM, M11-Organic Farming and M16-Cooperation. Interesting **combinations of measures**, involving M01/M02 associated with other measures like M04, which supports investments, or M14 and M11, which support practices, were identified: these concern mandatory training for farmers to access other support or to obtain a higher support rate. The drivers leading Managing Authorities to implement CAP measures are either ethical or economic. **Pressure from civil society** also leads Managing Authorities to support changes in practices to help farmers anticipate possible future regulatory requirements.

In this respect, marketing standards for egg production set in the CMO regulation, which require mandatory labelling of eggs according to the production systems and housing conditions of laying hens (from enriched cages to organic production) also **influenced consumer demand and production choices by farmers**.

CAP overall effect on animal welfare

It is difficult to assess the changes in practices driven by CAP instruments and measures, as **no indicators allow for documentation of progress made** in implementing sub-measures/types of operations targeting animal welfare or antimicrobial use issues (output indicators) or of the **corresponding effects achieved through the implementation of farming practices** beneficial for animal welfare/antimicrobial use (result indicators).

Information collected through the literature review (existing assessment reports, annual implementation reports, etc.) and interviews with stakeholders (Managing Authorities, farmer representatives, etc.) highlighted the **partial effect of the CAP** on the implementation of improved herd management practices or housing design at the EU level.

In most Member States/regions studied, **cross-compliance (SMRs 4, 11, 12 and 13),** through requirements of the EU legislation on animal welfare and food law**, was effective in influencing farmers' practices**, especially in Member States and regions where animal farms do not yet fully meet the requirements of the EU directives on animal welfare. On the other hand, it is also worth recalling that **intensive indoor systems often do not receive**

direct payments or area-based RD measures and are thereby not subject to cross-compliance. Consequently, for these systems there is no deterrent effect of losing part of CAP payments by not complying with animal welfare requirements.

Examples of successful changes in practices driven by the RD measures were identified locally in Member States and regions studied, mostly on changes in housing conditions and health management practices. Several measures were successfully implemented to **foster outdoor access and grazing** (e.g. M11, M10 for ruminants and M14), to **increase space allowance** (e.g. M14 for pigs and poultry and M04 for cattle), but also **to improve building design**, the provision of **enrichment and microclimate control** (e.g. M04 for dairy cows and M14 for pigs and poultry). Regarding health management practices, changes fostered by the RD measures mostly concerned **prophylaxis and alternative treatments** or other treatment-management practices that were fostered through training and advice to farmers (M01, M02) or conversion to organic farming practices supported by M11. Other successful changes noticed locally concern mutilation with pain-relief (supported through M14 in Finland) or the use of robust native breeds (supported by M10 in **Spain**-Castilla la Mancha for ruminants and pigs). Fewer examples were identified regarding changes in practices to improve nutritional balance or to promote group housing and maternal behaviour (i.e. later weaning).

Although examples of successful changes in practices driven by the CAP were identified only for specific sectors in the Member States/regions selected for in-depth study, **few examples were identified in the pig and poultry sector** (involving M04 and M14). In contrast, numerous examples of the use of M03, M04, M10, M11 and M14 were identified in the cattle sector, supporting the implementation of improved housing conditions and promoting grazing, outdoor access and increased space allowance. No examples of CAP support addressing the rabbit sector were identified.

The analysis also examined to what extent the CAP had fostered the implementation of **systemic approaches on-farm. It revealed that M14 was the most effective measure to improve animal welfare**, as it could be used to foster a **set of coherent practices** (involving housing conditions, feeding, enhancement of natural behaviour and/or health management). Finally, although the biggest impact on the animal welfare practices implemented could come from combinations of RD measures fostering increased awareness among farmers (M01), advisory services (M02), commitments on improved practices (M14, M11, M10.1) and investments (M04), this possibility was rarely taken up by Member States and regions (though examples of good practices were found in some Member States and highlighted in the report).

As a whole, **the CAP appears to have helped improve animal welfare locally, in specific sectors and/or Member States and regions, depending on the implementation choices**. However, the overall effect is not significant, as only a limited number of successful cases were identified.

CAP overall effect on antimicrobial use

The CAP contribution to antimicrobial use reduction mostly consists of **promoting increased space allowance** (e.g. through cross-compliance, marketing standards, voluntary coupled support, M04 and M14), as well as improving **feeding practices, microclimate control and maternal behaviour** practices. However, intake of colostrum of good quality and in sufficient quantity – which could help significantly reduce antimicrobial use in the dairy and veal sectors – is fostered only to a limited extent through cross-compliance. Among treatment-management practices, prophylaxis and alternative treatment were supported by RD measures (e.g. M11, M14, M01, M02), **but targeted antimicrobial use and avoidance of critically important antibiotics received very limited support** despite their high importance. Hygiene management, breeding choice and genetic selection for animal robustness, as well as maintenance of stable groups, would also benefit from greater support to effectively contribute to antimicrobial use reduction, notably in non-organic production systems.

However, the **overall CAP effect on antimicrobial use was generally considered as not significant** and, in any event, difficult to measure. No link could be identified between the CAP implementation choices and the trends in antimicrobial sales for veterinary purposes in Member States studied, and currently no output indicator could help determine the level of implementation and uptake of the measures precisely enough to be able to draw conclusions about the CAP's potential effect on antimicrobial use. In Member States/regions studied, **other factors such as national policies and action plans** probably contributed to trends for reduction at Member State level.

Efficiency of CAP instruments/measures related to animal welfare/antimicrobial use

The efficiency of CAP instruments and measures contributing to animal welfare and antimicrobial use was difficult to assess in the absence of data on administrative costs associated with the implementation of the measures. Available information showed that **administrative management costs vary considerably between Member States** but are equivalent for both regulatory instruments and voluntary RD measures. Most interviewees agreed that there was generally a **good balance between cross-compliance and voluntary RD measures**. It is difficult to assess whether the combination of RD measures helped improve efficiency, especially in fostering integrated approaches implemented on-farm. However, an interesting example was observed in Austria, where beneficiaries of both M11 and M14 received only half of the premium granted under M14, to avoid double EU financing. Furthermore, stakeholders pointed out that M01-Knowledge transfer and M02-Advisory services were important for lowering transaction costs for farmers.

NGOs interviewed emphasised that CAP overall efficiency with regard to animal welfare/antimicrobial use objectives would increase if a higher **budget was devoted to RD voluntary measures**. Indeed, the analysis revealed that payment rates granted in Member States/regions were **generally considered by the farmers as not attractive enough**, thereby negatively affecting the uptake of the measure and lowering the expected effects. Only one positive example was identified in Spain-Castilla La Mancha, in the sheep and goat sector, where the support rate was sufficiently well calibrated to reach a significant proportion of livestock.

Relevance of CAP instruments/measures related to animal welfare/antimicrobial use

Although all stakeholders interviewed highlighted urgent needs to improve animal welfare in animal husbandry sectors, **animal welfare was mentioned in only two national RDPs** (EE, RO) as a need to be addressed by RD measures, out of the 23 RDPs considered in case studies. In other RDPs, some needs were indirectly related to animal welfare and antimicrobial use (e.g. needs to develop sustainable practices and organic farming, modernise livestock buildings and support quality schemes).

In all studied sectors, the main challenges identified through interviews with researchers and NGOs concern **housing conditions of animals** (appropriate density, outdoor access and grazing, vegetal litter) and the **reduction of animal suffering** (no mutilation or with measures to avoid pain). These **challenges were not always targeted by CAP instruments/measures; this was particularly the case in the poultry, sheep/goat and rabbit sectors**. Whereas M14–Animal welfare is the most relevant measure implemented to address the needs of the pig and cattle sectors, other measures (M04–Investments, M10–Agri-environment and climate, and M11–Organic farming) can address animal welfare needs, either individually or in combination to promote a holistic approach on-farm. Still, very **few examples of measures addressing the issue of mutilation were identified**.

Regarding reduction of antimicrobial use, few needs were reported by farmers representatives and researchers in Member States/regions studied. Needs identified are mainly related to **farmers' education and training and health management practices**, as well as to biosecurity and sanitary conditions of livestock buildings. The relevant CAP measures on theses aspects are M01–Knowledge transfer and M02–Advisory services, whereas M04-Investment can support **investments necessary to improve animal health and biosecurity**. The analysis showed that **antimicrobial use was not directly addressed in the needs assessment of the RDPs studied** but, most of the time, dealt with by Member States at national level.

CAP indicators and targets on animal welfare/antimicrobial use

Member States/regions generally did not set up any specific monitoring system targeting animal welfare/antimicrobial use aspects, except for a few partial initiatives. Notably, none of them has set up a reporting system based on **national animal registers to document the type and number of animals concerned by CAP payments** and thereby monitor animal welfare/antimicrobial use effects. In the case of antimicrobial use, all Member States have reporting and monitoring procedures, but with varying degrees of accuracy.

The analysis of indicators provided in the Common Monitoring and evaluation Framework revealed the following:

- **Output indicators** implemented by Member States/regions do not always provide sufficient information on the number of beneficiaries or the **number of animals from the sectors concerned** by specific type of operations targeting animal welfare or antimicrobial use issues. For example, the number and types of animals concerned by investments in livestock buildings supported under M04 are not known.
- The **result indicator** does not make it possible to assess the coverage of operations implemented to support animal welfare and/or reduce antimicrobial use. Nor does it provide sufficient insight into the effects

achieved in the **implementation of farming practices** beneficial for animal welfare/antimicrobial use (e.g. type of housing systems, feeding regime, access to pasture, etc.). Only eight Managing Authorities implemented a voluntary result indicator for M14–Animal welfare that considered uptake of the measure (i.e. the percentage of farms or livestock units concerned by M14).

- **Impact indicators** should contribute to support the assessment of the CAP by measuring the long-term impact of policy interventions. However, **no context/impact indicators related to animal welfare were available at EU level under the CAP 2014-2020 programming period**. Currently, **no common methodology exists** to set the indicators, collect them, gather them and interpret them, so that they can be used to assess animal welfare properly. Researchers interviewed emphasised that a common CAP methodology for animal welfare monitoring, detailed with specific guidelines and based on a multi-stakeholder approach, will be crucial to ensure the robustness of the data collected, and that work is still necessary to make it operational.

In the future programming period, the target will be expressed in **percentage of livestock units concerned by operations improving animal welfare or antimicrobial use**. The analysis indicated that targets must be set according to the initial situation in each Member State, the efforts farmers must undertake and the interventions/budget programmed.

Suggestions of quantified targets were developed in the present study for the reduction of antimicrobial use for the next CAP, expressing the share of livestock units to be covered by CAP interventions at national level. The methodology had to be determined in the absence of information on CAP Strategic Plans being developed by Member States and therefore relied on **available data reflecting the current trends** in antimicrobial sales for veterinary purposes. The targets provided thus reflect the **efforts Member States must undertake** to comply with the Farm-to-Fork strategy to reduce at EU level sales of antimicrobials for farmed animals by 50% by 2030. They are differentiated according to the initial situation of the different Member States.

Suggestion of **indicators to assess the level of ambition of the targets on animal welfare** proposed in the CAP Strategic Plans were also provided. They relate mainly to data available at the EU level, documenting the animal population of the sectors, and specific practices impacting animal welfare (percentage of tail-docked pigs and percentage of laying hens housed in enriched cages).

8. RECOMMENDATIONS

Maximise CAP capacity to address animal welfare

The study emphasised that the RD measure dedicated to animal welfare (M14) was not implemented in all Member States, even though it is the most effective measure to foster changes in practices and systemic approaches on-farm leading to better animal welfare. Therefore, **broader implementation of RD measures targeting animal welfare by Member States would improve the effectiveness of the CAP on this topic**.

Systemic approaches on-farm should be better supported, as they appear to be of great interest in overall improvement of animal welfare. **Operations targeting animal welfare, supported under M14 or an equivalent measure, should foster the implementation of a set of coherent practices at farm level** (i.e. increased space allowance, improved feeding practices, enhancement of natural behaviour, avoidance of painful or stressful practices and use of robust breeds). In that respect, **combinations of measures supporting the implementation of practices improving animal welfare with investments, training, knowledge transfer or advisory services (measures equivalent to M14, M04, M01 and M02) should be encouraged**, as they have proven to be effective in raising farmers' awareness and knowledge about practices to be implemented[125].

The new CAP is designed to focus to a greater extent on the production of quality food products that takes animal welfare into account. It should enable further development of such quality schemes and help farmers to invest in the equipment they need for them, notably when market demand for high-quality products guarantees higher selling prices for farmers implementing animal-welfare practices. Therefore, **increased budget should be made available to support quality schemes that take animal welfare into account (through the equivalent of M03, M11, M14) and help farmers invest in the necessary equipment to upgrade their production (M04)**.

Similarly, marketing standards for egg production, through mandatory labelling according to the production systems and housing conditions, has exerted a positive influence on farmers' production choices. **Such labelling rules could thus be extended to other sectors to promote animal-friendly practices and housing conditions.**

Generally, eligibility criteria must be set to ensure that supported investments in animal husbandry holdings enable improvement in animal-welfare conditions. To this end, **EU legislation could be rounded out by setting specific provisions for the support of investments (M04 equivalent)**.

Routine tail-docking of pigs is forbidden by Council Directive 2008/120/EC of 18 December 2008, which lays down minimum standards for the protection of pigs. However, it is still widely practised in a number of Member States. More efforts should be undertaken by Member States to ensure proper implementation of this directive. As the directive is included within the scope of CAP cross-compliance, **the effect of veterinary inspections implemented under the specific EU legislation should have consequences on CAP payments to the farmers concerned, even if pig farms are not the main beneficiaries of CAP payments**. Additionally, Member States should make more use of RD measures that incentivise farmers to implement structural investments and change practices to ensure that pigs' tails remain intact, beyond the legal requirements. **The CAP Farm Advisory Service also covers legal provisions of animal welfare and should be used in that respect**.

Specific issues or sectors (poultry, rabbits) were not sufficiently addressed/supported by the CAP measures targeting welfare aspects. In the pig and poultry sectors, this situation might have to do with the high level of integration of production units into large, well-structured and financially viable production systems (e.g. in **Italy** for poultry and in **Denmark** and **Spain**–Catalonia for the pig sector). In this type of large company structure, farmers have no influence on production choices and will not implement practices related to animal welfare that are not required and rewarded by the company. **To enable changes in practices implemented on farms, Managing Authorities could further involve the representatives of pig/poultry livestock integration companies in the decision-making process for relevant CAP design, especially at Member State and region level.** Animal welfare issues associated with rabbit or turkey productions were not sufficiently addressed by the CAP, as the peculiarities of the production system sometimes led to its exclusion from RD-supported schemes (e.g. in **Spain**–Catalonia).

Targets should be set in terms of percentage of animals concerned by practices to be supported in the different sectors (e.g. percentage of sows in group housing after weaning, expressed in LSU as a last resort, as this unit

[125] Such combinations have been implemented e.g. in Spain-Castilla la Mancha, France-Pays de la Loire, Italy-Friuli Venezia Giulia, Poland, Germany, Estonia and Cyprus.

does not reflect the welfare of the animal individually), either at EU level or at Member State level. The following good practices should be followed to set the targets:

1. Collect data to describe **the initial situation (context) as well as potential number of beneficiaries** of the interventions planned. It could be based on data already available or on working groups including researchers, farmers representatives and technical institutes. Targets will differ depending on the specificities of the context and the current uptake of practices supported. If available, data on animals concerned by specific practices should be used, whether supported or not (e.g. pigs with intact tails, laying hens in enriched cages). In the absence of more specific data, data on the animal population of each sector could be used.

2. Consider the **effort needed to be undertaken by farmers** to implement the targeted practices (e.g. the uptake may require increased knowledge and/or significant investments) as well as the general environment hindering/promoting farmers' adhesion to the scheme.

3. Identify the **existing measures/interventions programmed** to achieve the targets. Discussions with a working group including researchers, farmers representatives and technical institutes should help to determine the content of the measure and the expected benefits for animal welfare.

4. Examine the **consistency of targets with the allocated budgetary resources.**

5. Determine the right indicator to **reflect the situation on farms and set the target. This indicator must be considered as reliable by the stakeholders involved**, to promote participation and enable constructive discussion.

Maximise CAP capacity to address antimicrobial use

Considering the EU target for a 50% reduction in antimicrobial use by 2030, Member States will need to implement ambitious strategies to address antimicrobial use by farmers. National plans implemented should rely on CAP instruments and measures to foster specific practices on-farm (e.g. prophylaxis, alternative treatment, biosecurity, etc.). In particular, **the CAP Strategic Plans should address needs related to antimicrobial use, develop relevant interventions to support those practices and allocate sufficient budget to cover a significant percentage of LSU in order to reach the EU target through national contributions.**

Regular animal health visits are important to prevent diseases and increase the health and welfare of the animals. They can also contribute to reduction in the use of antimicrobials. Article 25 of the Animal Health Law, Regulation (EU) 2016/429 requires operators to make sure that establishments receive animal health visits from a private veterinarian. Cross-compliance should incorporate this requirement to ensure that animals bred by operators receiving CAP payments receive these health visits. The reinforcement of animal health issues under the Farm Advisory Services should also contribute to improvement in the health of animals, through better prevention and better knowledge among farmers benefiting from this advisory service

Improve efficiency

The analysis of payment rates delivered under M14-Animal welfare revealed that farmers often considered them as insufficient to compensate for the costs associated with the implementation of the supported operations. This can explain the low uptake of the measure. In some cases, payment rate amounts proved to be sufficient to maintain existing practices by not fostering a switch in husbandry practices. **It is thus important that Managing Authorities set suitable payment rates that will act as incentives for farmers' participation; those rates must take into account both the number of potential beneficiaries and budgetary limitations**. As in the case of Austria, Managing Authorities could implement M11-Organic Farming and M14-Animal welfare together, targeting the same beneficiaries (with reduced payments to beneficiaries of the two RD measures, to avoid double financing). This might improve overall effectiveness on-farm and reduce the associated budget.

Collect data to document CAP effects on animal welfare and antimicrobial use

The lack of accurate data on animal welfare/antimicrobial use prevents Member States from designing relevant CAP Strategic Plans for interventions and from setting ambitious and realistic targets. More data should be collected to document the practices implemented on-farm (farm-based indicators) as well as corresponding animal welfare status (animal-based indicators). Moreover, assessment of the CAP contribution to animal welfare and antimicrobial use is not possible because a) output indicators do not provide sufficient overview of the achievements of CAP instruments/measures and b) result indicators are insufficient to enable quantification

of the coverage of actions implemented to support animal welfare and/or reduce antimicrobial use. To be effective, the monitoring framework should make it possible **to collect output data at the level of the types of interventions**. For example, if training on animal welfare/antimicrobial use is supported under M01.1 Trainings, then effective reporting would require the setting of a specific type of operation for training on animal welfare/antimicrobial use issues and the collection of output data at the level of the type of intervention.

Additionally, the **types of interventions addressing animal welfare and/or antimicrobial use should be quantified in number of animals in order to a) document the overall quantity of units concerned by different measures/types of interventions addressing animal welfare/antimicrobial use under the CAP and b) provide a comprehensive view of the number of animals concerned at regional/national level**. **As far as possible, data should distinguish between the different sectors concerned (e.g. cattle, sheep/goats, pigs, poultry, rabbits)** so as to properly assess the effects of the CAP and identify potential sectors left aside. Particular attention should be paid to avoiding double counting (in the event that animals/holdings are concerned by different types of interventions). Currently, the only solution identified to limit double counting is to use the ID of the beneficiary and compare the number of animals concerned by each intervention to the total number of animals on the farm according to national livestock registers.

The impact of changes supported by the CAP on animal welfare should be documented by considering animal-based indicators monitored within the CAP framework (e.g. metabolic health, evidence of painful husbandry practices, presence or number of lesions on the carcass at the slaughterhouse and indoor density rate). As mentioned by all farmers representatives and researchers interviewed, a set of indicators should be implemented. The study proposed a set of the most suitable indicators, using a score system on their transparency, simplicity, robustness, representativeness and relevance. Six indicators appear to be promising and practicable: thermal stress, metabolic health, comfort when resting, expression of social behaviour, presence of injuries, and indoor density rate. Nevertheless, most of these indicators present limitations for immediate use (e.g. data are currently collected only for some species or only proxy variables are available). This is the case, for instance, for indoor density rate. We therefore recommend **establishing – with relevant stakeholders involved in the evaluation and management of the CAP, as well as with animal-welfare experts and farmers representatives – a weighting of the criteria used**, in order to determine a small but suitable set of animal-related indicators.

To establish simple and robust collection of data, **different sources should be considered** according to their simplicity of implementation and relevance of the information provided (collection at slaughterhouses, collection during on-farm visits by trained inspectors, or data recorded by farmers). Moreover, **to lower collection costs and ensure data reliability**, we suggest relying on **impact indicators already documented during mandatory veterinary inspections in slaughterhouse** (e.g. health status, evidence of painful husbandry practices, presence or number of lesions on the carcass at the slaughterhouse), **data collected by milk processors, data recorded in existing national animal registration databases, and data reported by farmers in the application forms**. As far as possible, cross-checks of information from the different sources should be set up to guarantee reliability of the indicators, including cross-compliance spot-checks.

Data collected through application forms to participate in CAP interventions should include data on animal welfare and antimicrobial use aspects and on the number of animals and sectors concerned. The use of spatial remote-sensing data could round out checks on specific indicators (e.g. outdoor access of animals throughout the year).

However, indicators on the share of livestock units or animals concerned by CAP interventions should be considered with caution, by making sure that they do not concern several cycles of production but rather the average number of animals found on farm at a given time. In this way, the share of livestock units or animals concerned can be calculated using Eurostat data which provide only the total number of LSU as of 31 December and not for the entire production of the year. Otherwise, calculation of the ratio of number of LSU concerned/total number of LSU is not relevant and can lead to results exceeding 100% of LSU concerned.

Furthermore, the livestock unit is not a relevant indicator to document progress made on animal welfare. Indeed, reported data expressed in terms of LSU concerned do not reflect the reality of the situation, as they minimise the effects achieved on rabbits, poultry, pigs and sheep/goats in comparison with other animals such as cattle. **As the welfare of each species of animals is deemed equally important, the coverage of the measure should be expressed in number of head for each species**.

Moreover, antimicrobial sales, which are a significant indicator for antimicrobial reduction, should differentiate consumption by sector, as they have a significant impact on sales.

Finally, no common methodology exists to set the indicators, collect them, gather them and interpret them, so that they can be used to assess animal welfare properly. **A common CAP methodology for animal welfare monitoring, detailed with specific guidelines and based on a multi-stakeholder approach, will be crucial to ensure the robustness of the data collected, and this work is still needed to make it operational.** This methodology, knowing the importance of having a combined approach on animal welfare, should not only consider the specifically targeted interventions to improve animal welfare but also cross-cutting ones (e.g. investment, training or advisory services).

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