

## Action needed for the EU Common Agricultural Policy to address sustainability challenges

Guy Pe'er<sup>1,2,3,\*</sup>, Aletta Bonn<sup>1,2,4</sup>, Helge Bruelheide<sup>5,1</sup>, Petra Dieker<sup>6</sup>, Nico Eisenhauer<sup>1,3</sup>, Peter H. Feindt<sup>7</sup>, Gregor Hagedorn<sup>8</sup>, Bernd Hansjürgens<sup>2,5</sup>, Irina Herzon<sup>9</sup>, Angela Lomba<sup>10</sup>, Elisabeth Marquard<sup>2</sup>, Francisco Moreira<sup>10,11</sup>, Heike Nitsch<sup>12</sup>, Rainer Oppermann<sup>13</sup>, Andrea Perino<sup>1</sup>, Norbert Röder<sup>14</sup>, Christian Schleyer<sup>15</sup>, Stefan Schindler<sup>16,17</sup>, Christine Wolf<sup>2</sup>, Yves Zinngrebe<sup>2,18</sup>, and Sebastian Lakner<sup>14</sup>

### Affiliations:

- 1) German Centre for Integrative Biodiversity Research (iDiv) Halle-Jena-Leipzig, Deutscher Platz 5e, 04103 Leipzig, Germany
- 2) Helmholtz Centre for Environmental Research - UFZ, Permoserstr. 15, 04318 Leipzig, Germany
- 3) Leipzig University, Deutscher Platz 5e, 04103 Leipzig, Germany
- 4) Friedrich Schiller University Jena, Institute of Biodiversity, Dornburger Straße 159, 07743 Jena, Germany
- 5) Martin Luther University Halle-Wittenberg, Institute of Biology / Geobotany and Botanical Garden, Untere Karspüle 2, 06108 Halle/S., Germany
- 6) Thünen Institute of Biodiversity, Bundesallee 64, 38116 Braunschweig, Germany
- 7) Humboldt-Universität zu Berlin, Thaer Institute for Agricultural and Horticultural Sciences, Agricultural and Food Policy Group, Unter den Linden 6, 10099 Berlin, Germany
- 8) Scientists for Future, Berlin, Germany
- 9) University of Helsinki, Department of Agricultural Sciences and Helsinki Institute of Sustainability Science, HELSUS, P.O. Box 27, FI-00014, Helsinki, Finland

- 10) CIBIO-InBIO, University of Porto, Campus Agrário de Vairão, 4485-601, Vairao, Portugal
- 11) CIBIO-InBIO, University of Lisbon, Institute of Agronomy, Tapada da Ajuda, 1349-017 Lisbon, Portugal
- 12) Institute for rural Development Research, Kurfürstenstr. 49, 60486 Frankfurt a. M., Germany
- 13) Institute for Agroecology and Biodiversity (IFAB), Boecklinstr. 27, 68163 Mannheim, Germany
- 14) Thünen-Institute for Rural Studies; Bundesallee 64, 38116 Braunschweig, Germany.
- 15) University of Innsbruck, Institute of Geography, Innrain 52f, 6020 Innsbruck, Austria
- 16) University of Vienna, Division of Conservation Biology, Vegetation and Landscape Ecology, 1030 Vienna, Austria.
- 17) Czech University of Life Sciences Prague, Faculty of Environmental Sciences, Community Ecology and Conservation research group, Kamýcká 129, CZ-165 00 Prague 6, Czech Republic
- 18) Georg-August-Universität Göttingen, Department for Agricultural Economics and Rural Development, Platz der Göttinger Sieben 5, 37073 Göttingen

\* corresponding author. Email: [guy.peer@idiv.de](mailto:guy.peer@idiv.de)

Word count: 2833 (excluding acknowledgements, references and the box)

1 **Abstract**

- 2 1) Making agriculture sustainable is a global challenge. In the European Union (EU), the  
3 Common Agricultural Policy (CAP) is failing with respect to biodiversity, climate, soil, land  
4 degradation as well as socio-economic challenges.
- 5 2) The European Commission’s proposal for a CAP post-2020 provides a scope for enhanced  
6 sustainability. However, it also allows Member States to choose low-ambition  
7 implementation pathways. It therefore remains essential to address citizens’ demands for  
8 sustainable agriculture and rectify systemic weaknesses in the CAP, using the full breadth of  
9 available scientific evidence and knowledge.
- 10 3) Concerned about current attempts to dilute the environmental ambition of the future CAP,  
11 and the lack of concrete proposals for improving the CAP in the draft of the European Green  
12 Deal, we call on the European Parliament, Council and Commission to adopt ten urgent  
13 action points for delivering sustainable food production, biodiversity conservation, and  
14 climate mitigation.
- 15 4) Knowledge is available to help moving towards an evidence-based, sustainable European  
16 agriculture that can benefit people, nature and their joint futures.
- 17 5) The statements made in this article have the broad support of the scientific community,  
18 expressed by 3,571 signatories to the preprint version of this manuscript. The list can be  
19 found here [link].

20  
21 **Keywords:** Agriculture, biodiversity, Common Agricultural Policy, climate change, European Green  
22 Deal, evidence-based policy, public goods, SMART targets

23

24

## 25 **Agriculture is a main driver of environmental degradation in Europe**

26 Agricultural expansion and intensification are key drivers of biodiversity and ecosystem services loss  
27 (Diaz et al., 2019) as well as climate change (IPCC, 2019). Historically some agricultural practices  
28 supported biodiversity and multiple ecosystem services. Yet such practices have been increasingly  
29 abandoned or replaced by farming systems which maximise yields through unsustainable use of  
30 natural resources and at the expense of biodiversity and ecosystem services (Stoate et al., 2009).  
31 These processes are driven by socioeconomic and technological forces but also supported by public  
32 policies. The European Union's (EU) Common Agricultural Policy (CAP; see **Box 1**) shapes the EU's  
33 agricultural sector (Hodge, Hauck and Bonn, 2015) and supports a variety of practices contributing to  
34 wide-scale biodiversity loss (Pe'er et al., 2014, Gregory et al., 2019, Pe'er et al., 2019, Van Swaay et  
35 al., 2019), climate change (Alliance Environment, 2019), soil erosion (Orgiazzi et al., 2016), and land  
36 degradation (IPBES, 2018). CAP programmes that could counteract these developments have been  
37 insufficient and/or underfunded (Alliance Environment, 2019, Pe'er et al., 2019). Furthermore, the  
38 current CAP is ineffective and inefficient also in addressing the social and economic challenges (ECA,  
39 2016, Pe'er et al., 2017a). The CAP has undergone several reforms, partly aiming to enhance its  
40 environmental and social performance. Some positive outcomes have been described (Batáry et al.,  
41 2015, Walker et al., 2018), yet effective measures are required to reverse negative trends (e.g. Pe'er  
42 et al., 2017b) – indicating the need of a much more fundamental change of the CAP to deliver on  
43 both environmental and socioeconomic challenges. The CAP post-2020, as proposed by the European  
44 Commission in June 2018 (EC, 2018), acknowledges the need to address environmental and  
45 sustainability challenges and introduces a new Green Architecture and a delivery model that offers  
46 Member States (MSs) higher flexibility as to how they implement the CAP (see **Box 1**). The post-2020  
47 CAP proposal will soon enter the next phase of negotiations.

48

### 49 **Box 1: The CAP in a nutshell**

- 50 • *As one of the founding policies of the EU, the CAP was established in the Treaty of Rome of*  
51 *1957, aiming to increase productivity, enhance farmers' income, stabilize markets, and ensure food*  
52 *supplies and reasonable consumer prices. The CAP has been subject to numerous reforms and is*  
53 *currently undergoing another reform process. The CAP is now mainly an agricultural funding policy,*  
54 *with a budget of € 58.4 bn./year (as of 2019), i.e. 36% of the total EU-budget (EC, 2019). It is divided*  
55 *into two "Pillars".*
- 56 • *Pillar 1 consists of income support and market measures. Income support is granted through*  
57 *different types of Direct Payments (€40.4 bn., 69.4% of CAP in 2019). Direct Payments are mostly paid*  
58 *per hectare and are conditional on compliance with various regulations including environmental*  
59 *aspects (e.g. "Good Environmental Agricultural Conditions, or GEAC, in "Cross Compliance"). Since*  
60 *2014, 30% of Direct Payments are linked to three "Greening" requirements, evaluated as mostly*  
61 *ineffective (Pe'er et al., 2017a, ECA, 2017). €5.7 bn. of the Direct Payments are coupled to specific*  
62 *types of production, such as sugar, cotton, beef and veal, dairy, sheep and goats, and protein crops.*  
63 *€3.0 bn. (5.3%) are for market support and stabilization.*
- 64 • *Pillar 2 refers to the Rural Development Programmes (€14.4 bn.), and includes instruments*  
65 *supporting rural areas (€8.6 bn.) as well as Agri-Environment-Climate Measures (AECM), payments*  
66 *for organic farming and Natura 2000 sites (€3.5 bn.). The latter three are regarded as ecologically*  
67 *effective (Batáry et al., 2015). Support for Areas for Natural Constraints (ANC, €2.5 bn.) has mixed*  
68 *environmental impacts (Oppermann et al., 2012).*
- 69 • *For the CAP post-2020, the European Commission proposes 1) a new set of objectives, 2) a*  
70 *new delivery model, granting more flexibility to Member States (MSs), 3) a requirement to develop*  
71 *national Strategic Plans, delineating how MSs will set and implement targets, and 4) a new "Green*  
72 *Architecture" with greater environmental requirements in Cross Compliance ("enhanced*  
73 *conditionality") and voluntary "Eco-Schemes" replacing the obligatory but ineffective "Greening"*  
74 *measures in Pillar 1 (Pe'er et al., 2019).*

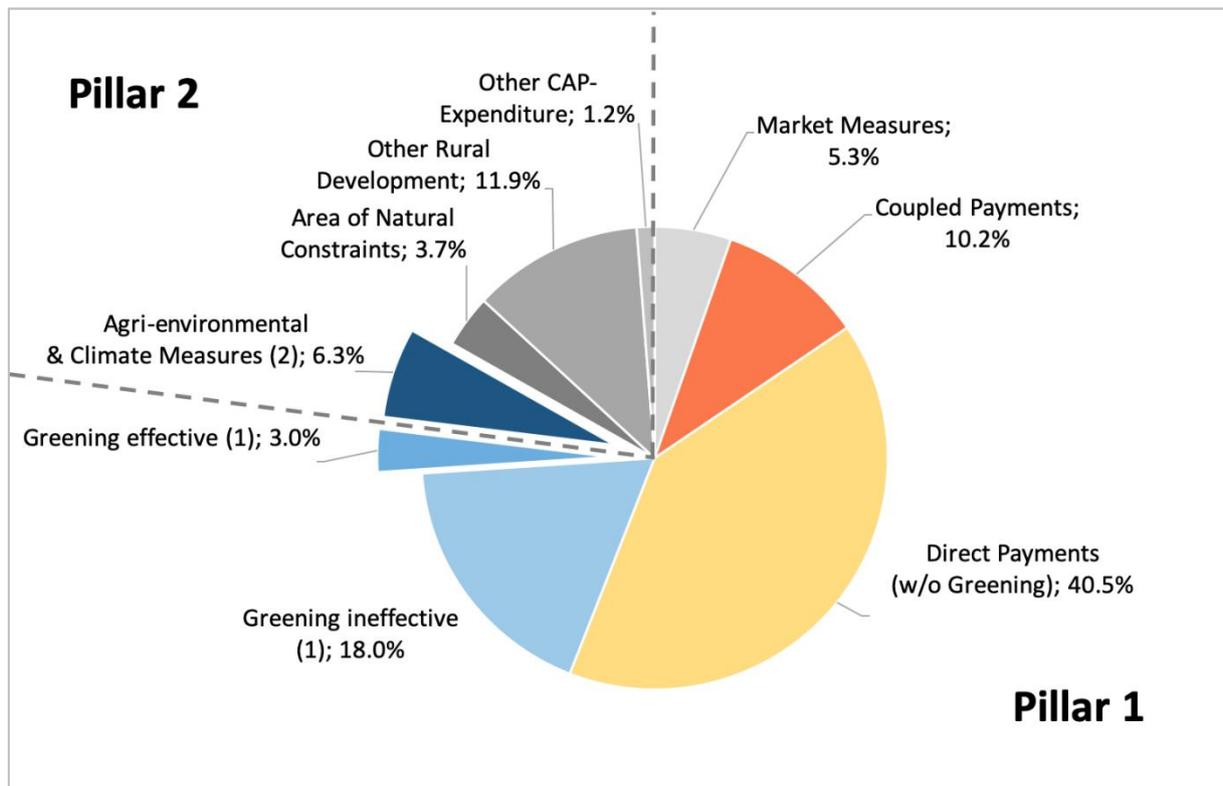
75

76

77

78

**Figure 1: CAP expenditures for key instruments in 2019**



79

80 **Source:** (EC, 2019c) for total budget-appropriations. Notes: (1) Shares of effective versus ineffective  
81 Greening are based on (Pe'er et al., 2017b). (2) Shares of Agri-Environmental and Climate Measures  
82 (AECM) and Area of Natural Constraints (ANC) are estimated based on (EC, 2016).

83

#### 84 **Reasons for concern**

85 Analysis of the Commission's proposal indicates that it generally retains the structure and  
86 weaknesses of the current CAP (see also Pe'er et al., 2019). Key shortcomings include:

- 87 • **Continuation of subsidies through area-based 'Direct Payments' (in Pillar 1) with low levels**  
88 **of environmental requirements.** Area-based payments are inefficient both with respect to farmers'  
89 income and environmental aims, and their recent "greening" has achieved minimal change in  
90 agricultural practice and environmental performance – only <5% of the area under greening has seen  
91 a change in management (ECA, 2017). Direct Payments are often passed on to landowners rather

92 than benefiting those who manage the land (Hennig and Breustedt, 2018, WBAE, 2018), and  
93 attempts to cap the maximum allowable payments, and redistribute the funds to address their highly  
94 inequitable distribution, are likely to remain unsuccessful (Matthews, 2018). Moreover, the coupling  
95 of some Direct Payments to high-input production remains permitted despite strong evidence that  
96 coupled payments lead to market distortion (OECD, 2017), foster Greenhouse Gas (GHG) emissions  
97 and support practices with demonstrated negative impacts on biodiversity (Pe'er et al., 2017a).

98 ● **Budget cuts for Rural Development Programmes (so-called Pillar 2), including Agri-**  
99 **Environment-Climate Measures (AECM).** If designed and implemented well, these policy tools are  
100 the most effective in supporting pro-environmental farming practices (Batáry et al., 2015, Walker et  
101 al., 2018). Cutting the respective budgets, rather than reducing barriers to effective implementation  
102 (such as insufficient funding, high administrative complexity and insufficient incentives for uptake),  
103 are therefore counterproductive (CEJA et al., 2019).

104 ● **Misleading claims attached to insufficient climate action.** The Commission's proposal states  
105 that 40% of the expenditures for Direct Payments and Support for Areas for Natural Constraints  
106 (ANC) will be labelled as "climate-friendly". Yet these instruments are not systematically linked to any  
107 effective measure for greenhouse gas reduction or climate adaptation, thus lacking any justification  
108 of this statement. Instead, they even partly support practices and sectors with significant greenhouse  
109 gas emissions (Alliance Environment, 2019, Pe'er et al., 2019).

110 ● **A "Green Architecture" with vague requirements allows MSs and farmers to choose**  
111 **unambitious ('light green') options.** The Commission's proposal presents a new voluntary  
112 instrument ("Eco-Schemes") and a slightly expanded set of environmental conditions under "Cross  
113 Compliance" for Direct Payments. The proposal also demands higher ambition from the MSs on the  
114 environmental performance compared to the current period (article 92 in EC, 2018). However, the  
115 proposal fails to list concrete measures that are known as essential for biodiversity and environment  
116 and thus should be prioritized by MSs, such as maintaining and restoring small-scale landscape  
117 features (see Harvey et al., 2020), buffer strips, fallow land, high-diversity grasslands, and at the

118 landscape level, viability of High Nature Value farmland regions (Navarro and López-Bao, 2019).  
119 While flexibility for MSs and farmers to make their own choices is valuable for developing context-  
120 specific solutions, the experience of past and current CAP cycles is that a lack of clear requirements  
121 and evaluation criteria encourages a ‘race to the bottom’ where MSs ‘compete’ for the lowest  
122 requirements for their farmers’ Direct Payments (Heinemann and Weiss, 2018, WBAE, 2018). The  
123 proposed ‘performance bonus’ (article 123 in EC, 2018), which should incentivise MSs to meet their  
124 goals, may adversely fuel such a race by incentivising MSs to set easy-to-achieve targets from the  
125 onset.

126 ● **Insufficient set of indicators** (Annex I of EC, 2018). The planned “output” and “results”  
127 indicators basically monitor the administrative and financial implementation of the CAP. The  
128 proposed “impact” indicators mostly describe farming structures rather than actual impacts. They  
129 are insufficient for an effective monitoring of the CAP objectives and instruments and provide little  
130 guidance for policy steering. For example, there is a lack of indicators on farm management, land-use  
131 and land cover, environmental parameters, and the economic performance of farming households  
132 (WBAE, 2018, Pe'er et al., 2019). This stands in stark contradiction to the result-based principles that  
133 the future CAP is proposed to follow. Moreover, complex administrative burdens that are  
134 disproportionate to their simplistic contents, set major hurdles to ambitious environmental  
135 implementation by MSs (WBAE, 2019a,b).

136 ● **Extending insurance instruments without a link to risk mitigation can promote**  
137 **unsustainable, risk-prone behaviour**. Extending risk management tools (i.e. insurance; article 70 in  
138 EC, 2018) seems reasonable given the increased risks to farmers from market exposure,  
139 environmental degradation (partly due to overuse of resources) and climate change (especially  
140 extreme weather events such as heat, droughts and wildfires). Climate change also enhances sanitary  
141 hazards (through pests and pathogens) and phytosanitary hazards (through plant pathogens) (Altizer  
142 et al., 2013, Velásquez et al, 2018). However, without requiring proper risk mitigation measures,

143 insurance may promote risk-prone behaviour, that is, disregarding avoidable risks (Müller et al.,  
144 2017, Goodrich et al., 2020).

145 ● **Lack of consistency and transparency.** The proposed CAP post-2020 repeats the heavily  
146 criticised procedure of restructuring and renaming CAP elements in a way that impedes learning and  
147 undermines transparency and legitimacy (Rutz et al., 2014, Erjavec and Erjavec, 2015), rather than  
148 conducting a deep reform. Previous reforms have failed to redesign or integrate existing instruments  
149 to improve the CAP's performance (Feindt, 2010, Pe'er et al., 2014, Alons, 2017, Pe'er et al., 2019,  
150 Simoncini et al., 2019). Along the same line, the Commission's proposal for the CAP post-2020 retains  
151 vagueness in its guidance for implementation, thereby risking a dilution of ambition in  
152 implementation. On top of that, there are current pressures to water down further the  
153 environmental requirements set by the CAP. This can be evidenced in the amendments voted for by  
154 the European Parliament's Committee for Agriculture and Rural Development (COMAGRI, 2019), and  
155 in a draft proposal from the EU's Council (representing the MSs) which reduces or removes a range  
156 of environmental requirements (Council of the European Union, 2019). Both of these show that, as in  
157 the previous reform cycle, a closed institutional process is used to defend the interests of a few at  
158 the expense of the many (Erjavec and Erjavec, 2015) – thereby, disregarding both public calls for  
159 decisive action on the environment and the robust scientific evidence indicating the need for a  
160 profound policy change (Matthews, 2017, Pe'er et al., 2017a).

161 The "European Green Deal", published by the European Commission in December 2019, presents a  
162 new framework for EU policy-making with high ambition to align economic processes with planetary  
163 boundaries. It states an intention to present a "Farm to Fork Strategy on sustainable food" (von der  
164 Leyen, 2019, EC, 2019b). This may offer an important opportunity for the European Institutions to  
165 make evidence-based decisions toward a future-proof CAP. However, the Green Deal is vague with  
166 respect to the CAP. It reiterates that "*at least 40% of the common agricultural policy's overall budget*  
167 *[...] would contribute to climate action*" (EC, 2019b: 12), a claim already assessed as unjustifiable  
168 (Pe'er et al., 2019, EC, 2019b). Beyond a focus on the Strategic Plans required by the MSs for

169 implementation, there is little indication on how the Commission intends to address the systemic  
170 flaws of the CAP, and the shortcomings outlined above.

171

## 172 **Ten action points**

173 We call on the European Commission, Parliament, the Council and MSs to use the breadth of  
174 scientific knowledge and experiences from past CAP reforms for drastically improving the CAP in  
175 order to avoid a policy failure and further ineffective use of taxpayers' money. **As an overarching**  
176 **target, all CAP elements, without exception, should be aligned with the principles of sustainability,**  
177 **multi-functionality and public payments for public goods.** We propose ten urgent action points,  
178 accompanied by targets and implementation options (Table 1), to focus 40% of the EU budget on  
179 public goods and societal objectives and improve the management of half of the EU's land area.

180 **1. Transform Direct Payments into payments for public goods,** to align both environmental and  
181 socio-environmental dimensions of sustainability, given the poor performance of Direct Payments for  
182 both (Navarro and López-Bao, 2019). Most urgent would be the abolishment of Coupled Payments  
183 for intensive production systems with high GHG emissions but low delivery of public goods, and to  
184 diminish the distortion of markets (OECD, 2017). Transforming Direct Payments would allow using  
185 public funds in a more target-oriented way, be it as funds for Eco-Schemes, for gradual expansion of  
186 Rural Development, to improve support for multi-functional farming systems that are designed  
187 according to agroecological principles like organic farming and agroforestry (Lampkin et al., 2015), or  
188 to help protect High Nature Value farming systems (EIP-AGRI Focus Group, 2016).

189 **2. Provide sufficient support for effective climate change mitigation,** aiming to reduce GHG  
190 emissions in the agricultural sector with a focus on improved nitrogen fertilizer application, rewetting  
191 of peatlands, and improved GHG-balances from livestock husbandry (WBAE, 2016). Insurance against  
192 climate-related risks should be conditional on tangible risk mitigation measures for droughts,

193 wildfires, floods, soil losses, and GHG emissions, for example through relevant landscape features  
194 and proper management of vegetation and soil cover.

195 **3. Provide sufficient support for effective instruments to maintain biodiversity and ecosystems,**  
196 aiming to halt and reverse ongoing declines in farmland biodiversity (Mace et al., 2018). This can be  
197 done by securing and enhancing budgets for AECM and Eco-Schemes and other environmental  
198 measures in both Pillars; restoring the pre-2009 requirements to set aside at least 10% of the  
199 national Utilized Agricultural Area with low or no production; expanding support for low-input  
200 production without or with minimal chemical fertilisers or pesticides (e.g. organic farming),  
201 expansion and longer-term maintenance of fallow land (Pe'er et al., 2017b), and extensive grazing on  
202 High Nature Value farmland; channelling support to efficient (so-called 'dark green') measures; and  
203 achieving a coherent and synergistic policy design across Pillars (e.g. Lakner et al., 2018).

204 **4. Promote innovative approaches to design and implement measures addressing the**  
205 **environmental challenges,** such as result-based remuneration of AECM (e.g. oriented to target  
206 species or habitats (Herzon et al., 2018)), collective measures to support landscape-level  
207 management (see below), or the introduction of a points system to reward farmers for their  
208 ambition and/or investments, as also proposed by several farmer organizations (e.g. Neumann et al.,  
209 2017).

210 **5. Enhance spatial planning and collaborative implementation of landscape-level measures,** as  
211 such approaches have been shown to be successful with respect to environmental aims (Westerink,  
212 Jongeneel, Polman et al., 2017). Policy 'experiments' are urgently needed, for both Pillars, to allow  
213 local targeting of management measures that can achieve a more effective delivery of public goods  
214 such as maintaining water quality (Jones et al., 2017, Lomba et al., 2019), reducing fire hazard  
215 (Moreira and Pe'er, 2018), and contributing to the EU's strategy on Green Infrastructure. Such  
216 approaches should entail longer-term contracts with farmers to improve income security and  
217 ecological benefits.

218 **6. Require MSs to set S.M.A.R.T. targets in their Strategic Plans** (i.e. specific, measurable,  
219 ambitious, realistic and time bound; Green et al., 2019) in order to fulfil all CAP objectives. This is  
220 essential for aligning the CAP with other national and international policies and commitments. MSs  
221 should be obliged to demonstrate how they address trade-offs between objectives (see  
222 Supplementary Material in: Pe'er et al., 2019). This will require guidance by the Commission, as well  
223 as close monitoring of implementation and outcomes.

224 **7. Revise the set of indicators** to ensure they are supported by the best available science and  
225 comply with the indicators of the Sustainable Development Goals (SDGs), the Convention for  
226 Biological Diversity (CBD) and the United Nations' Framework Convention on Climate Change  
227 (UNFCCC). Implementing a result-based approach requires both result and impact indicators to be  
228 adequate and meaningful (Herzon et al., 2018). For example, well-established biodiversity indicators  
229 such as the Butterfly Grassland Indicator (Van Swaay et al., 2019) should be added to complement  
230 the Farmland Bird Index, and the indicator of High Nature Value farming should be maintained and  
231 improved. Opening the indicators' list to scientific evaluation and participation and clarifying the  
232 (currently non-transparent) process of updating the indicators would pave the way for future  
233 improvements of the indicator framework.

234 **8. Strengthen environmental monitoring and enforcement** to ensure that CAP instruments  
235 lead to desirable results. Annual monitoring (e.g. using the EU's reporting system to account for  
236 yearly changes in land-use/cover and management) is imperative for evaluating effectiveness and  
237 efficiency, enabling policy makers and land managers to react promptly to developments, providing  
238 incentives and placing efficient sanctions in cases of infringements of the requirements. These data  
239 must be made open and freely available for science and independent impact evaluation, within a  
240 reasonable time. To reduce complexity, financial reporting and reporting for sustainability indicators  
241 should be separated.

242 **9. Identify and address global impacts of the CAP especially in the global South**, to achieve a  
243 reduction of environmental leakage and global negative land-use effects as well as market distortions

244 by EU agriculture, and to comply with the EU’s principle of “Policy Coherence for Development”  
245 (Article 208 of the Treaty of the European Union)(Matthews, 2018, EC, 2019a). The EU needs to strive  
246 for a better understanding of the impacts of its agricultural sector on developing countries’ ability to  
247 meet the SDGs, and the roles of agricultural payments (Yang et al., 2018) and unsustainable imports,  
248 especially of animal-derived products, feed, and biofuel (Schulmeister, 2015, Barthel et al., 2018,  
249 Matthews, 2018). Beyond the CAP, strengthening international agreements and environmental  
250 governance systems, as well as communicating about sustainable consumption levels that reflect  
251 European and global capacity, are options here.

252 **10. Improve governance of the CAP and its reform** in order to enhance transparency,  
253 accountability, participation and knowledge-uptake in line with SDG 16, and thereby regain  
254 legitimacy and public trust (Pe'er et al., 2019). This requires opening and enabling public scrutiny of  
255 data, CAP-reform negotiation documents and implementation data, throughout the policy cycle and  
256 prior to approval. Conflicts of interest in decision making and implementation must be identified and  
257 managed, and a more inclusive participation enabled. A more proactive integration of all affected  
258 DG’s in CAP policy formulation would facilitate more policy synergies and coherence.

259 Overall, the breadth of scientific evidence, best-practice examples, decision-support tools, and  
260 sustainability assessments should be integrated more effectively into the CAP design and  
261 implementation, in a way that acknowledges and addresses the expectations of European citizens,  
262 the multi-functionality of agricultural lands, the diversity of affected stakeholders, and all three  
263 dimensions of sustainability – social, economic, and environmental.

264

265 **The European Commission, Council and Parliament need to take ambitious and responsible actions**

266 Sustainability is a top societal priority and an urgent challenge. It is enshrined as a goal in the Treaty  
267 of the European Union (European Union, 2016). Given the documented poor performance of the CAP

268 with respect to sustainability, business as usual is no longer an option. Urgent and efficient actions  
269 are needed to ensure environmental and social sustainability and long-term food security.

270 Transforming the CAP to help farmers adapt to the sustainability challenges would serve as a  
271 landmark for the new European Commission and the Green Deal, but it will require political courage  
272 to overcome a resistance to change. Despite a potential slow-down of the reform process, it is critical  
273 to reflect on the unequivocal scientific evidence behind the demands made by civil society to direct  
274 the CAP towards sustainability targets. We therefore call on the Commission, Parliament, and Council  
275 to fulfil their responsibility toward current and future generations (Hagedorn, Kalmus, Mann et al.,  
276 2019) by ensuring a high level of environmental and climate protection, investing in healthy food and  
277 diverse landscapes, and promoting rural vitality and citizens' wellbeing.

278 The scientific community stands ready to support the process with the knowledge and tools required  
279 for transformative changes, both at the national and EU levels, as indicated by 3,571 signatories to  
280 the preprint version of this manuscript. The list can be found here [link].

281

## 282 **Acknowledgements**

283 *This position paper has benefitted from two expert workshops in November and December 2018, one*  
284 *within the project INTERNAS funded by the Helmholtz Association, and one through the sDiv project*  
285 *“Towards the next reform of the EU’s Common Agricultural Policy: evaluating the new greening*  
286 *measures from Ecological and Socio-economic perspectives” awarded to GP, AB and BH by the*  
287 *German Centre for Integrative Biodiversity Research (iDiv) Halle-Jena-Leipzig (DFG FZT 118). We*  
288 *thank Elisa G. Schütze for the collation of inputs from workshop participants, and for preparation of*  
289 *text material contributing to this paper. We also thank Richard Gregory, Ariel Brunner, Michal Wiezik,*  
290 *Nuria Selva, Andy Green, Marc Dufrene, Harriet Bradley and Reinhard Klenke for valuable comments*  
291 *that have greatly improved the manuscript. NE acknowledges funding by the European Research*  
292 *Council (ERC Starting Grant 677232, ECOWORM). FM was supported by FCT (contract*

293 *IF/01053/2015*). AL was supported by national funds through FCT – Fundação para a Ciência e a  
294 *Tecnologia, I.P.*, in the context of the Transitory Norm - DL57/2016/CP1440/CT0001 and FARSYD  
295 *project (FARSYD-2011–2016—POCI-01-0145-FEDER-016664)*. IH was supported by the HNV-Link  
296 *project under the Horizon2020 programme (project reference 696391)*. All authors contributed to the  
297 *manuscript and gave their approval for its submission*.

298

299 **Data Availability:** This manuscript does not include any data.

300 **Conflict of Interest:** None of the authors have any conflicts of interests.

301 **Authors' Contributions:** GP conceived the paper. All authors contributed to writing and revising the  
302 manuscript. SL produced Figure 1.

303

#### 304 **References**

- 305 Alliance Environment (2019). Evaluation study of the impact of the CAP on climate change and  
306 greenhouse gas emissions. (Report). Brussels. url: <https://bit.ly/38vsycy>.
- 307 Alons, G. (2017). Environmental policy integration in the EU's common agricultural policy: greening  
308 or greenwashing? *Journal of European Public Policy*, 24(11), 1604-1622. doi:  
309 <https://doi.org/10.1080/13501763.2017.1334085>.
- 310 Altizer, S., Ostfeld, R. S., Johnson, P. T. J., Kutz, S. and Harvell, C. D. (2013). Climate Change and  
311 Infectious Diseases: From Evidence to a Predictive Framework. *Science*, 341(6145), 514-  
312 519. doi: <http://doi.org/10.1126/science.1239401>.
- 313 Barthel, M., Khor, Y., Jennings, S., Sheane, R., Fry, J., Schreiber, ... McGill, J. (2018). Study on the  
314 Environmental Impact of Palm Oil Consumption and on Existing Sustainability Standards.  
315 (Report). Brussels, Belgium. url: <https://bit.ly/38IXMwJ>. last access: 27.01.2020.
- 316 Batáry, P., Dicks, L. V., Kleijn, D. and Sutherland, W. J. (2015). The role of agri-environment schemes  
317 in conservation and environmental management. *Conservation Biology*, 29, 1006–1016.  
318 doi: <https://doi.org/10.1111/cobi.12536>.
- 319 CEJA, CEPF, CIC, Copa/Cogeca, ELO, FACE and UECEV (2019). Rural Coalition Statement: Empowering  
320 rural areas in the CAP post-2020. (Report). Brussels, C. CEJA, CIC, Copa and Cogeca, ELO,  
321 FACE and UECEV. url: <https://bit.ly/38M4B0H>. last access: 27.01.2020.
- 322 Council of the European Union (2019). Working paper on the proposal for a regulation of the  
323 European Parliament and of the Council establishing rules for the support for strategic  
324 plans to be drawn up by member states under the Common Agricultural Policy (CAP  
325 strategic plans) and financed by the EAGF and by EAFRD. (Report). Brussels.
- 326 Diaz, S., Settele, J., Brondízio, E., Ngo, H., Guèze, M., Agard, J., ... Butchart, S. (2019). Summary for  
327 policymakers of the global assessment report on biodiversity and ecosystem services of the  
328 Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services.  
329 (Report). Paris, France. url: <https://bit.ly/37HN35q>. last access: 27.01.2020.
- 330 EC (2016). Rural development programmes by country. Retrieved 27.01.2020, from  
331 <https://bit.ly/2RvOJJO>.

332 EC (2018). Proposal for a Regulation of the European Parliament and of the Council establishing rules  
333 on support for strategic plans to be drawn up by Member States under the Common  
334 agricultural policy (CAP Strategic Plans) and financed by the European Agricultural  
335 Guarantee Fund (EAGF) and by the European Agricultural Fund for Rural Development  
336 (EAFRD) and repealing Regulation (EU) No 1305/2013 of the European Parliament and of  
337 the Council and Regulation (EU) No 1307/2013 of the European Parliament and of the  
338 Council. (Report). Brussels. url: <https://bit.ly/2TYrVUz>. last access: 27.01.2020.

339 EC (2019a). Policy Coherence for Development; Commission Staff Working Document SWD(2015) 159  
340 final. (Report). European Commission, Brussels, Belgium. url: <https://bit.ly/2RsIK8D>. last  
341 access: 27.01.2020.

342 EC (2019b). The European Green Deal - Communication from the Commission to the European  
343 Parliament, the European Council, the Council the European Economic and Social  
344 Committee and the Committee of the Regions. (Report). 11.12.2019 COM(2019) 640 final,  
345 European Commission, Brussels. url: <https://bit.ly/30Vv3EO>. last access: 27.01.2020.

346 EC (2019c). Budgets Definitive Adoption (EU, Euroatom) 2019/333 of the European Union's general  
347 budget for the financial year 2019. (Report). European Commission, Brussels, Belgium. url:  
348 <https://bit.ly/2O1v42k>. last access: 27.01.2020.

349 ECA (2016). Is the Commission's system for performance measurement in relation to farmers'  
350 incomes well designed and based on sound data? (Report). European Court of Auditors,  
351 Luxembourg. url: <https://bit.ly/2Gs3gzU>. last access: 27.01.2020.

352 ECA (2017). Greening: a more complex income support scheme, not yet environmentally effective.  
353 (Report). European Court of Auditors, Luxembourg. url: <https://bit.ly/3afyhF4>. last access:  
354 27.01.2020.

355 EIP-AGRI Focus Group (2016). Sustainable High Nature Value (HNV) farming (Final Report);. (Report).  
356 Brussels, Belgium. url: <https://bit.ly/2G6TOBV>.

357 Erjavec, K. and Erjavec, E. (2015). 'Greening the CAP'—Just a fashionable justification? A discourse  
358 analysis of the 2014–2020 CAP reform documents. *Food Policy*, 51, 53-62. doi:  
359 <http://dx.doi.org/10.1016/j.foodpol.2014.12.006>.

360 Feindt, P. H. (2010). Policy-learning and environmental policy integration in the Common Agricultural  
361 Policy, 1973–2003. *Public Administration*, 88(2), 296-314. doi:  
362 <https://doi.org/10.1111/j.1467-9299.2010.01833.x>.

363 Goodrich, B., Yu, J. and Vandever, M. (2020). Participation patterns of the rainfall index insurance  
364 for pasture, rangeland and forage programme. *The Geneva Papers on Risk and Insurance -*  
365 *Issues and Practice*, 45(1), 29-51. doi: <https://doi.org/10.1057/s41288-019-00149-3>.

366 Green, E. J., Buchanan, G. M., Butchart, S. H. M., Chandler, G. M., Burgess, N. D., ... Gregory, R. D.  
367 (2019). Relating characteristics of global biodiversity targets to reported progress.  
368 *Conservation Biology*, 33(6), 1360-1369. doi: <https://doi.org/10.1111/cobi.13322>.

369 Gregory, R. D., Skorpilova, J., Vorisek, P. and Butler, S. (2019). An analysis of trends, uncertainty and  
370 species selection shows contrasting trends of widespread forest and farmland birds in  
371 Europe. *Ecological Indicators*, 103, 676-687. doi:  
372 <https://doi.org/10.1016/j.ecolind.2019.04.064>.

373 Hagedorn, G., Kalmus, P., Mann, M., Vicca, S., Van den Berge, J., van Ypersele, J.-P., ... Rahmstorf, S.  
374 (2019). Concerns of young protesters are justified. *Science*, 364, 139-140. doi:  
375 <https://doi.org/10.1126/science.aax3807>.

376 Harvey, J. A., Heinen, R., Armbrrecht, I., Basset, Y., Baxter-Gilbert, J. H., Bezemer, T. M., ... de Kroon, H.  
377 (2020). International scientists formulate a roadmap for insect conservation and recovery.  
378 *Nature Ecology & Evolution*. doi: <https://doi.org/10.1038/s41559-019-1079-8>.

379 Heinemann, F. and Weiss, S. (2018). The EU Budget and Common Agricultural Policy Beyond 2020:  
380 Seven More Years of Money for Nothing? (Report). Gütersloh, Germany. url:  
381 <https://bit.ly/36zm0I9>. last access: 27.01.2020.

382 Hennig, S. and Breustedt, G. (2018). The Incidence of Agricultural Subsidies on Rental Rates for  
383 Grassland. *Journal of Economics and Statistics*, 238(2), 125. doi:  
384 <https://doi.org/10.1515/jbnst-2017-0124>.

385 Herzon, I., Birge, T., Allen, B., Povellato, A., Vanni, F., Hart, K., ... Pražan, J. (2018). Time to look for  
386 evidence: results-based approach to biodiversity conservation on farmland in Europe. *Land*  
387 *Use Policy*, 71, 347–354. doi: <https://doi.org/10.1016/j.landusepol.2017.12.011>.

388 Hodge, I., Hauck, J. and Bonn, A. (2015). The alignment of agricultural and nature conservation  
389 policies in the European Union. *Conservation Biology*, 29(4), 996-1005. doi:  
390 <https://doi.org/10.1111/cobi.12531>.

391 IPBES (2018). The IPBES assessment report on land degradation and restoration. (Report). Bonn,  
392 Germany. url: <https://bit.ly/38Hwp6b>. last access: 27.01.2020.

393 IPCC (2019). Climate Change and Land: An IPCC Special Report on climate change, desertification,  
394 land degradation, sustainable land management, food security, and greenhouse gas fluxes  
395 in terrestrial ecosystems - Summary for Policy Makers. (Report). Geneva, Switzerland. url:  
396 <https://bit.ly/2U1gzza>. last access: 27.01.2020.

397 Jones, J. I., Murphy, J. F., Anthony, S. G., Arnold, A., Blackburn, J. H., Duerdoth, C. P., ... Scarlett, P. M.  
398 (2017). Do agri-environment schemes result in improved water quality? *Journal of Applied*  
399 *Ecology*, 54(2), 537-546. doi: <https://doi.org/10.1111/1365-2664.12780>.

400 Lakner, S., Holst, C., Dittrich, A., Hoyer, C. and Pe'er, G. (2018). Impacts of the EU's Common  
401 Agricultural Policy (CAP) on Biodiversity and Ecosystem Services. in S. Klotz, A. Bonn, R.  
402 Seppelt, M. Schröter and C. Baessler (Ed.), *Impacts of the EU's Common Agricultural Policy*  
403 *(CAP) on Biodiversity and Ecosystem Services*. Springer.

404 Lampkin, N. H., Pearce, B. D., Leake, A. R., Creissen, H., Gerrard, C. L., Girling, R., ... Wolfe, M. S.  
405 (2015). The role of agroecology in sustainable intensification. (Report). Newbury and  
406 Fordingbridge, United Kingdom. url: <https://bit.ly/2tG8y81>.

407 Lomba, A., Moreira, F., Klimek, S., Jongman, R. H. G., Sullivan, C. A., Moran, J., ... McCracken, D. I.  
408 (2019). Back to the future: rethinking socioecological systems underlying high nature value  
409 farmlands. *Frontiers in Ecology and the Environment*, December 2019. doi:  
410 <https://doi.org/10.1002/fee.2116>.

411 Mace, G. M., Barrett, M., Burgess, N. D., Cornell, S. E., Freeman, R., Grooten, M. and Purvis, A. (2018).  
412 Aiming higher to bend the curve of biodiversity loss. *Nature Sustainability*, 1(9), 448-451.  
413 doi: <https://doi.org/10.1038/s41893-018-0130-0>

414 Matthews, A. (2017). Why further reform? Appendix I in A. Buckwell (Ed.), *Why further reform?*  
415 *Appendix I* Brussels, Belgium., RISE foundation: p.24 ff.

416 Matthews, A. (2018). The EU's Common Agricultural Policy Post 2020: Directions of Change and  
417 Potential Trade and Market Effects. (Report). Rome, Italy. url: <https://bit.ly/2U0umWE>. last  
418 access: 27.01.2020.

419 Matthews, A. (2018). Why Capping will be a mirage; Blog Post of May 11, 2018: url:  
420 <http://capreform.eu/why-capping-will-be-a-mirage/>.

421 Moreira, F. and Pe'er, G. (2018). Agricultural policy can reduce wildfires. *Science*, 359(6379), 1001-  
422 1001. doi: <https://doi.org/10.1126/science.aat1359>.

423 Müller, B., Johnson, L. and Kreuer, D. (2017). Maladaptive outcomes of climate insurance in  
424 agriculture. *Global Environmental Change*, 46(09/2017), 23-33. doi:  
425 <https://doi.org/10.1016/j.gloenvcha.2017.06.010>.

426 Navarro, A. and López-Bao, J. V. (2019). EU agricultural policy still not green. *Nature Sustainability*,  
427 2(11), 990-990. doi: <https://doi.org/10.1038/s41893-019-0424-x>.

428 Neumann, H., Dierking, U. and Taube, F. (2017). Erprobung und Evaluierung eines neuen Verfahrens  
429 für die Bewertung und finanzielle Honorierung der Biodiversitäts-, Klima- und  
430 Wasserschutzleistungen landwirtschaftlicher Betriebe („Gemeinwohlprämie“). *Berichte*  
431 *über Landwirtschaft*, 95(3). doi: <https://doi.org/10.12767/buel.v95i3.174>.

432 OECD (2017). Agricultural Policy Monitoring and Evaluation 2017. (Report). Paris, France. url:  
433 [http://dx.doi.org/10.1787/agr\\_pol-2017-en](http://dx.doi.org/10.1787/agr_pol-2017-en). last access: 20.01.2020.

434 Orgiazzi, A., Bardgett, R. D., Barrios, E., Behan-Pelletier, V., Briones, M. J. I., Chotte, J.-L., ... Jones, A.  
435 (2016). Global Soil Biodiversity Atlas. (Report). Sevilla, Spain. url: <https://bit.ly/2tGCeBU>.

436 Pe'er, G., Dicks, L. V., Visconti, P., Arlettaz, R., Báldi, A., Benton, T. G., ... Scott, A. V. (2014). EU  
437 agricultural reform fails on biodiversity. *Science*, 344(6188), 1090-1092. doi:  
438 <https://doi.org/10.1126/science.1252254>.

439 Pe'er, G., Lakner, S., Müller, R., Passoni, G., Bontzorlos, V., Clough, D., ... Zinngrebe, Y. (2017a). Is the  
440 CAP Fit for purpose? An evidence-based fitness-check assessment. (Report). Leipzig,  
441 Germany. url: <https://bit.ly/32oSrY1>. last access: 27.01.2020.

442 Pe'er, G., Zinngrebe, Y., Hauck, J., Schindler, S., Dittrich, A., Zingg, S., ... Lakner, S. (2017b). Adding  
443 some green to the greening: improving the EU's Ecological Focus Areas for biodiversity and  
444 farmers. *Conservation Letters*, 10(5), 517-530. doi: <https://doi.org/10.1111/conl.12333>.

445 Pe'er, G., Zinngrebe, Y., Moreira, F., Sirami, C., Schindler, S., Müller, R., ... Lakner, S. (2019). A greener  
446 path for the EU Common Agricultural Policy. *Science*, 365(6452), 449-451. doi:  
447 <https://doi.org/10.1126/science.aax3146>.

448 Rutz, C., Dwyer, J. and Schramek, J. (2014). More new wine in the same old bottles? The evolving  
449 nature of the CAP reform debate in Europe, and prospects for the future. *Sociologia Ruralis*,  
450 54(3), 266-284. doi: <https://doi.org/10.1111/soru.12033>.

451 Schulmeister, A. (2015). Eating up Forests: How EU Consumption Drives Deforestation and Land  
452 Conversion: The Case of Soy from Brazil. (Report). Brussels, Belgium. url:  
453 <https://bit.ly/2GtYUZc>. last access: 27.01.2020.

454 Simoncini, R., Ring, I., Sandström, C., Albert, C., Kasymov, U. and Arlettaz, R. (2019). Constraints and  
455 opportunities for mainstreaming biodiversity and ecosystem services in the EU's Common  
456 Agricultural Policy: Insights from the IPBES assessment for Europe and Central Asia. . *Land*  
457 *use policy*, 88, p.104099. doi: <https://doi.org/10.1016/j.landusepol.2019.104099>.

458 Stoate, C., Báldi, A., Beja, P., Boatman, N. D., Herzog, I., van Doorn, A., ... Ramwell, C. (2009).  
459 Ecological impacts of early 21st century agricultural change in Europe - A review. *Journal of*  
460 *Environmental Management*, 91, 22–46. doi:  
461 <https://doi.org/10.1016/j.jenvman.2009.07.005>.

462 Van Swaay, C. A. M., Dennis, E. B., Schmucki, R., Sevilleja, C., Balalaikins, M., Botham, M., ... Roy, D. B.  
463 (2019). The EU Butterfly Indicator for Grassland species: 1990-2017. (Report). Wageningen,  
464 The Netherlands. url: <https://bit.ly/2NP5e1s>. last access: 27.01.2020.

465 Velásquez, A. C., Castroverde, C. D. M. and He, S. Y. (2018). Plant–Pathogen Warfare under Changing  
466 Climate Conditions. *Current Biology*, 28(10), R619-R634. doi:  
467 <https://doi.org/10.1016/j.cub.2018.03.054>.

468 von der Leyen, U. (2019). A Union that strives for more - My agenda for Europe (Political guidelines  
469 for the next European Commission 2019-2024). (Report). Brussels, Belgium. url:  
470 <https://bit.ly/37wABFQ>. last access: 27.01.2020.

471 Walker, L. K., Morris, A. J., Cristinacce, A., Dadam, D., Grice, P. V. and Peach, W. J. (2018). Effects of  
472 higher-tier agri-environment scheme on the abundance of priority farmland birds. *Animal*  
473 *Conservation*, 21, 183–192. doi: <https://doi.org/10.1111/acv.12386>.

474 WBAE (2016). Climate change mitigation in agriculture and forestry and in the downstream sectors of  
475 food and timber use (Summary). (Report). Berlin, Germany. url: <https://bit.ly/2vc8k9h>. last  
476 access: 27.01.2020.

477 WBAE (2018). For an EU Common Agricultural Policy serving the public good after 2020:  
478 Fundamental questions and recommendations. (Report). Berlin, Germany. url:  
479 <https://bit.ly/2O3DNRR>. last access: 27.01.2020.

480 WBAE (2019a). Designing an effective agri-environment-climate policy as part of the post-2020 EU  
481 Common Agricultural Policy. (Report). Berlin, Germany. url: <https://bit.ly/2RcM5Ze>. last  
482 access: 27.01.2020.

483 WBAE (2019b). Administrative Simplification of the EU Common Agricultural Policy – Options,  
484 Approaches and Constraints. (Report). Berlin. url: <https://bit.ly/2TZwAWr>. last access:  
485 27.01.2020.

486 Westerink, J., Jongeneel, R., Polman, N., Prager, K., Franks, J., Dupraz, P. and Mettepenningen, E.  
487 (2017). Collaborative governance arrangements to deliver spatially coordinated agri-  
488 environmental management. *Land Use Policy*, 69, 176-192. doi:  
489 <https://doi.org/10.1016/j.landusepol.2017.09.002>.

490 Yang, H., Lupi, F., Zhang, J., Chen, X. and Liu, J. (2018). Feedback of telecoupling: the case of a  
491 payments for ecosystem services program. *Ecology and Society*, 23(45). doi:  
492 <https://doi.org/10.5751/ES-10140-230245>.

493

494

495

496 **Table 1: Ten action points, corresponding targets and examples of measures for their implementation.**

497 Policy targets should be S.M.A.R.T, i.e. specific, measurable, attainable, relevant, and time-bound. However, here we avoid quantitative time-bound targets, because a) all  
 498 issues must be addressed as soon as possible, and b) specific targets may differ among Member States (MSs). The proposed measures demonstrate that alternative paths exist  
 499 by which targets could be met. Measures that may go beyond the CAP (in its current scope), namely relating to food policies and the so-called “Farm to Fork Strategy”, are  
 500 marked with an F2F icon



501

Actions	Targets	Specific measures for the EU and MSs
<b>1. Transform Direct Payments into payments for public goods</b>	The current income support (based on area alone) is fully replaced with a payment system supporting an effective provision of public goods by farmers, aligned with both environmental and socio-environmental dimensions of sustainability	Transform Direct Payments using (a combination of) the following measures: <ul style="list-style-type: none"> <li>● Phase-out payments, in both Pillars, with environmental damage (including activities with high use of non-renewable resources, such as fuel consumption and permanent conversion of land)</li> <li>● Cancel coupled Direct Payments for intensive production systems as most harmful CAP subsidy with adverse environmental and social impacts (OECD, 2017)</li> <li>● Convert decoupled Direct Payment elements into payments for environmental performance (e.g. within Eco-Schemes), and revise payments not aligned with environmental or socio-environmental goals</li> <li>● Shift funds to the Rural Development Programmes and, within them, to Agri-Environment-Climate Measures (AECM) or other instruments benefitting the provision of public goods</li> <li>● Reward Member States (MSs) for shifting budgets to targeted payments for public goods and/or to Pillar 2 and, within it, to AECM and similarly-beneficial instruments</li> <li>● Set co-funding requirements on Pillar 1, while reducing them from Pillar 2</li> </ul>
<b>2. Provide sufficient support for effective climate change mitigation</b>	A reduction of GHG emissions in the agricultural sector is achieved	<ul style="list-style-type: none"> <li>● Revise and reduce payments for intensive animal production (starting with coupled support and continuing through decoupled Direct Payments)</li> <li>● Expand instruments supporting a transition to sustainable animal production intensities</li> <li>● Revise the application of the “Rio Markers methodology”, to register only concrete measures for GHG reduction (especially under AECM and Eco-Schemes) rather than payments with uncertain impacts on emissions</li> <li>● Strengthen or introduce financial support for               <ul style="list-style-type: none"> <li>○ Rewetting of peatlands (WBAE, 2016, Röder et al., 2015)</li> <li>○ Paludicultures (i.e. wet agriculture or forestry on peatlands; GMC 2019, Buschmann et al., 2020)</li> <li>○ Nature-based solutions jointly addressing climate risks and biodiversity</li> <li>○ Termination of conversion of organic soils to arable land (Tiemeyer et al., 2020)</li> </ul> </li> </ul>

		<ul style="list-style-type: none"> <li>○ Natural-forest restoration and rewilding (Perino et al., 2019) through designated instruments (e.g. payments for forest holders)</li> <li>● Demand MSs to prove that their support schemes lead to actual reduction in GHG emissions using full accounting or emissions' analysis</li> <li>● Link farm risk management (i.e. insurance) to within-farm mitigation strategies (e.g. maintaining landscape features and vegetation cover to reduce drought, erosion or fire risks) to help building resilience and adaptiveness rather than compensating for losses</li> <li>F2F Develop and introduce EU-wide and regional labelling of farming products with low CO<sub>2</sub> footprint</li> <li>F2F Support education and communication on healthy and balanced diets that focus on pesticide-free, regionally produced, seasonal, low CO<sub>2</sub> foods, and reduced reliance on animal production</li> <li>F2F Provide incentives to reduce food-waste, transport distances ("food miles") and packaging</li> </ul>
<b>3. Provide sufficient support for biodiversity protection and restoration</b>	A zero decline, followed by increasing farmland biodiversity expressed by indicator species and habitats, is achieved at the earliest possible point in time	<ul style="list-style-type: none"> <li>● Cancel the asymmetric budget cut on Pillar 2 proposed for the financial period of 2021-2027</li> <li>● Secure a significant budget for environmental measures in both pillars</li> <li>● Restore the pre-2009 requirement for CAP recipients to set aside at least 10% of agricultural area for semi-natural habitats without production, like buffer strips, fallow land or landscape features</li> <li>● Enlist and demand a minimum allocation to measures essential for biodiversity and associated ecosystem services: extensive arable land, buffer strips, fallow land, landscape elements (terraces, hedges, trees on farms etc.), high-diversity grasslands, wetlands, peatlands, and, at the landscape scale, High Nature Value farmland and mosaic landscapes (Lomba et al., 2019)</li> <li>● Expand targeted budget for, and enhance farmer-profits from, implementing effective ("dark green"), specific and/or complex AECM and Eco-Schemes for biodiversity</li> <li>● Extend support for extensive grazing contributing to the provision of public goods</li> <li>● Improve requirements for, and remuneration of, organic farming that complies with biodiversity-related criteria (e.g. include space for nature) as well as other sustainability criteria (Dainese et al., 2019)</li> <li>● Improve the framework for calculating "cost incurred" and "profit foregone" and to generate greater benefits from public goods payments (for both biodiversity and climate) to increase effectiveness and efficiency</li> </ul>
<b>4. Support innovative approaches to design and implement measures</b>	Innovative agri-environment options with proven benefits are introduced across the EU and their	<ul style="list-style-type: none"> <li>● Require a minimum allocation by all MSs for innovative approaches such as: <ul style="list-style-type: none"> <li>○ result-based payments (or payment components), i.e. oriented toward ecological/environmental results (Herzon et al., 2018, Schroeder et al., 2013)</li> <li>○ collaborative implementation or other forms of local and innovative initiatives (see also Action 5)</li> <li>○ auction models for the provision of AECM where suitable (Iftexhar and Latacz-Lohmann, 2017)</li> </ul> </li> </ul>

<p><b>addressing environmental challenges</b></p>	<p>uptake by farmers has successfully increased</p>	<ul style="list-style-type: none"> <li>● Implement proposed approaches to reduce administrative costs of agri-environmental support without compromising targets (WBAE, 2019)</li> <li>● Explore means to improve farmers’ motivation and participation in AECM, for example through: <ul style="list-style-type: none"> <li>○ higher flexibility and adaptability and more participatory approaches</li> <li>○ enhancing financial and knowledge support for local initiatives through existing instruments (such as support for small farmers / investments) and initiatives (such as the European Innovation Partnership (EIP) and the evolving Community-Led Local Development (CLLD))</li> <li>○ using AKIS and other tools to enhance knowledge of the impacts of different farming actions on public goods, and increase the feedback to farmers and other actors</li> </ul> </li> </ul>
<p><b>5. Enhance spatial planning and collaborative implementation, and the application of landscape-level measures</b></p>	<p>Spatial distribution of measures is improved to achieve higher efficiency of agri-environment payments and contribute to the EU’s Green Infrastructure</p>	<ul style="list-style-type: none"> <li>● Require MSs to employ spatial planning and landscape-level implementation under AECM and Eco-Schemes, and provide rewards for MSs (e.g. by reduced co-funding) and for farmers (e.g. by higher remuneration or labelling)</li> <li>● Allocate budgets for piloting and exploring collaborative implementation approaches by farmers</li> <li>● Link up Natura 2000 management plans with the utilization of AECM and Eco-Schemes within and beyond protected areas</li> <li>● Encourage environmental farm management plans</li> <li>● Employ longer-term contracts with farmers to improve both income security and ecological benefits of such efforts</li> </ul>
<p><b>6. Demand Member States to set S.M.A.R.T (specific, measurable, ambitious, realistic, and time-bound) targets in their Strategic Plans</b></p>	<p>All Member States have defined S.M.A.R.T targets to ensure effective and efficient implementation toward fulfilling all CAP objectives</p>	<ul style="list-style-type: none"> <li>● Require MSs to develop S.M.A.R.T targets in close consultation with scientists and other experts</li> <li>● Sharpen the requirements and standards for the design and evaluation of MS’s Strategic Plans, especially in terms of target-setting</li> <li>● Revise the Performance Bonus (article 123 in EC, 2018) to ensure it incentivises ambitious target setting</li> <li>● Demand MSs to clarify how they intend to address and reduce trade-offs between objectives</li> <li>● Allow partial approval of Strategic Plans to enable approval of well-justified sections while others are revised as needed</li> </ul>
<p><b>7. Revise the set of indicators</b></p>	<p>EU-and MS-specific lists of indicators are based on the best available science and in accordance with SDGs, post-2020 CBD’s targets and UNFCCC</p>	<ul style="list-style-type: none"> <li>● Open the indicators’ list to scientific evaluation and participation</li> <li>● Clarify the currently non-transparent process of updating the indicators</li> <li>● Redesign the set of result indicators using best knowledge so that they can support the comparison of political priorities between MSs and regions as well as for the timely monitoring and readjustment of Strategic Plans</li> <li>● Expand the list of result indicators to ensure they balance all CAP objectives and are coherent with the SDGs</li> </ul>

		<ul style="list-style-type: none"> <li>● Link result indicators with existing data monitored and reported by farmers (see Action point 8) to account for feasible tracing of land-use changes and supporting sustainable, adaptive farm management (mowing regime, grazing intensity, use of chemical outputs)</li> <li>● Expand the list of impact indicators to cover all CAP objectives: reintroduce the HNV indicator (i.e. maintain it in the current list); include well-tested biodiversity indicators such as the Butterfly Grassland Indicator; include proposed indicators on farm-economy, health and wellbeing</li> </ul>
<b>8. Strengthen environmental monitoring and enforcement</b>	The monitoring and management tools are adequately expanded to trace the CAP impacts and to ensure that payments lead to desirable results	<ul style="list-style-type: none"> <li>● Allocate a clearly defined EU budget for monitoring of CAP impacts on the environment in all MSs (see Geijzendorffer et al., 2016)</li> <li>● Revise monitoring requirements together with scientists and relevant bodies to expand the extent and frequency of monitoring with respect to Cross Compliance, Eco-Schemes and AECM</li> <li>● Support development, testing and implementation of emerging technologies and approaches (such as remote sensing, citizen science, DNA-based methods) for data collection and analysis across all MSs (ECA, 2020)</li> <li>● Redesign the control and sanctioning mechanisms for putting greater emphasis on addressing potential environmental harm and less on mere 'formal' errors</li> <li>● Disconnect administrative reporting requirements (= outputs / results) from performance indicators on socio-economic and environmental impacts of the CAP</li> <li>● Make monitoring data, especially the EU's Integrated Administration and Control System (IACS) and the Land Parcel Identification System (LPIS) data, open and freely available for science and independent impact-evaluation; and remove current delays in data releases to allow rapid assessment of progress against targets</li> <li>● Implement yearly monitoring for both results and impact indicators where possible and sensible, using the EU's reporting systems (e.g. IACS, LPIS) to account for changes in land-use/cover and management</li> <li>● Enhance law enforcement to ensure compliance with requirements, including allocating sufficient resources (staff and funding) to this within the Commission</li> <li>● Work on synergies with existing or emerging farmland biodiversity monitoring schemes at the MS and EU level</li> </ul>
<b>9. Identify and address global impacts of the CAP especially in the global south</b>	A measurable reduction of environmental leakage, global negative land-use effects and market distortions by EU's agriculture is achieved, complying with the EU's principle of	<ul style="list-style-type: none"> <li>● Abolish payments leading to adverse land-use changes and market distortions outside of the EU</li> <li>● Develop a strategy for European agriculture with coherent CAP support to assure that agricultural production satisfies EU demands within the planetary boundaries</li> <li>●  Complement certification and product standards with governmental regulation and legal arrangements in both producing and consuming countries to reduce losses of habitat and biodiversity in tropical forests and other ecosystems (Lambin et al., 2018, Tayleur et al., 2017, Miledler et al., 2016)</li> <li>●  Modify trade agreements to require common standards and tying the trading in food commodities with national and EU agriculture, food and sustainability policies</li> </ul>

	“Policy Coherence for Development” (PCD)	
<b>10. Improve governance of the CAP and its reform in terms of transparency, accountability, participation and knowledge-uptake</b>	Achieve a measurable improvement in transparency, accountability and public participation in line with SDG 16	<ul style="list-style-type: none"> <li>● Open negotiation and implementation documents (such as national Strategic Plans) for public evaluation prior to approval, to enable public scrutiny of data, processes and outcomes throughout the policy cycle. Documents should be made available in both national languages and in English (WBAE, 2019b)</li> <li>● Improve political structures for consultation and public participation during the generation of national Strategic Plans as well as during CAP implementation periods in order to enhance adaptive learning for improved sustainability performance</li> <li>● Implement a joint decision-making process for DG AGRI and DG ENVI, as well as agricultural and environmental ministers in the Council, to reflect a broader range of affected sectors and stakeholders</li> <li>● Improve the use of modelling and scenario building in all ex-ante evaluations to assess more profoundly whether proposed changes can generate the intended improvements, while applying the precautionary principle</li> <li>● Decouple the financial decision making from issues regarding policy design and targeting within the CAP</li> <li>● Enhance structured participation of scientists in CAP assessment and policy reform processes</li> </ul>

502

503

504 **References for Table 1:**

- 505 Buschmann, C., Röder, N., Berglund, K., Berglund, Ö., Lærke, P.E., Maddison, M., ... van den Akker, J.J.H. (2020). Perspectives on agriculturally used drained peat soils:  
506 Comparison of the socioeconomic and ecological business environments of six European, Land Use Policy 90, 104181. doi:  
507 <https://doi.org/10.1016/j.landusepol.2019.104181>
- 508 Dainese, M., Martin, E.A., Aizen, M.A., Albrecht, M., Bartomeus, I., Bommarco, R., ... Ghazoul, J., (2019). A global synthesis reveals biodiversity-mediated benefits for crop  
509 production. *Science advances*, 5 (10), eaax0121. doi: <https://doi.org/10.1126/sciadv.aax0121>.
- 510 ECA (2020). Using new imaging technologies to monitor the Common Agricultural Policy: steady progress overall, but slower for climate and environment monitoring, Special  
511 Report 04/2020 of the European Court of Auditors (ECA), Luxembourg. url: <https://bit.ly/36xwnMF>, last access: 29.01.2020.
- 512 Geijzendorffer, I. R., Targetti, S., Schneider, M. K., Brus, D. J., Jeanneret, P., Jongman, R. H. G., ... Herzog, F., (2016). EDITOR'S CHOICE: How much would it cost to monitor  
513 farmland biodiversity in Europe? *Journal of Applied Ecology* 53, 140-149. doi: <https://doi.org/10.1111/1365-2664.12552>.
- 514 GMC (2019). Klimaschutz durch Moorschutz voranbringen – Möglichkeiten der GAP-Reform nutzen; Position paper by Greifswald Mire Centre (GMC); Greifswald. url:  
515 <https://bit.ly/30YFq8m> ; last access 27.01.2020.
- 516 Herzon I., Birge, T., Allen B., Povellato A., Vanni F., Hart K., ... Pražan J. (2018). Time to look for evidence: results-based approach to biodiversity conservation on farmland in  
517 Europe. *Land Use Policy* 71, 347-354. doi: <https://doi.org/10.1016/j.landusepol.2017.12.011>
- 518 Iftekhar, S. and Latacz-Lohmann, U. (2019). How well do conservation auctions perform in achieving landscape-level outcomes? A comparison of auction formats and bid  
519 selection criteria; *Australian Journal of Agricultural and Resource Economics* 61, 557-575. doi: <https://doi.org/10.1111/1467-8489.12226>.

520 Lambin, E.F., Gibbs, H.K., Heilmayr, R., Carlson, K.M., Fleck, L.C., Garrett, R.D., ... Nolte, C., (2018). The role of supply-chain initiatives in reducing deforestation. *Nature Climate*  
521 *Change*, 8(2), p.109. doi: <https://doi.org/10.1038/s41558-017-0061-1>.

522 Lomba, A., Moreira, F., Klimek, S., Jongman, R. H. G., Sullivan, C. A., Moran, J., ... McCracken, D. I. (2019). Back to the future: rethinking socioecological systems underlying high  
523 nature value farmlands. *Frontiers in Ecology and the Environment* (early view). doi: <https://doi.org/10.1002/fee.2116>, last access: 27.01.2020.

524 Milder, J.C., Newsom, D., Lambin, E. and Rueda, X., (2016). Measuring impacts of certification on biodiversity at multiple scales: Experience from the SAN/Rainforest Alliance  
525 system and priorities for the future. *Policy Matters*, 21, p.14 url: <https://bit.ly/2Ru4y3y> last access 27.01.2020.

526 OECD (2017). Agricultural Policy Monitoring and Evaluation 2017. Paris, France, Organization for Economic Cooperation and Development (OECD).  
527 [http://dx.doi.org/10.1787/agr\\_pol-2017-en](http://dx.doi.org/10.1787/agr_pol-2017-en). last access: 20.01.2020.

528 Perino, A., Pereira, H.M., Navarro, L.M., Fernández, N., Bullock, J.M., Ceaușu, S., ... Pe'er, G., (2019). Rewilding complex ecosystems. *Science*, 364 (6438). doi:  
529 <https://doi.org/10.1126/science.aav5570>.

530 Röder, N., Henseler, M., Liebersbach, H., Kreins, P. and Osterburg, B. (2015). Evaluation of land use based greenhouse gas abatement measures in Germany. *Ecological*  
531 *Economics*, 117, 193-202. doi: <https://doi.org/10.1016/j.ecolecon.2015.06.007>.

532 Schroeder, L.A., Isselstein, J., Chaplin, S. & Peel, S. (2013). Agri-environment schemes: Farmers' acceptance and perception of potential 'Payment by Results' in grassland—A  
533 case study in England. *Land Use Policy*, 32, 134–144. doi: <https://doi.org/10.1016/j.landusepol.2012.10.009>.

534 Tayleur, C., Balmford, A., Buchanan, G.M., Butchart, S.H., Ducharme, H., Green, R.E., ... Phalan, B. (2017). Global coverage of agricultural sustainability standards, and their role  
535 in conserving biodiversity. *Conservation Letters*, 10(5), pp.610-618.

536 Tiemeyer, B., Freibauer, A., Albiac-Borraz, E., Augustin, J., Bechtold, M., Beetz, S., ... Drösler, M. (2020). A new methodology for organic soils in national greenhouse gas  
537 inventories: Data synthesis, derivation and application. *Ecol Indic* 109:105838.

538 WBAE (2016). Climate change mitigation in agriculture and forestry and in the downstream sectors of food and timber use (Summary). (Report). Berlin, Germany. url:  
539 <https://bit.ly/2vc8k9h>.

540 WBAE (2019a). Designing an effective agri-environment-climate policy as part of the post-2020 EU Common Agricultural Policy. (Report). Berlin, Germany. url:  
541 <https://bit.ly/2RcM5Ze>. last access: 27.01.2020.

542 WBAE (2019b). Administrative Simplification of the EU Common Agricultural Policy – Options, Approaches and Constraints. (Report). Berlin. url: <https://bit.ly/2TZwAWr>. last  
543 access: 27.01.2020.

544