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Farmers and the new green architecture of the EU common agricultural policy: a behavioural experiment

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Abstract
This behavioural experiment with farmers assessed the effect of two policy features of the new green architecture of the EU common agricultural policy on the adoption of environmentally friendly practices: (1) increasing mandatory adoption and (2) shifting budget to voluntary schemes. Results shed light on behavioural patterns, highlighting potential trade-offs between mandatory and voluntary schemes to increase agriculture's environmental and climate performance.

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Executive summary

What is the policy challenge?

One of the major policy objectives of the 2021-2027 EU common agricultural policy (CAP) is to improve the environmental and climate performance of agriculture. To reach this and other objectives, the European Commission proposed a **new green architecture**. Two of the main changes proposed are the following.

(1) **Enhancing conditionality**, that is, increasing the requirements related to environmentally friendly farming practices that farmers must implement to receive direct support.

(2) **Introducing eco-schemes**, a new instrument whereby farmers would voluntarily commit to the adoption of more environmentally friendly practices against a yearly compensation. Eco-schemes would be funded through the direct payments budget, primarily through a **budget shift from basic income support for sustainability** (BISS).

How can this new green architecture of the CAP improve the environmental and climate performance of agriculture? The challenge will be to find the right balance between mandatory measures (i.e. conditionality) and voluntary schemes (i.e. the new eco-schemes and the existing agri-environment-climate measures - AECMs).

What was the objective of this study?

The objective of this study was to gather empirical evidence on farmers' behaviour to inform the implementation of the new green architecture of the CAP.

Studying farmer reactions to this new policy context was warranted because the achievement of higher environmental and climate performance from agriculture will partly depend on farmers' behaviour, in particular their enrolment in voluntary schemes. There was a need to collect behavioural evidence, as the existing related literature was scant.

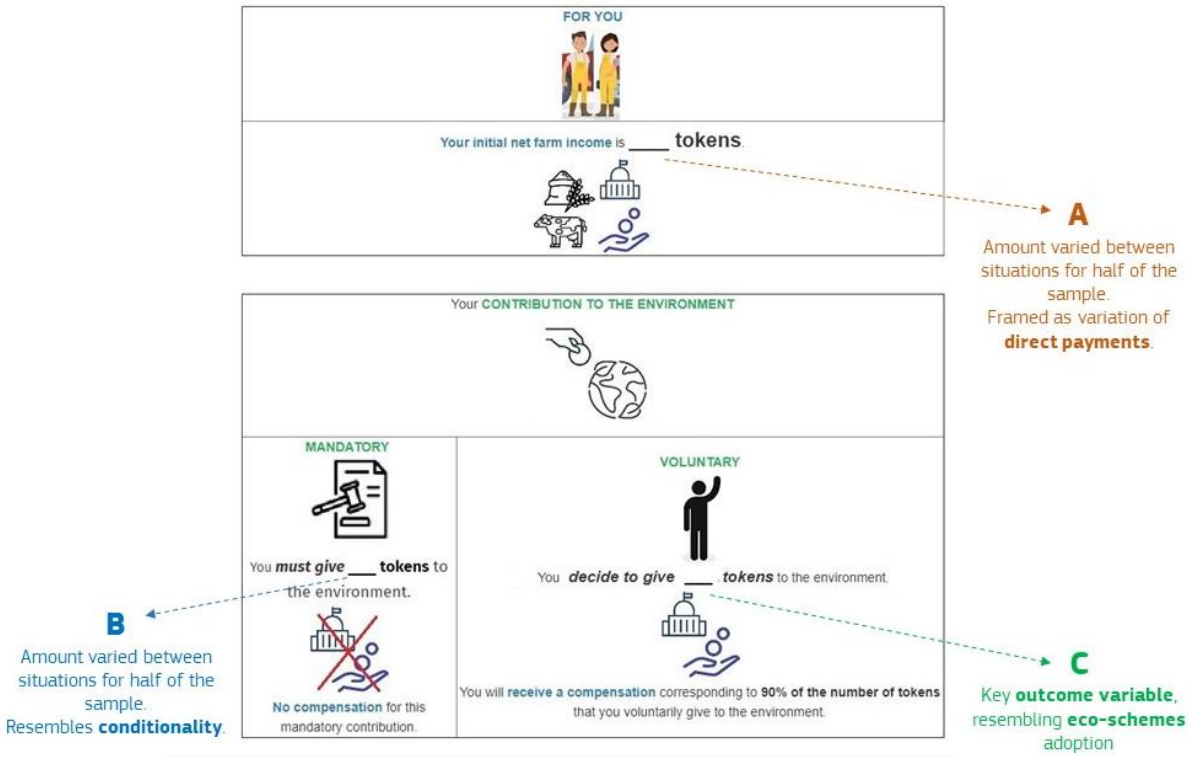
In particular, this study aimed to answer the two following research questions.

1. How, and to what extent, would **enhancing conditionality** affect farmers' adoption of more environmentally friendly practices (through voluntary schemes and in total)?
2. How, and to what extent, would a **decrease in farmers' basic income support for sustainability** (following the introduction of eco-schemes) affect farmers' adoption of more environmentally friendly practices (through voluntary schemes and in total)?

What methodological approach did this study use?

Six hundred farmers from Germany, Spain and Poland took part in a **behavioural experiment** (see Figure 1). This experiment was a **simplified representation** of real decision settings, designed to reveal basic behavioural patterns. Readers must interpret the findings with caution, taking into account the specificities of the experiment.

Figure 1. Main features of the behavioural experiment



Participants were given a certain number of **tokens** that represented their **net farm income** (see **A** in Figure 1), which included both their profit from agricultural products and their direct payments (a simplification representing BISS).

All participants had to make a **mandatory contribution** of a certain number of tokens to the environment, with no compensation in return (see **B** in Figure 1). This mandatory contribution was meant to represent **conditionality** linked to CAP support.

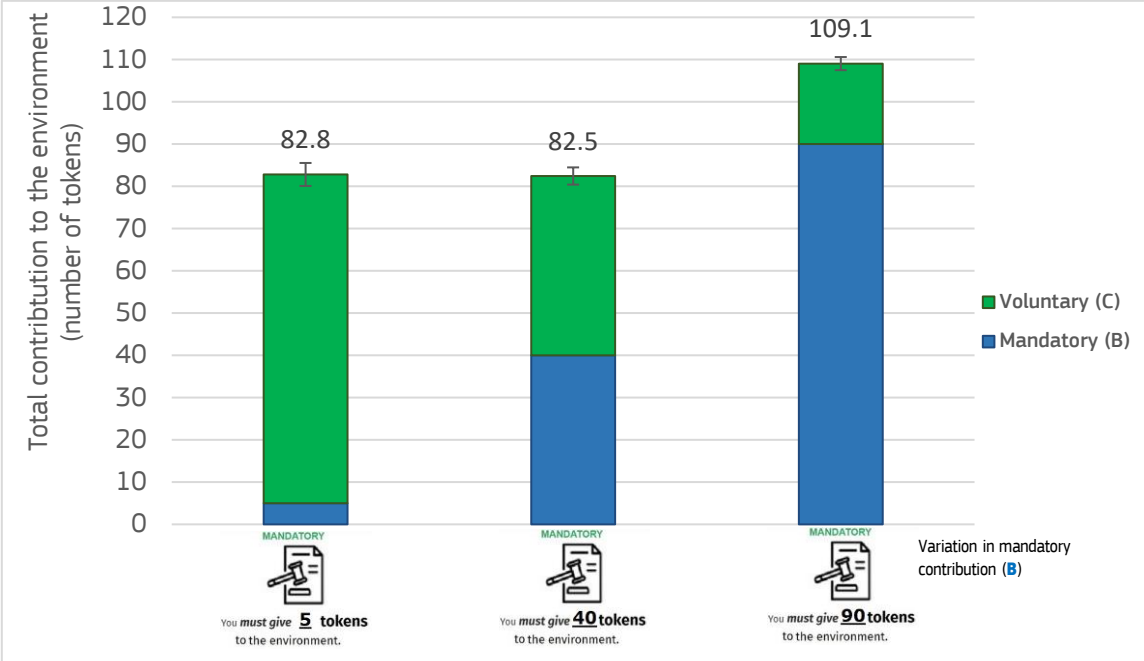
For half of the participants, the amount of net farm income (**A** in Figure 1) varied between three different situations, and was presented as a variation in direct payments. For the other half of the participants, the amount of mandatory contribution (**B** in Figure 1) varied between three different situations.

Participants' task was to decide **how many of the remaining tokens they would voluntarily give to the environment** (see **C** in Figure 1), a proxy for farmers' adoption of **eco-schemes**. Participants received yearly compensation amounting to 90 % of the tokens voluntarily contributed. This 90 % compensation accounted for the administrative and behavioural change costs that farmers face when enrolling in 100 % compensated voluntary schemes.

What did the study find?

The effect of increasing mandatory contribution (i.e. increase in **B** in Figure 1)

Figure 2. Effect of varying the mandatory contribution to the environment



1. When the mandatory contribution to the environment increased from 5 tokens (first blue bar in Figure 2) to 40 tokens (second blue bar in Figure 2), participants reduced their voluntary contribution by approximately the same amount on average (green bar in Figure 2), leaving the total contribution (blue bar + green bar) virtually unchanged.

   → Policy message: a **small enhancement** in conditionality may result in farmers enrolling **less in voluntary schemes**, leaving the **total adoption** of environmentally friendly practices **unchanged**.

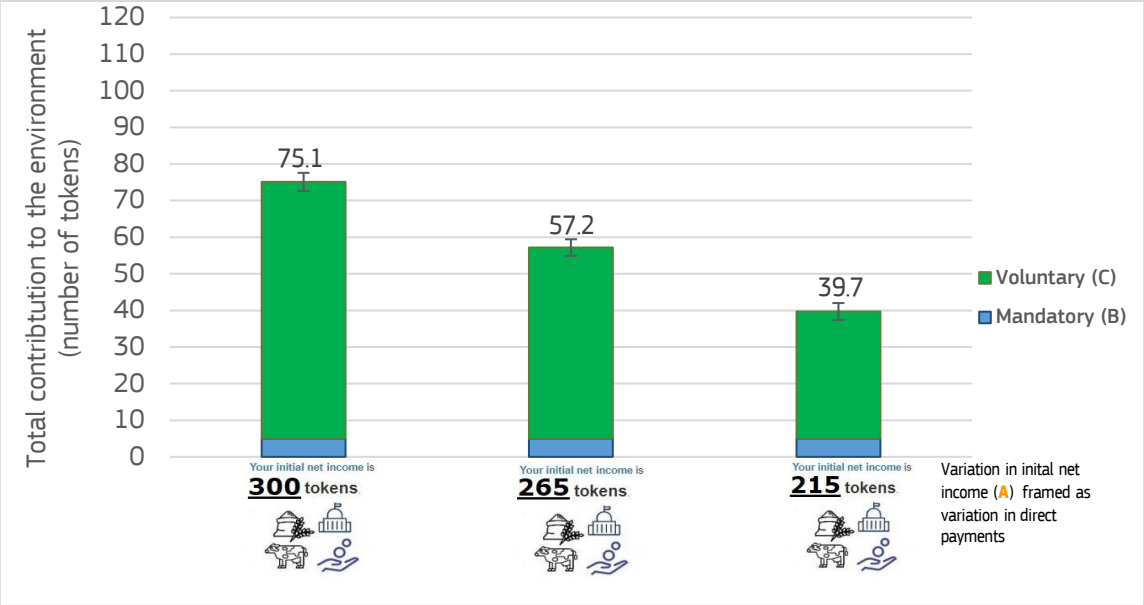
   → Nuance: this effect might only occur in the short term. Farmers in real life may reap long-term benefits from the adoption of environmentally friendly practices and may learn from the adoption of mandatory practices. These aspects were not captured in the experiment.

2. When the mandatory contribution to the environment increased from 5 tokens (first blue bar in Figure 2) to 90 tokens (third blue bar in Figure 2), participants reduced their voluntary contribution on average (green bar in Figure 2), but their total contribution (blue bar + green bar) still increased substantially.

   → Policy message: a **major enhancement** in conditionality may **increase the total adoption** of environmentally friendly practices.

The effect of decreasing direct payments (i.e. decrease in **A** in Figure 1)

Figure 3. Effect of varying direct payments



3. When farm income decreased from 300 tokens (first bar in Figure 3) to 265 tokens (second bar in Figure 3) because of a decrease in direct payments, on average participants reduced their voluntary contribution (green bar in Figure 3), but less than proportionally. The total contribution to the environment (blue bar + green bar) significantly decreased. The same pattern occurred when farm income decreased from 300 tokens (first bar) to 215 tokens (third bar).

   → Policy message: a **budget shift** from BISS to eco-schemes may **reduce total adoption of environmentally friendly practices if farmers are not fully compensated**.

   → Nuances. (1) This effect is probably highly contingent upon the level of compensation for eco-schemes, which in this experiment was set at 90 %. (2) In real life, farmers may not determine the costs of adopting the practices under eco-schemes exactly and consider them in such a transparent way as in the experiment. They may also mentally account separately for eco-scheme compensations and the cost of adopting environmentally friendly practices.

Other variables of interest

4. The study also looked at the effects on the **share of participants who contribute** at least 1 token (vs no token at all) on self-declared likelihood of adopting **agri-environment-climate measures**, and on the perception of **fairness**.

What can we conclude?

This research constitutes a **first piece of behavioural evidence** on the effect of the new proposed CAP green architecture on farmers' decisions. The assumptions and the simplifications of the experiment make it necessary to interpret findings with caution and nuance.

The experiment sheds light on potential trade-offs between mandatory (i.e. conditionality) and voluntary (i.e. eco-schemes and AECM) schemes of the CAP. The study revealed **behavioural patterns** consistent with the ideas that, compared with the current CAP:

(1) Enhancing conditionality may decrease farmers' level of enrolment in voluntary schemes, but may still increase the overall adoption of environmentally friendly practices if there is a substantial increase in conditionality.

(2) Reducing BISS in favour of eco-schemes may decrease farmers' level of enrolment in voluntary schemes and total adoption of environmentally friendly practices when the compensation for such schemes does not entirely compensate for income forgone and cost incurred.

1. Policy context, policy questions and objectives

1.1. The common agricultural policy's environmental measures until today

The common agricultural policy (CAP) has provided economic support to farmers since the 1960s. In 1992, the European Commission introduced the agri-environmental schemes (AES), the first **voluntary instrument** to encourage farmers towards environmentally friendly practices. AES are a multiannual contract between public authorities and farmers whereby the latter adopt more environmentally friendly practices against a payment that covers their costs incurred or income forgone. Through the different CAP reforms, these voluntary schemes have covered more and more environmental domains and have gained weight in the overall CAP budget. As part of the 2013 reform, AES were relabelled **agri-environment-climate measures (AECMs)** to reflect the growing importance of climate action in the EU's agricultural policy.

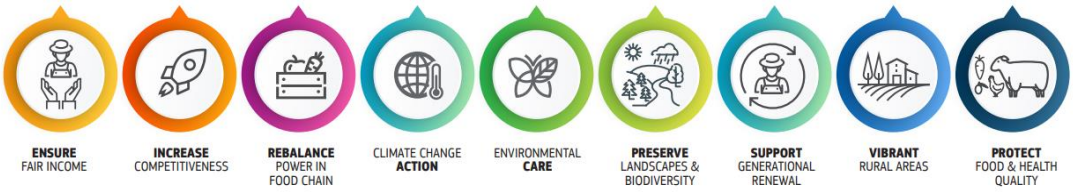
In addition to voluntary measures, the CAP also includes **mandatory measures** that farmers must comply with in order to receive direct payments. Since the Agenda 2000 (European Commission, 1997), these mandatory measures include **cross-compliance** applied to direct payments. This means that farmers must implement good agricultural practices to be eligible for CAP payments. Successive reforms of the policy strengthened the environmental dimension of cross-compliance, with a comprehensive list of measures that aim to ensure that farmland is in good agricultural and environmental conditions (GAEC) and that farmers comply with statutory and mandatory requirements (SMRs).

The 2013 reform included, in addition to cross-compliance, a **greening** conditionality associated with 30 % of direct payments. Greening requires farmers to increase crop diversification, to maintain permanent grasslands and to dedicate 5 % of their arable land to areas beneficial for biodiversity, known as ecological focus areas. Although, theoretically, farmers may choose not to implement the greening measures and forgo the associated 30 % of their direct payments, preliminary evidence (Dessart, 2019; Solazzo & Pierangeli, 2016) suggests that farmers have varied perceptions of whether greening is a voluntary or a mandatory measure. The facts that the vast majority of farmers did not have to change their farming practices to comply with greening (Louhichi et al., 2018) and that greening practices are implemented 'by nearly all farmers subject to greening' (European Commission, 2017b, p. 61) may partly explain this blurred perception.

1.2. The new common agricultural policy and the new green architecture

Following the standard 7-year cycle, a revised CAP should start its implementation in 2023. The review process started in June 2018 with the European Commission tabling three **legislative proposals** (European Commission, 2018d, 2018e, 2018f). The proposals are an attempt to provide the right tools to help the sector respond to emerging economic, environmental and social challenges. The proposed CAP aims to reach nine specific objectives (Figure 4) related to the economy, the food system, climate and the environment, and social issues.

Figure 4. The nine CAP objectives



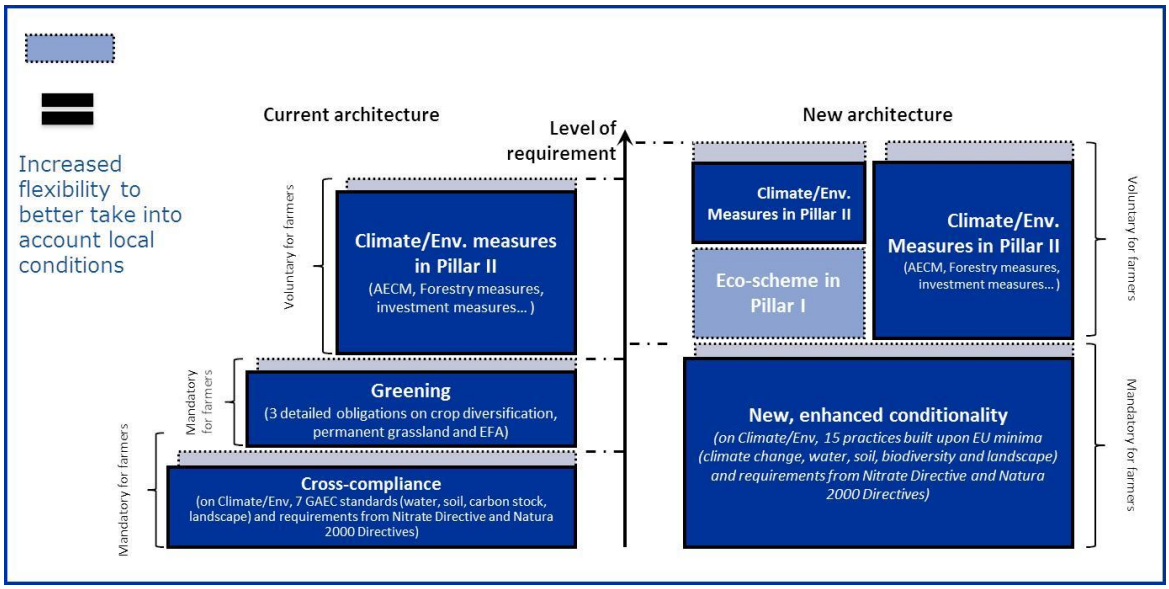
Source: European Commission (2018c).

Regarding the climatic and environmental aspects of these legislative proposals, there are three main aspects worth mentioning. First, the proposals aim to set **higher ambitions** for environmental and climate action. Second, the proposals envisage a shift from complying with environmentally friendly farming practices to actually **achieving** an improvement of agriculture's environmental and climate performance. Third, the proposals envisage increasing the **flexibility** left to Member States to propose appropriate instruments to achieve common environmental and climatic objectives. In this new delivery model, the European Commission would lay down the objectives of the policy, the types of interventions that can be funded, the general principles guiding these interventions, and finally the rules for performance assessment. Member States would then perform a territorial and sectorial strengths, weaknesses, opportunities and threats analysis, as part of a

strategic plan. Based on this assessment, Member States would specify, design and develop the specific interventions needed to address the identified challenges and reach the common environmental and climate-related objectives.

The CAP legislative proposals suggest a **change in the green architecture** (see Figure 5). This new green architecture (illustrated on the right) would maintain the distinction between mandatory and voluntary measures prevalent in the current architecture (appearing on the left). However, there would be a radical change in the distribution of requirements and allocation of budget between these tools.

Figure 5. The current and new CAP green architectures



Source: European Commission (2018a).

First, the proposed new green architecture of the CAP would **increase the mandatory layer** of the policy. This **new, enhanced conditionality** would mean, among other things, revising and extending standards for GAEC in cross-compliance and including the former greening commitments in a strengthened form. As illustrated by the light blue layer above 'New, enhanced conditionality' in Figure 5, Member States would have some degree of flexibility to further increase the mandatory measures under conditionality.

Second, the CAP legislative proposals also envisage beefing up the budget allocated to voluntary measures. A minimum requirement of 30 % of Pillar II budget (i.e. pillar for rural development) spending on the environment and climate would be maintained. The proposals also suggest introducing **eco-schemes**, a new policy instrument to stimulate farmers' adoption of more environmentally friendly practices above and beyond the mandatory requirements covered by conditionality. Although Member States would have the obligation to offer eco-schemes, these measures would be **voluntary for farmers**. Eco-schemes would provide farmers with an annual payment against the implementation of specific environmentally friendly farming practices. This payment would be granted either as an addition to the basic income support for sustainability (BISS) or as a compensation for all or part of the additional costs incurred and income forgone as a result of the commitments (European Commission, 2018e, Article 28). Eco-schemes would be funded under Pillar I (i.e. pillar for direct payments and market measures), mainly through a **shift from the budget dedicated for BISS**. As Pillar I direct payments constitute the largest proportion of EU agricultural spending, eco-schemes can be an ambitious way to refocus EU funds on environment- and climate-friendly agriculture.

1.3. Policy questions and objectives

Against this new framework, policymakers will be expected to improve agriculture's environmental and climate performance (i.e. the policy objective) by adequately using, adjusting and adapting the following three CAP policy tools:

- conditionality (mandatory for farmers),
- eco-schemes (voluntary for farmers),
- AECMs (voluntary for farmers).

Finding the **right balance** between these three tools will be critical to the achievement of higher environmental and climate performance. In particular, policymakers will need to strike the best equilibrium between mandatory measures (i.e. conditionality) and voluntary measures (i.e. eco-schemes and AECMs).

This study addresses two **policy features** of this challenge.

- The **level of requirements** of the mandatory environmentally friendly agricultural practices associated with **conditionality**.

  The European Commission's proposals envisage increasing the requirements under conditionality (i.e. enhanced conditionality), which farmers need to comply with to receive CAP income support. Member States need to decide whether they go beyond these requirements if they deem this appropriate to achieve the climate and environmental objectives.

- The **budget** associated with **BISS** and eco-schemes.

  The budgets for BISS and eco-schemes will come from the same source (i.e. Pillar I direct payments). Therefore, a stronger reliance on eco-schemes to achieve higher environmental and climate performance will imply less budget for BISS.

How will these policy changes affect the environmental and climate performance of the CAP? A key unknown with regard to this question is how farmers will react to these policy changes. When faced with these policy changes, how many farmers will decide to sign up to the voluntary instruments (eco-schemes and AECM), and to what extent? The impact assessment of the CAP legislative proposals (European Commission, 2018b) included an ex ante evaluation of the different levels of requirements in conditionality (options 1 and 4a) and the split of Pillar I budget between BISS and eco-schemes (options 3a and 3b). However, this evaluation was based on assumptions regarding how farmers would react to those tools and did not incorporate an empirical analysis of farmer behaviour. Moreover, when farmer reaction to voluntary measures was considered in large-scale agri-economic modelling, the adoption rates were either assumed or based on pure profit maximisation (Barreiro-Hurle et al., 2020). These assumptions overlooked the potential role that behavioural factors can play in the adoption of sustainable farming practices (Baumgart-Getz et al., 2012; Dessart et al., 2019; Thoyer & Préget, 2019).

The **objective** of this research is to fill this gap by bringing evidence on farmers' behaviour, in order to inform the implementation of the new green architecture of the CAP. More specifically, this research aims to address the following **policy questions**.

1. What is the (relative) impact of enhancing conditionality on the improvement of agriculture's environmental and climate performance?
2. What is the (relative) impact of shifting Pillar I budget from BISS to eco-schemes on the improvement of agriculture's environmental and climate performance?

1.4. Structure of this report

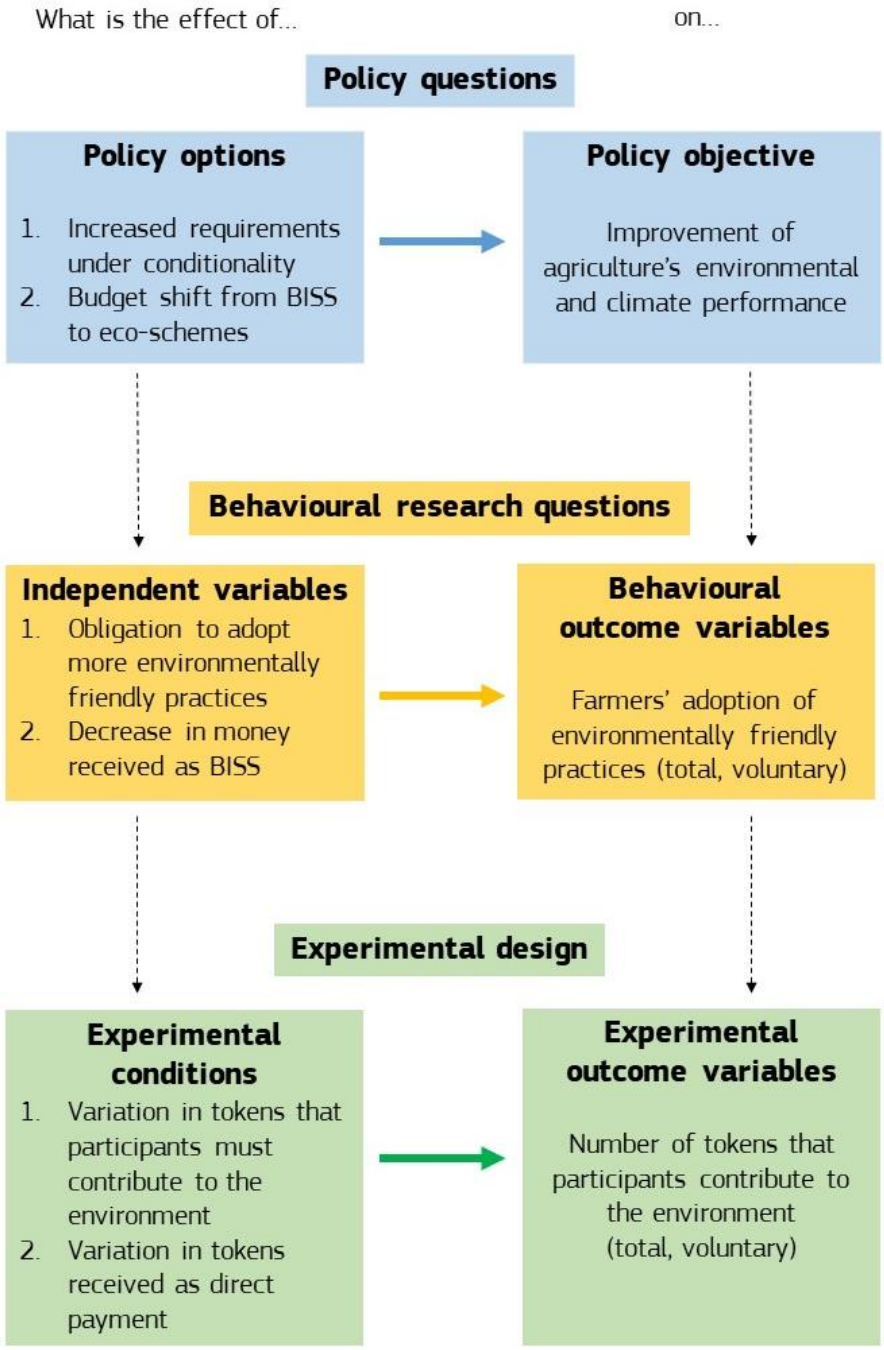
The remainder of this report is structured as follows. In Chapter 2, we translate the abovementioned policy questions into behavioural research questions, taking the perspective of farmers. Chapter 3 includes a justification for the selection of three Member States in which we collected behavioural evidence, and a description of the national contexts in these countries. We present a short review of the literature in Chapter 4, before explaining the methodology and the sample in Chapter 5 and Chapter 6, respectively. Chapter 7 presents the findings and some initial policy messages. Finally, in Chapter 8, we conclude the report by discussing the main strengths and limitations of the study and by putting forward an integrated qualitative analysis of the findings to derive consolidated policy messages.

2. Behavioural research questions

2.1. Introduction

The **policy questions** identified in the previous chapter take, as it is often the case, a **macro** perspective. That is, they concern the impact of high-level policy features (i.e. a budget shift, general enhancement of conditionality) on general policy objectives (i.e. overall improvement of agriculture's environmental and climate performance). A **behavioural approach** requires, instead, a **micro** perspective. The EU Better Regulation Toolbox, in its tool No 19 ('identification/screening of impacts') (European Commission, 2017a), shows how one should understand what the policy options will mean for their targets (in our case, farmers), and what behaviour will be key to achieving the policy objective. Figure 6 illustrates this process of translating policy options into independent variables (on the left) and the policy objective into behavioural outcome variables (on the right). The figure also includes the final step of the process, that is, the practical translation of the behavioural research questions into an experimental design (see Chapter 5 – Methodology).

Figure 6. Translating the policy question into behavioural research question and experimental design.



2.2. Independent variables

In Table 1, we translate the policy options into the independent variables of the behavioural research question, that is, the variables whose impact we are interested in assessing.

Table 1. Policy options in the new green architecture of the CAP and corresponding independent variables

Policy options	**Independent variables**
Enhancing conditionality	Obligation to adopt more environmentally friendly farming practices
Budget shift from BISS to eco-schemes	Decrease in money received as BISS

For farmers, **enhancing conditionality** means that they will have the obligation to adopt more environmentally friendly farming practices in order to keep receiving direct payments.

The **budget shift from BISS to eco-schemes** will imply, for farmers, a decrease in the money received as BISS.

2.3. Behavioural outcome variables

To translate the policy questions into behavioural research questions, one must also convert the policy objectives into behavioural outcome variables.

One of the most important objectives of the new CAP is to achieve better environmental and climate performance (European Commission, 2018). In practical terms, this means, for instance, increasing biodiversity, preserving landscapes and reducing greenhouse gas emissions from farming. Thus, from a policy perspective, the overall environmental and climate performance is the outcome variable of interest.

Which decisions of farmers will determine the achievement of this policy objective? Improving agriculture's environmental and climate performance will come from farmers' total adoption of environmentally friendly farming practices, which can be either (1) mandatory under conditionality or (2) voluntary through eco-schemes and/or AECM. Table 2 shows the correspondence between the policy objectives and the associated behavioural outcome variables.

Table 2. Policy objectives and corresponding behavioural outcome variables

Policy objectives	**Behavioural outcome variables**
Overall improvement of environmental and climate performance	Total adoption of environmentally friendly practices (voluntary + mandatory)
Improvement of environmental and climate performance obtained through eco-schemes	Adoption of environmentally friendly practices under eco-schemes
Improvement of environmental and climate performance obtained through AECMs	Adoption of environmentally friendly practices under AECMs

2.4. Behavioural research questions

Taking into account the independent and outcome variables identified above, the behavioural research questions of this study are the following.

1. How, and to what extent, would increasing the obligations to adopt environmentally friendly farming practices affect farmers' adoption of environmentally friendly practices (total = voluntary + mandatory, voluntary under eco-schemes, voluntary under AECM)?
2. How, and to what extent, would decreasing BISS affect farmers' adoption of environmentally friendly practices (total = voluntary + mandatory, voluntary under eco-schemes, voluntary under AECM)?

3. Selected national contexts

This chapter will first explain the criteria used to select among the EU Member States three candidates for the implementation of the experimental study. Then we will offer a brief introduction to the agri-environmental and policy context in each of these three Member States, focusing on the upcoming reform of the CAP.

3.1. Selection of Member States for this research

As for any behavioural experiment conducted in support of EU policy, researchers must select the Member States where they will collect data. Budgetary constraints meant that it was virtually impossible to collect data in all 27 EU Member States and, therefore, to reach full representativeness. However, perfect representativeness of EU Member States is not always needed (René van Bavel et al., 2015). Instead of full representativeness, our purpose was to reach a sufficient level of variety in the Member States covered.

For the purpose of this research, we used the following **criteria for the selection of Member States**:

- variety of regions within the EU, as understood from the EuroVoc classification (Publication Office of the European Union, 2020);
- variety of types of farms and agricultural practices (e.g. farm size, relative importance of arable vs permanent crops);
- variety of the level of adoption of environmentally friendly farming practices (e.g. organic farming).

In addition, two **constraints** guided our choice.

- Availability of experts in the selected Member States. Behavioural research with farmers is still in its infancy (Thoyer & Préget, 2019), and experts with the necessary abilities and experience are scarce in some EU Member States ([1]).
- Possibility of conducting online research with farmers in the selected Member States. Online behavioural research with farmers is very novel, implying that sample providers may not have sufficient access to farmers with an online connection in some Member States.

Considering that budgetary constraints limited the number of Member States covered in this research to three, and in the light of the abovementioned criteria and constraints we selected Germany, Spain and Poland. Table 3 presents some key statistics on these three Member States.

These three Member States meet the requirements put forward earlier.

- They represent three EU regions: western Europe, southern Europe and central/eastern Europe.
- They vary in terms of types of farmers and agricultural practices: German farms are relatively large on average, whereas Polish farms are smaller than the EU average. Spanish average farm size falls in between. German and Polish farms dedicate, on average, more than 70 % of their agricultural land to arable crops and less than 3 % to permanent crops. Spain, in contrast, has 20 % of its agricultural land dedicated to permanent crops.
- They vary in terms of the level of adoption of environmentally friendly farming practices.

([1]) As evidence, see the list of experts in the Research Network on Economic Experiments for the Common Agricultural Policy (https://sites.google.com/view/reecap/researchers).

Table 3. Relevant statistics for the selected Member States and EU-27 aggregate or average

Criterion	Statistics	**Germany**	**Spain**	**Poland**	**EU-27**
EU region (EuroVoc classification)		Western	Southern	Central/eastern	—
Importance of the farming sector	Total number of **farm holdings** (2016) ([a])	276 120	945 020	1 410 700	10 282 700
	Total utilised **agricultural area** (2016) (ha) ([a])	16 715 320	23 229 750	14 405 650	156 665 280
Farm characteristics	Average utilised **agricultural area** per holding (2016) (ha) ([a])	60.50	24.60	10.20	15.20
	% of utilised agricultural land for **arable crops** ([b]) (2018)	70.5	50.1	75.7	61.2
	% of utilised agricultural land for **permanent grassland** and meadows ([b]) (2018)	28.3	29.1	21.7	31.0
	% of utilised agricultural land for **permanent crops** ([b]) (2018)	1.2	20.3	2.4	7.5
CAP support	Average CAP **income support per ha** (2018) (EUR) ([c]) *Direct payments and support to areas facing natural constraints*	291	258	250	314
	Average **% of direct payments in income** (2018) ([c])	38	18	29	24
Adoption of environmentally friendly practices	% of utilised agricultural land converted or under conversion to **organic farming** (2018) ([d])	7.3	9.3	3.3	8.0
	Utilised agricultural area subject to **AECM contracts** (2018) (ha) ([e])	3 257 061 (≈ 20 %)	3 230 484 (≈ 14 %)	1 030 506 (≈ 7 %)	21 653 232 (≈ 14 %)
	% of utilised agricultural land under **contracts to improve soil** (2018) ([f]) *Soil management and/or prevent soil erosion, focus area 4C, rural development programmes*	6	15	12	12
	% of utilised agricultural land under **contracts to support biodiversity** (2018) ([g]) *Biodiversity and/or landscapes, focus area 4A, rural development programmes*	14	19	9	15
	Share of utilised agricultural land under **contracts to improve water management** (2018) ([h]) *Water management, focus area 4B, rural development programmes*	6	15	9	12

Sources: ([a]) Common context indicators for rural development programmes – C17; ([b]) Common context indicators for rural development programs – C18; ([c]) Agri-food data portal – CAP indicators – Farming Income Support; ([d]) Agri-food data portal – CAP indicators – Organic Production; ([e]) Agri-food data portal – CAP indicators – Environment and Climate Action; ([f]) Agri-food data portal – CAP indicators – Soil Quality; ([g]) Agri-food data portal – CAP indicators – Biodiversity; ([h]) Agri-food data portal – CAP indicators – Water Quality & Availability.

3.2. Agri-environmental and policy context in Germany

With approximately 16.5 million hectares of utilised agricultural land and more than 270 000 farm businesses in 2016 (source: see Table 3), the German agricultural sector is still of major economic importance. As a result of a massive structural change in the farming sector in the past few decades, the average farm size increased to 60.5 ha in 2016, four times the EU-27 average. In 2018, arable crops represented the main type of land use (70.5 %), followed by 28.3 % for permanent grassland and meadows (source: see Table 3).

Compared with other Member States, the German implementation of the CAP is slightly more complex, since Germany is organised in a federal system. In general, conditionality is guaranteed by cross-compliance and greening, which are both binding in all federal states. In addition, SMRs are part of the national environmental

legislation, implying that farmers have to adhere to these rules even if they do not receive EU subsidies (Bundesministerium für Ernährung und Landwirtschaft, 2019a). A major issue in terms of SMRs is nitrate pollution, which persists as a major problem in some parts of Germany, even though EU sanctions are applied and national laws have been adapted several times (Umweltbundesamt, 2019).

The implementation of direct payments was long heterogeneous across federal states and has only recently been unified. Pillar I's basic premium is now about EUR 175 per hectare in all federal states. The greening premium is around EUR 85 (Bundesministerium für Ernährung und Landwirtschaft, 2015). Since young farmers and the first hectares are more than proportionally subsidised, the average direct payment received per farm can vary. In 2018, the average total income support of EUR 291 per hectare was slightly lower than the EU-27 average (source: see Table 3). In contrast, direct payments accounted on average for 38 % of farmers' income, a relatively high figure compared with the EU average (24 %).

Pillar II, which includes AECM, is solely administered at the federal level. In 2020, Germany shifted 6 % of its Pillar I funds to Pillar II (Bundesministerium für Ernährung und Landwirtschaft, 2019b). With the available budget, a total of 13 rural development programmes were offered, including different portfolios of AECMs. The measures offered (e.g. farm management, cultivation practices, landscape management, water management) are mainly action-oriented (with a few result-oriented measures for extensive grasslands) and are all offered at the farm level (i.e. there are no group contracts). In 2018, around 3.2 million ha were contracted with AECMs, which represents roughly 20 % of all utilised agricultural area. In terms of further indicators for the adoption of environmentally friendly practices, 6 % of utilised agricultural land is subject to contracts aiming at soil quality/erosion protection and 7.3 % of utilised agricultural land is currently being converted or has been converted to organic farming (source: see Table 3).

With respect to the upcoming CAP reform, and especially the new enhanced conditionality and eco-schemes, a public debate has emerged. A position paper from the Scientific Advisory Board on Agricultural Policy, Food and Consumer Protection (WBAE, 2019), which advises the German Federal Ministry of Food and Agriculture, argued in favour of a less demanding enhanced conditionality, and well-financed, ambitious eco-schemes and AECMs. Specifically, the advisory board supports a complete phase-out of direct payments over a period of 10 years. According to this position paper, in the first stage, 30 % of the sum of Pillar I and Pillar II funds should be devoted to environmental and climate goals (including eco-schemes). After 10 years, 100 % of Pillar I funds should go to eco-schemes or animal welfare measures, or via modulation to Pillar II AECMs. If eco-schemes are oversubscribed, the shortfall should be taken from the direct payments budget. This means that the final amount of direct payments can only be determined after the eco-scheme subscription process is completed. The advisory board backs this position with the argument that a much more targeted approach to environmental and climate protection is needed in order to tackle pressing environmental and climate issues. Instead of relying on conditional direct payments, the advisory board is in favour of a mixture of eco-schemes, AECMs and national environmental law. To this end, it is suggested that Germany should stay at minimum conditionality for direct payments and instead take up suitable GAEC into national law.

Several environmental non-governmental organisations (NGOs) released a joint statement (Verbände-Plattform, 2019) advocating strongly enhanced conditionality in Germany's strategic plan and a budget for eco-schemes of at least 30 % of Pillar I funds, which would progressively increase. This joint statement argued that eco-schemes should incentivise ambitious ecological efforts by having a positive impact on farmers' income. The statement proposed a list of "medium green" to "dark green" measures (depending on their level of requirements) as candidates to be included in eco-schemes.

The German Farmers' Union also released a position paper (Deutscher Bauernverband, 2020). In this document, the union recommends preserving the conditional direct payments to safeguard farm incomes, and does not endorse enhancing conditionality or reducing the overall CAP budget. Moreover, the union does not support moving current greening obligations into enhanced conditionality. Eco-schemes are generally seen as a favourable instrument by the union. However, eco-schemes should, according to the union, be designed in a way that minimises the administrative burden on farmers and does not undermine tried and tested AECMs. Regarding the budget for eco-schemes, the German Farmers' Union argues in favour of an EU-wide uniform share of Pillar I funds, without further specifying the size of the share. For farmers, eco-schemes should take the form of a flat rate per hectare of farm land, with measures taken, for example, from current ecological focus areas.

Finally, regarding the position of the German Federal Ministry of Food and Agriculture, the minister argued, during the debates in the European Council, in favour of a 20 % share of Pillar I funds to be used as a minimum budget for the eco-schemes (Bundesministerium für Ernährung und Landwirtschaft, 2021). It remains to be

seen whether Germany will stay with this minimum or will increase this share in a more ambitious national strategic plan.

3.3. Agri-environmental and policy context in Spain

Spain has a surface area of 506 000 km^2, of which 80 % is considered rural. Agriculture makes up 50 % of land use (MAPA, 2019) and accounted for more than 23 million hectares in 2016. There are slightly more than 945 000 farm businesses with an average farm size of 24.6 ha. In 2016, agricultural land in Spain was mainly used for arable crops (50.1 %), followed by permanent grassland and meadows (29.1 %) and permanent crops (20.3 %) (source: see Table 3).

The average CAP income support amounted to EUR 258 per hectare in 2018, with a lower share of CAP direct payments in total income (18 %) than the EU average (24 %) (source: see Table 3). Regarding the implementation of the basic payment scheme, Spain is a particular case. There is internal convergence based on 50 ad hoc regions, defined based on agronomic characteristics and their land use (i.e. rain-fed arable crops, irrigated arable crops, permanent crops and permanent pastures). This complex system results in wide heterogeneity in the unit value of the basic payment, which ranges between EUR 60 and EUR 1 430 per entitlement (European Court of Auditors, 2018), although this upper bound is an outlier (Ministerio de Agricultura Alimentación y Medio Ambiente, 2016).

In Spain, there are 18 separate rural development programmes: 1 national and 17 regional. There is wide heterogeneity in the AECMs targeted at the regional level, and farmers' preferences and willingness to accept AECMs vary as well (Espinosa-Goded et al., 2010; Villanueva et al., 2015; Villanueva, Rodríguez-Entrena, et al., 2017). In total, there are 121 AECMs (Zabalza et al., 2017). The agricultural area subject to AECM contracts represented roughly 14 % of the utilised agricultural area in 2018 (source: see Table 3). With respect to further indicators for the adoption of environmentally friendly practices, 15 % of utilised agricultural land was subject to contracts aimed at soil quality/erosion protection, and 9.3 % of utilised agricultural land was being converted or already converted to organic farming, both of which are above the EU-27 average.

With respect to the upcoming reform, a public debate is ongoing, with the new eco-schemes at the core of the discussion. The Spanish government laid out a proposal that presents eco-schemes as an intervention similar to AECMs, but allows annual incentive payments seeking a much broader territorial and sectoral impact than that of AECMs (MAPA, 2020). This proposal includes eight eco-schemes, including, for instance, extensive grazing and the sustainable use of pesticides.

The budget reserved for eco-schemes in the proposal is between 13 % and 23 % of direct payments (MAPA, 2018). The Spanish government's initial proposal is to have different intensities of eco-scheme payments according to the stringency of the specific measures, or that the incentive should be higher for areas or sectors in which the application of eco-schemes is more necessary.

Spanish farmers' unions do not have a clear public position on the post-2020 CAP at the time of writing these lines. However, they raised their voice to avoid renationalisation of the CAP and to ensure that CAP payments are targeted at genuine farmers (Europa Press, 2018; UPA, 2020). Regarding the new green architecture of the CAP, a trade union publicly stated (Europa Press, 2018) that (1) it is not in favour of eco-schemes because they would add complexity and would duplicate environmental measures and (2) conditionality should be adapted to the real conditions of the farms. Likewise, there are different sensitivities in the trade unions regarding the CAP Pillar I budget split to be allocated to eco-schemes. These sources advocate flexibility and progressivity, with a transitional period to improve farmers' knowledge base about eco-scheme management, during which an entry level of 10 % may be reasonable.

On the other hand, environmental NGOs put forward a common position with more specific suggestions (WWF, 2020). They advocate a CAP strategic plan whereby 50 % of the budget is allocated to environmental and climate objectives. According to these NGOs, the enhanced conditionality should impose high environmental restrictions. Moreover, they consider that at least 30 % of the total direct payments should aim to provide public goods through eco-schemes, such as the goods offered by Natura 2000 sites: high nature value farmland and organic agriculture.

3.4. Agri-environmental and policy context in Poland

Agricultural production is an important sector in the Polish national economy, and the basic source of income for a large part of society (GUS, 2020). With more than 14 million ha in 2016, the land used for agricultural

production covers almost half of the country (source: see Table 3). Polish farms are among the smallest in the EU. The average utilised agricultural area per farm, amounting to 10.2 ha, is indeed smaller than the EU-27 average of 15.2 ha (see Table 3). Agricultural land use in Poland is mainly focused on arable crops (75.7 %), followed by permanent grassland and meadows (21.7 %) (source: see Table 3).

Poland's integration in the EU and the accelerating globalisation processes created chances for innovation and the development of rural areas, but also led to competitive pressure, sudden intensification of the agricultural production and increasing pressure on the natural environment. Such processes are observed by environmental specialists in Poland (Czajkowski et al., 2019).

In 2018, the average CAP income support was EUR 250 per hectare, which is below the EU-27 average of EUR 314 per hectare. The European Commission proposals for the post-2020 CAP (European Commission, 2018d, 2018e, 2018f) included a renewed scheme for external convergence to reduce this gap. The average share of direct payments in total farm income in 2018 was 29 %, a figure close to, yet slightly higher than, the EU average (24 %). For that reason, the argument about farmers' income stability and maintaining the level of Pillar I payments dominates public discourse on the shape of agricultural policy in the future (Ministerstwo Rolnictwa i Rozwoju Wsi, 2018b, 2018a; Tomczyk, 2020). Turning to Pillar II, the share of utilised agricultural area subject to AECM contracts was roughly 7 % in 2018 (source: see Table 3). In terms of further indicators for the adoption of environmentally friendly practices, 12 % of utilised agricultural land was subject to contracts aimed at soil quality/erosion protection in 2018, and 3.3 % of utilised agricultural land was being converted or had been converted to organic farming.

Current discussion around the future CAP is organised around two major changes in Pillar I. The priority for Poland is to ensure equal financial conditions for farmers in the EU competitive market (Ministerstwo Rolnictwa i Rozwoju Wsi, 2018b; Nawozy, 2017). In agricultural media, enhanced conditionality is presented particularly in the context of lower direct payments for non-compliance and new monitoring systems (e.g. the monitoring of farms through the use of satellite images from the Copernicus system) (JK, 2020; PAP, 2020; Pokora-Kalinowska, 2018, 2020). In Poland, there are many small, irregular land parcels, and even the quality of the Sentinel satellites resolution is insufficient for monitoring. Monitoring needs to be supplemented with on-the-spot controls and photos with geolocation taken by the farmer themselves (Pokora-Kalinowska, 2019b). Small farmers would be subject to simplified controls to reduce the administrative burden.

Concerning the new eco-schemes, Poland is rather opposed to these payments being treated as voluntary for farmers. Instead, the Ministry of Agriculture and Rural Development sees the eco-schemes as a means to use Pillar I funds to help farmers finance additional obligations resulting from the implementation of certain environmental directives, such as those concerning air and water pollution (Pokora-Kalinowska, 2019a). By this logic, if a farmer wants to sustain the current level of direct payments, they must select some of the new eco-schemes and thus help to meet the increasing environmental goals and regulations that are binding at the EU level.

The ministry proposed 15 new eco-schemes, and tried to estimate farmers' interest in participation by conducting a country-wide survey (Kozłowska, 2019). Eighteen thousand respondents filled out the survey. It revealed a high interest in liming, crop rotation, fertilisation plans, catch crops and manure planting. These survey findings are in line with those of Hasler et al. (2019), who estimated farmers' willingness to accept monetary compensations for adopting two of these practices. The smallest farms were under-represented in the survey sample, although they are the main target group in Poland. In February 2020, the Department of Direct Payments at the Polish Ministry of Agriculture and Rural Development presented its first proposition for the new eco-schemes and its approach to estimating farmers' interest and the levels of payments. In the presentation, the department gave information about potential subsequent losses in the Pillar I budget in a given year if enrolment is over- or underestimated (Departament Płatności Bezpośrednich MRiRW, 2020). The results are subject to consultation with stakeholders.

Pillar II received less attention, as there are no major changes planned. The stability of ongoing investments and transformation processes in rural areas is underlined.

4. Literature review

4.1. The effect of increasing mandatory requirements

Enhancing conditionality and increasing the budget for voluntary measures under eco-schemes both raise the issue of the adequate balance between mandatory and voluntary measures when it comes to farmers' adoption of environmentally friendly practices. Much of policymaking involves getting people to behave in ways they otherwise would not (Schneider & Ingram, 1990). These behaviour change policies can be mandatory (e.g. a ban or an obligation, as in conditionality) or voluntary (e.g. an incentive, as in eco-schemes and AECM).

Mandatory policies can be effective, as people have little option but to comply. However, a classical libertarian point of view may reject such an approach because it restricts people's right to decide (Leggett, 2014). Qualitative evidence suggests that EU farmers highly value their freedom of choice on their farms (Stock & Forney, 2014), and therefore prefer voluntary measures to mandatory ones (Dessart, 2019). Moreover, people could push back against this perceived control and remain non-compliant, regardless of the consequences for them. Such situations may result in reactance, that is, an unpleasant motivational arousal that emerges when people experience a threat to or loss of their free behaviours (Brehm, 1966). Public authorities, at whatever level of governance, might also find it difficult to implement, enforce or monitor a mandatory policy. Because of these drawbacks, **voluntary approaches** may be preferred, whereby people can choose to behave in a certain way and receive an incentive to do so.

This study looks at farmers' willingness to participate in voluntary programmes that benefit the environment, and will test, among other things, the effect of increasing mandatory requirements for farmers – that is, enhanced conditionality. Farmers may be obliged to adopt more environmentally friendly practices, because otherwise they will not receive direct payments from the CAP. Will this make them more or less likely to enrol in voluntary schemes to protect the environment?

The psychological literature does not offer an immediate answer to this. Two contradictory streams of literature can inform this question:

- on the one hand, literature mainly based on cognitive dissonance theory (Festinger, 1957) suggests that increasing mandatory requirements for farmers will make them more likely to contribute voluntarily to the environment, because people in general want to avoid contradicting themselves (see Box 1);
- on the other hand, the moral licensing effect (Merritt et al., 2010) suggests the opposite, based on the idea that farmers, having done a good (mandatory) deed for the environment, will feel entitled to behave in a less environmentally friendly way subsequently (see Box 2 for further details).

Box 1. Literature suggesting that increasing mandatory measures would increase voluntary adoption

A number of psychological theories emphasise the need for consistency in behaviour (Abelson et al., 1968; Gawronski & Strack, 2012). **Cognitive dissonance theory**, for example, suggests that people experience stress when they undertake activities that are contradictory to their beliefs, ideas or values (Festinger, 1957). **Balance theory** suggests that people strive to maintain cognitive consistency in their attitudes towards people and objects (Heider, 1946). Accordingly, if farmers are obliged to adopt more environmentally friendly practices under mandatory schemes, they should be more likely to do so on a voluntary basis, in order to be consistent with themselves. However, complying with mandatory requirements is not so much an indicator of a belief or attitude, so these theories might not apply very well here.

The **sunk-cost effect** refers to a situation where people continue behaving in a certain way because of previously invested resources (Arkes & Blumer, 1985). If the mandatory adoption of more environmentally friendly farming practices involves such investment (e.g. in terms of time to learn how to implement reduced tillage), then such a sunk-cost effect could favour the further adoption of voluntary practices (e.g. adopting no tillage).

In addition, the **foot-in-the-door effect** is a compliance tactic whereby people get others to agree to a larger request by having them agree to a smaller request first (Freedman & Fraser, 1966). Here again, it is questionable if complying with a mandatory requirement is equivalent to agreeing to a request.

Finally, mandatory requirements could act as a **signal of socially desirable behaviour** (i.e. 'norm giving') (Keser et al., 2017), which creates an anchor (Engelmann et al., 2017) and could thereby increase voluntary adoption. Making some environmentally friendly practices mandatory for farmers may thereby lead to a positive crowding-out effect once this obligation is removed (Kaczan et al., 2019).

Box 2. Literature suggesting increasing mandatory measures would decrease voluntary adoption

The psychological literature speaks of **moral licensing**, meaning that, if people initially behave properly, they are more likely to behave improperly or less properly later (Merritt et al., 2010). It is as if the initial good deed gave them a licence to behave as they wished later on. This phenomenon has been observed in a number of areas (see Blanken et al., 2015, for a meta-analysis), including in pro-environmental consumer behaviour (Mazar & Zhong, 2010). For example, participants who recall their own moral actions show less pro-social intentions later (Conway & Peetz, 2012; Jordan et al., 2011). In another example, people who previously undertake ethical behaviour end up offering less money to other participants (Cornelissen et al., 2013). Whether or not the moral licensing effect occurs when the good deed is mandatory is subject to debate (Clot et al., 2016; Engelmann et al., 2017). Applied to farmers' behaviour, it could be that, when obliged to adopt more environmentally friendly farming practices, farmers may feel entitled to do less for the environment on a voluntary basis.

4.2. The effect of reducing basic income support for sustainability

The second effect that this study investigates is the reduction in the amount of BISS. With a higher budget for eco-schemes, farmers will probably face a reduction in their BISS. How will this reduction in BISS affect their willingness to enrol in voluntary schemes such as eco-schemes and AECMs?

The most relevant behavioural literature with respect to this question uses dictator games (Kahneman et al., 1986), in which participant A receives an endowment, which they are asked to split between themselves and participant B. Participant A can choose to donate any amount, which includes the possibility of giving nothing to participant B. In some versions of this dictator game, participant B is not a person but a charity (e.g. Eckel & Grossman, 2003). Dictator games are relevant to understanding farmers' adoption of environmentally friendly practices because these practices often entail a (short-term) cost or loss of income (Banerjee et al., 2014) and the provision of a public good. Farmers can be the 'dictators', deciding how much they are willing to reduce their income or increase their costs for the benefit of the environment. Dictator games with farmers have used donations to an environmental programme as a proxy for farmers' willingness to adopt more environmentally friendly farming practices (Alpízar et al., 2013; Kaczan et al., 2019; Kits et al., 2014).

A reduction in BISS for farmers would translate into a reduction in endowment in such dictator games. How does behaviour change, in these dictator games, when endowment varies? In absolute terms, when endowments are lower, donations are lower. For instance, when dictators receive USD 100, they give on average USD 25; but, when they receive USD 10, they give on average USD 3.3 (Carpenter et al., 2005). Since the range of permissible donations is very different, this difference in absolute terms is straightforward. In relative terms, the pattern is less intuitive. In the abovementioned study, dictators who receive USD 100 give on average 25 % of their endowment, whereas those who receive USD 10 give on average 33 % of their endowment to the other participant. Recent meta-analyses show that, when dictators receive a lower endowment, they tend to donate a slightly larger proportion of their endowment (Engel, 2011; Larney et al., 2019). Applied to the reduction in BISS, this would suggest that lower BISS would lead to higher relative voluntary contributions to the environment. However, unlike in these dictator games, farmers participating in an eco-schemes would receive compensation in return. Very few studies have looked at dictators' behaviour when donations are subsidised (for an exception, see Eckel & Grossman, 2003).

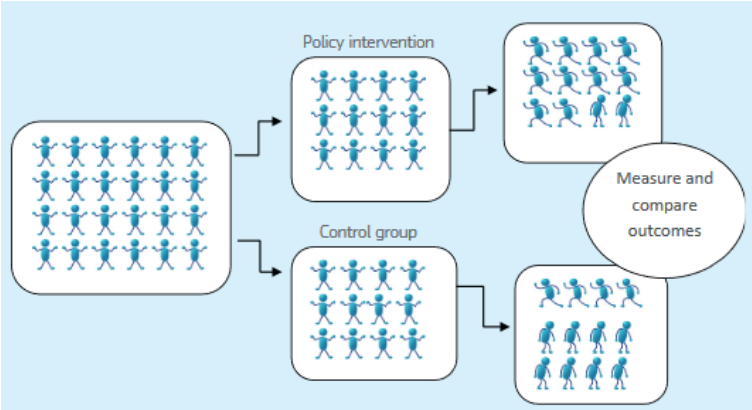
Donations may depend not only on the endowment in the game itself, but also on participants' income in real life. In different populations, a change in endowment may have different effects. Raihani et al. (2013) observed that Indian players were less generous (in relative terms) in games with a USD 10 endowment than with USD 1 and USD 5 endowments. On the other hand, no such effect was observed in the United States. It may be caused by the fact that the same amount of money may have different values in different places in the world. Applied to farmer's behaviour, this may mean that the effect of reducing BISS may be different depending on their income and their dependence on direct payments.

5. Methodology

5.1. General methodological approach

There are different tools to collect behavioural evidence, such as qualitative interviews, surveys and experiments. In this research, we opted for a **behavioural experiment**. In a behavioural experiment, participants are randomly allocated to one of several experimental conditions (which constitute the independent variable), and their behaviour (i.e. the outcome variable) is compared across these experimental conditions (see Figure 7). Often, the experimental conditions will include a 'control' condition (a situation corresponding to the status quo, e.g. absence of policy intervention or current policy framework) and a 'treatment' condition (exposing participants to a different situation, e.g. to a specific policy intervention). By controlling for all other factors that might influence behaviour, experiments can isolate the effect of the differences introduced between the experimental conditions (Jacquemet & l'Haridon, 2018). Behavioural experiments are well suited to compare ex ante the causal effects of different policy options, including in agriculture (Colen et al., 2016; Viceisza, 2016).

Figure 7. Basic principles of an experimental design



Source: van Bavel et al. (2013).

There are various channels through which one can collect behavioural experimental evidence:

- in the field – here, the experiment takes place in real life and participants are generally unaware that they are participating in an experiment;
- in a lab – in this case, participants come to a facility where the experiment takes place;
- online – here, participants use a computer, a tablet or a smartphone to indicate their responses, without being in a laboratory.

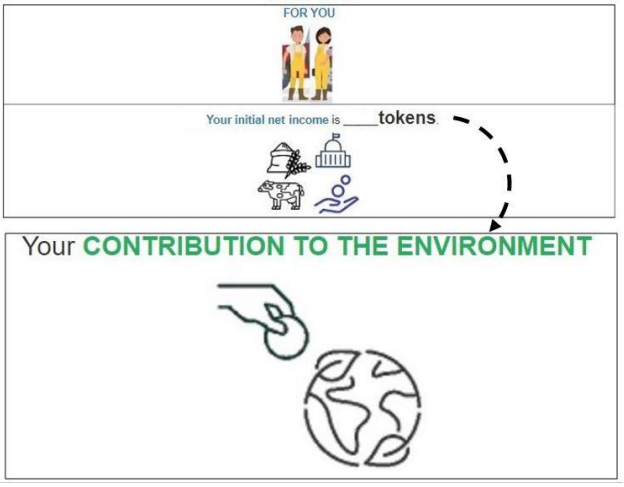
Collecting experimental behavioural evidence in the field can offer high ecological validity; the behaviour observed in the experiment reflects real-world behaviour relatively well. However, its internal validity (i.e. the isolation of the causal relationship) is more challenging (Harrison & List, 2004). It is often difficult, and sometimes impossible, to implement natural field experiments given the practical, ethical, and sometime legal limitations they often have. In the case of this research, it would mean, for instance, actually randomly allocating farmers to different levels of conditionality. Given the legal impossibility of doing so, we rejected data collection in the field. Behavioural evidence collected in a lab offers a high level of internal validity: labs make it possible to control for a high number of confounding factors, meaning that the causal relationship between the independent variable and the outcome variable has a high validity. Collecting behavioural evidence in labs is very costly to implement if the population is dispersed and has high opportunity costs, as is the case for farmers. Budget restrictions led us to reject collecting evidence in the lab. Collecting evidence online allows less control and it is more difficult to hold factors constant – for instance, people access the experiment at different times of the day, alone or with other people around them. However, online experiments can be a cost-effective method, especially for studying farmers in the EU. Therefore, in this research, we opted for **online data collection**, whereby farmers accessed a web link from a computer. The experiment was **self-administered**, meaning that we had no colleague reading out the questions or assisting participants as they were responding to the questions.

5.2. The basic decision task

The experiment used **tokens** to represent money and to measure farmers' adoption of more environmentally friendly farming practices (see Figure 8)**.** The first steps were as follows.

1. Participants **received a certain number of tokens**, which represented their **initial net farm income**. Participants were told that this initial net farm income included their profits from selling crops or livestock products and their direct payments from the CAP.
2. Participants then chose **how many of these tokens they wanted to contribute to the environment**. The tokens contributed to the environment represented the reduction of profits that farmers face in the short term when they adopt more **environmentally friendly farming practices** ([2]).

Figure 8. Basic decision task as presented to participants



This type of experimental setting resembles a **dictator game**, a popular experiment in behavioural economics, in which a participant receives an endowment and decides how to split it between themselves and another participant (Engel, 2011) (see Section 4.2). Our experimental setting is similar to that of emerging research investigating farmers' adoption of environmentally friendly practices (Alpízar et al., 2013; Kaczan et al., 2019; Kits et al., 2014).

Harrison and List (2004) provide a classification of behavioural experiments, which includes the level of context as a key criterion to take into account. An experiment can be very abstract – for instance giving tokens to participants without saying what they represent – or very contextualised – for instance asking farmers to choose between spraying less pesticide and increasing the size of a buffer strip. This experiment was **semi-contextualised**: while it clearly framed the decision within a farming context, it intentionally did not specify the type of environmentally friendly agricultural practices that farmers had to adopt and it did not refer to monetary amounts. Generally speaking, when the objective of the research is to test general theories across a wide range of contexts, decontextualised experiments are warranted (Alekseev et al., 2017). In this research, the extreme variety of agricultural and environmental contexts, both between and within Member States, and between farmers (e.g. big vs small farms) precluded providing more context for the decision task in the experiment. Providing more context would have entailed that participants would have differing perceptions of the differences between the experimental conditions, thereby decreasing the validity of the findings. At the same time, it was advisable to provide *some* context – by framing the decisions in terms of farming practices – because the context itself is relevant to assessing farmers' behaviour, and because, if they had faced a completely abstract experimental task, farmers might have inferred themselves a context that the experiment would not control for (Harrison & List, 2004). In addition, adding context to an experiment might enhance realism and comprehension (Meraner et al., 2018; Rommel et al., 2017, 2019).

([2]) Very often, implementing environmentally friendly farming practices can be profitable in the long term (e.g. cover crops - see Marcillo & Miguez, 2017). However, to simplify the experiment as much as possible, and in line with other behavioural research (Banerjee et al., 2014), we assumed that environmentally friendly practices are costly in the short term and that farmers perceive them as such (Michel-Guillou & Moser, 2006).

In practical terms, this type of semi-contextualised decisions allowed valid comparisons between types of farmers, and allowed the inclusion of all types of farming activities in the target population (e.g. livestock farms, farms specialised in permanent crops, farms specialised in annual crops). Several researchers (e.g. Kits et al., 2014) have successfully used this type of semi-contextualised decision settings with farmers, for the same reasons as we do.

In terms of disadvantages, the relative abstractness of this type of decision can result in participants having some difficulty understanding the task. We mitigated this risk by exposing participants to an instruction video and by subsequently asking them comprehension questions and providing feedback on participants' answers, in order to reinforce their understanding of the basic tenets of the experiment.

5.3. Instructions and token allocation task

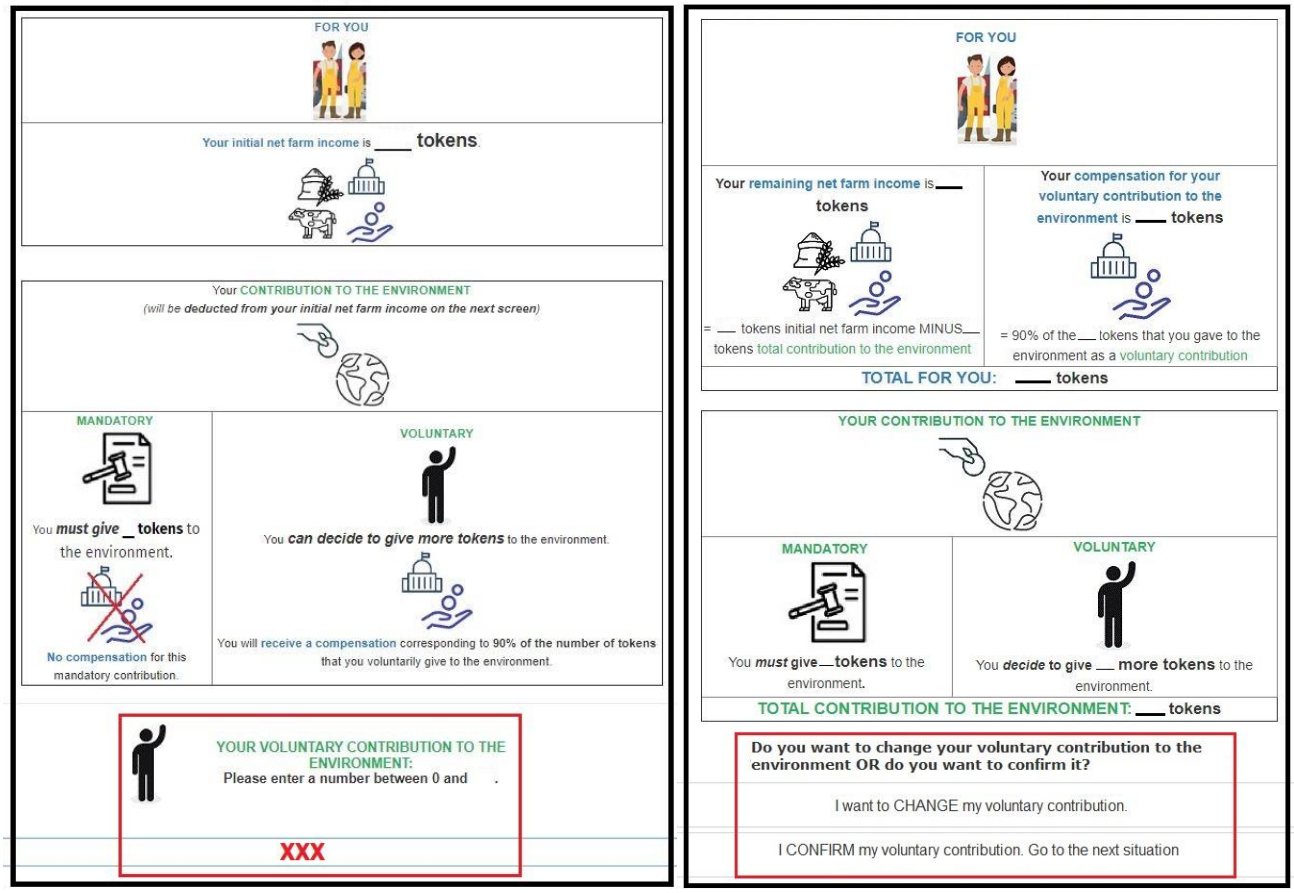
After answering a series of filter questions to ensure that they belonged to the target population (see Section 6.1), participants saw a 3-minute **instruction video** detailing the features of the experiment. Then participants had the opportunity to watch the video again or see the same explanations in writing, should they have encountered technical problems or difficulty in understanding. Annex 1 shows the complete written instructions.

In addition to the basic decision task described in Section 5.2, the instructions told participants the following.

3. Participants had to give a certain number of tokens to the environment as a **mandatory contribution**. For this mandatory contribution, participants received no compensation. This mandatory contribution approximately represented the costs of implementing mandatory practices under **conditionality** ([3]).
4. Participants could decide, if they wanted to, to contribute more tokens to the environment as an additional **voluntary contribution**. This voluntary contribution to the environment in the experiment was a proxy for farmers' level of **enrolment in eco-schemes**. For this voluntary contribution, participants received **compensation** corresponding to **90 %** of the number of tokens voluntarily contributed to the environment. In this way, we considered the policy option in which eco-scheme payments are granted as compensation for all or part of the additional costs incurred and income forgone as a result of the commitments (European Commission, 2018e, Article 28). Although, in theory, eco-schemes should compensate for 100 % of farmers' costs incurred and income forgone, we chose to give a 90 % compensation in this experiment to account for behavioural biases and factors occurring in real life, such as administrative costs, learning costs and status quo bias. Later, participants were told that both the voluntary contribution and the compensation were binding for 1 year only.
5. Participants saw, on the **first screen** (image on the left in Figure 9), their initial net farm income and their mandatory contribution. On this screen, **participants entered their voluntary contribution** to the environment (red box on the left image in Figure 9).
6. On the **second screen** (image on the right in Figure 9), farmers saw the **result of their decision**: their net farm income was reduced by their total contribution to the environment, they received a compensation if they made a voluntary contribution, and they saw their mandatory and voluntary contributions to the environment. Participants could then either validate their voluntary contribution or go back to the first screen and modify it.

([3]) Under the current CAP, farmers receive a greening payment if they implement the associated environmentally friendly practices. The payment of BISS is also contingent on farmers respecting the rules under cross-compliance. As conditionality is linked to granting such CAP payments, and in order to simplify the experiment, mandatory contributions to the environment in the experiment were not compensated for.

Figure 9. Token allocation task (first screen on the left, second screen on the right)



5.4. Assumptions and simplifications

The idea behind the token allocation task presented above was to simplify and make salient some of the main parameters that farmers face when choosing whether or not to enrol in voluntary schemes to adopt more environmentally friendly practices. The objective was not to account for all the complexities, contexts and dynamics of such a decision.

Therefore, when interpreting the findings, it is important to understand and consider the assumptions and simplifications embedded in this experiment (see Box 3).

Box 3. Simplifications and assumptions of the experiment

- 90 % compensation: participants received compensation for their voluntary contribution to the environment, amounting to 90 % of the number of tokens voluntarily contributed. This level of compensation was chosen to approximately reflect the real-life additional costs (e.g. administration, behavioural change) a farmer would face when participating in an eco-scheme compensating for 100 % of costs incurred and income forgone.
- Immediate and red tape-free compensation: participants received the compensation for voluntary contribution immediately and automatically.
- 100 % compliance: participants had to comply with the mandatory contribution to the environment and could not opt out of direct payments.
- No compensation for mandatory contribution: participants received no compensation for the tokens they had to contribute as a mandatory contribution. This was done to simplify the experiment and also because conditionality is linked to granting area-based CAP payments.
- Salient and transparent costs and benefits: unlike real life, in which the short-term losses in profit associated with environmentally friendly farming practices and profits are not always straightforward, in this experiment, participants knew precisely what the loss would be.
- Social isolation: participants made their decisions in isolation, and were not aware of other participants' behaviour.
- Static choices: participants made their decisions based on the short-term loss in profit associated with environmentally friendly practices. In the long run, this type of practice can be profitable. There were no learning effects or investment spill overs (e.g. sunk costs effects) associated with the adoption of environmentally friendly practices.
- No representation of farmer heterogeneity: in real life, farmers have different levels of income and wealth, and different levels of CAP direct payments compared with farm income. We intentionally kept these variables constant in order to increase the internal validity of the findings.
- No budget restriction: the experiment did not restrict choices taking into account a lack of budget (e.g. if participants voluntarily contributed too many tokens to the environment) or availability of budget (e.g. if participants contributed too few tokens voluntarily).

5.5. Factorial design

The bottom part in Figure 6 in Section 2.1 illustrated the process of operationalising the research questions into an experimental design. Participants were randomly allocated to one of the following two conditions or 'treatments' (**between-subject factor**).

- Variation in mandatory contribution to the environment
  This condition mimicked the different levels of **conditionality**.
- Variation in direct payments
  This condition was a proxy for the different budget splits between **eco-schemes** and BISS.
  Participants in this experimental condition were told that any variation in their initial net income was due to a variation in their direct payments ([4]).

Within each of these conditions, each participant was subsequently exposed to three different levels (see Table 4 – **within-subject factor**), presented in random order, with the same absolute gap between them. We chose these levels based on policy realism and on the need to ensure sufficient contrast between the levels to detect changes in behaviour.

([4]) A more accurate labelling of this treatment would have been variation in BISS. However, in order to simplify the experiment, the increase in the budget for eco-schemes was translated as variation in direct payments. This was justified by the fact that farmers are not familiar with the voluntary characteristic of eco-schemes in Pillar I (as stated previously, current greening can be considered virtually mandatory). It was therefore deemed cognitively easier for participants to talk about variation in direct payments.

- The initial net income of 300 tokens was selected to allow sufficient variation in the outcome variable, a value similar to that used by Kaczan et al. (2019).
- The mandatory contribution of 5 tokens was supposed to represent the average costs for EU farmers of implementing the mandatory measures under greening. These costs range between 0.7 % and 3 % of farmers' total income (European Court of Auditors, 2017). Taking 1.85 % as an average, we get 5 tokens.
- The 35-token reduction in direct payments between Level 1 and Level 2 in the condition 'variation in direct payments' corresponded to 38 % ring-fencing for eco-schemes – considering an average share of 30 % of direct payments in farmers' income ([5]) (European Commission, 2020).
- The 85-token reduction in direct payments and equivalent 85-token increase in mandatory contribution between Level 1 and Level 3 was set to ensure contrast between experimental conditions, and is in line with previous research (Eckel & Grossman, 2003; Kaczan et al., 2019; Keser et al., 2017).

Table 4. Experimental design and levels

	Framing of variation	**Parameters**	**Within-subject factor** (Every participant was exposed to all three levels, one after the other, in random order)		
			Level 1	**Level 2**	**Level 3**
Between-subject factor (Every participant was randomly allocated to one and only one of these two experimental conditions)	Variation in mandatory contribution to the environment	Held constant: Your initial net income is **300** tokens.	MANDATORY You *must give* **5** tokens to the environment.	MANDATORY You *must give* **40** tokens to the environment.	MANDATORY You *must give* **90** tokens to the environment.
		Gap from Level 1		+ 35 tokens	+ 85 tokens
		Disposable initial net income (= initial net income – mandatory contribution)	295 tokens (= 300 – 5)	260 tokens (= 300 – 40)	210 tokens (= 300 – 90)
	Variation in income, framed as variation in direct payments	Held constant: MANDATORY You *must give* **5** tokens to the environment.	Your initial net income is **300** tokens.	Your initial net income is **265** tokens.	Your initial net income is **215** tokens.
		Gap from Level 1		– 35 tokens	– 85 tokens
		Disposable initial net income (= initial net income – mandatory contribution)	295 tokens (= 300 – 5)	260 tokens (= 265 – 5)	210 tokens (= 215 – 5)

5.6. Real incentives

In line with theory and common practice in experimental economics (Guala, 2005), this experiment used real incentives to get farmers to *reveal* their preferences. Other experiments, which only get participants to *state* their preferences (i.e. non-consequential behaviour) fail to address the following biases.

- The **hypothetical bias**, that is, participants overstating their economic valuation of a good or their willingness to contribute to a public good, compared to what they are willing to pay or contribute in

([5]) Reduction in direct payments × average share of direct payment in income × income in Level 1 = 0.38 × 0.30 × 300 tokens = 34.2 tokens, rounded to 35 tokens.

real life (Ajzen et al., 2004; Champ & Bishop, 2001; Murphy et al., 2005). In other words, if participants' decisions in the experiment had no real consequences for them, they may have been more likely to contribute more tokens to the environment than they would in real life.

- The **social desirability bias**, that is, vulnerability to socially desirable responding (Crowne & Marlowe, 1960). This bias, which could aggravate the hypothetical bias, is likely to be present when the experiment captures environmentally friendly farming practices, as farmers tend to consider them socially desirable (Läpple & Kelley, 2013).

In this experiment, some participants saw their **decisions actually implemented**, a common practice in behavioural economics experiments (Charness et al., 2016). In practical terms, a computer program randomly selected 1 in 20 participants, and then one of their three decisions. The tokens corresponding to the final pay-offs in the experiment (i.e. participant vs environment) were converted into euro or zlotys. We used the Organisation for Economic Co-operation and Development monthly comparative price levels (OECD, 2020) to calibrate the conversion rates in the three selected Member States (see Table 5), rounding the amount up or down to the nearest EUR 0.05 or PLN 0.05. Participants were informed about this mechanism prior to allocating their tokens.

Table 5. Experimental token – euro/zloty conversion rate

Member State	**1 token =**
Germany	EUR 0.40
Spain	EUR 0.35
Poland	PLN 1.00

Randomly selected participants then received a voucher whose amount corresponded to their converted pay-off, to spend on Amazon (in Germany and Spain) or Allegro (in Poland), the most popular online shopping websites in their respective countries (Statista, 2020). The amount corresponding to their total contribution to the environment was transferred to the environmental programme 'A Tree for You'. This French NGO uses the money received in donations to plant trees. We selected this programme based on the following criteria:

- resemblance to the environmental benefits of adopting more environmentally friendly practices – reforestation contributes to reducing or reversing biodiversity loss and to mitigating climate change (Cunningham et al., 2015);
- potential to be part of the eco-schemes – in 2019, the EU Commissioner for Agriculture proposed the '1 hectare initiative', consisting in rewarding farmers with payments for the afforestation of 1 ha (European Commission, 2019);
- trustworthiness of the programme – 'A Tree for You' is a registered NGO under French law (*Loi 1901*) co-founded by French public authorities (A Tree for You, 2019);
- farmers' favourable or neutral attitude towards the programme – a pretest (see Section 5.9.1) revealed that this was the case.

5.7. Other outcome variables and psychological variables

In addition to the token allocation, we introduced three non-incentivised (i.e. with no monetary consequences for participants) outcome variables:

1. farmers' perception of the fairness of the different levels of mandatory contributions or direct payments, on a scale from 1 (very unfair) to 7 (very fair);
2. farmers' self-reported likelihood of participating in an AECM ([6]), on a scale from 1 (very unlikely) to 7 (very likely);
3. farmers' opinions regarding the CAP, consisting in agreement with the following statements, on a scale from 1 (completely disagree) to 7 (completely agree) – the wording of these statements was drafted together with the Directorate-General for Agriculture and Rural Development:
    - 'The CAP should link support to farmers to more mandatory adoption of environmentally friendly practices',
    - 'The CAP should support farmers' voluntary adoption of environmentally friendly practices',
    - 'I consider CAP direct payments as a right as long as I fulfil my obligations as a farmer',
    - 'I need CAP support to keep being a farmer'.

Finally, we measured various psychological variables, including the following.

- General environmental concern. An environmental concern index was constructed as the mean of the five items (Dunlap & Van Liere, 1978) on a scale from 1 to 7 (Cronbach's α =.79).
- Trait reactance (Hong & Faedda, 1996), that is, the predisposition to be negatively aroused when one experiences a threat to or loss of freedom (Brehm, 1966). This dispositional variable is likely to be linked to increasing mandatory contributions to the environment. A trait reactance index was constructed as the mean of the five items on a scale from 1 to 7 (Cronbach's α =.90).

5.8. Sociodemographic and farm-related variables

We collected the information in Table 6 regarding participating farmers.

The purposes of including these variables were:

- to assess the representativeness of the sample;
- to assess if the strength of the effect of the independent variables on the dependent variables depended on these variables (moderating role) – for instance, do younger farmers react differently from other farmers to a variation in mandatory contributions?

([6]) 'Consider now that you could participate in an agri-environmental scheme. This type of voluntary scheme would be more demanding, but also more targeted to your farm. You would enrol for several years. You would receive a compensation covering 90 % of the costs you incur. How likely is that that you would participate in a more demanding, multiannual agri-environmental scheme with 90 % compensation for your costs, in each of the following situations?'

Table 6. Sociodemographic and farm-related variables measured before or after the experiment

Farmer-related variables	Farm-related variables
- Age - Gender - Educational level - Psychological variables (see Section 5.7)	- Farm specialisation (crop, livestock, mixed) - Farm size - Share of direct payments in farmer's income - Participation in AECMs - Organic farming - Region - Presence of livestock on the farm - Types of livestock on the farm - Types of temporary crops - Types of permanent crops - Greening requirements that farm has to comply with

5.9. Piloting, preregistration and ethical approval

In order to achieve maximum quality, we implemented the following measures ex ante: extensive piloting, preregistration, and ethical approval.

5.9.1. Extensive piloting

In November 2019, we tested a first version of the behavioural experiment by combining:

- **face-to-face pilots** with 15 farmers (i.e. 5 farmers in each of the three Member States where the experiment took place) with whom we could interact on an individual basis in order to assess their understanding of the experiment;
- **online pilots** with 30 farmers (i.e. 10 farmers in each of the three Member States) participating on their own with their computers or tablets (as they would in the actual experiment).

This first series of pilots revealed some issues in terms of complexity of the experiment, lack of salience of the differences of the parameters between the subsequent decision tasks, and duration of the experiment.

We developed an entirely new visualisation of the token allocation task in April 2020. Fourteen Spanish farmers carried out the experiment from home in May 2020. We collected feedback on comprehension through an online follow-up questionnaire and, in some cases, through a qualitative discussion over the phone. We tested two different versions of the token allocation task. Overall, participants indicated that they understood the general logic of the experiment. However, they also identified a few terms that were unclear to them. This second pilot led to some further adjustments.

5.9.2. Preregistration of the experiment

Experiments have been famously criticised for failing to replicate findings from previous research (Open Science Collaboration, 2015). '*P*-hacking' refers to a practice whereby researchers conduct ever more sophisticated analyses on an existing data set in hopes of arriving at a significant result (i.e. one in which $p < .05$, hence the term '*p*-hacking'). These analyses are ex post, and often do not correspond to the initial hypotheses or research questions.

The currently accepted means to prevent this practice is to register the study's hypotheses or research questions and analysis plans in a public repository before the fieldwork and analysis are conducted (Christensen & Miguel, 2018; van 't Veer & Giner-Sorolla, 2016). For this study, we preregistered the basic experimental design and

the pre-analysis plan on the dedicated platform aspredicted.org.

5.9.3. Ethical approval

We obtained an ethical approval from the German Association for Experimental Economic Research for this behavioural experiment. Prior to starting the experiment, participants were informed about the fact that participation was voluntary, about the compensation they would receive to participate in the study, the duration, absence of risk, confidentiality, general study purpose and the list of study sponsors. No deception was used. Based on this information, participants had to click on “I accept” to give their informed consent

6. Fieldwork, sample and quality controls

6.1. Fieldwork

Kantar Spain and its subcontractors recruited participants through a '**push-to-web**' method: a trained interviewer called potential farmers by telephone to invite them to participate in the study. The **sampling frame** consisted in a list of individuals or firms operating in the agricultural sector, gathered mainly through public phone directories (e.g. the yellow pages and dedicated farmer directories) and marginally through internet searches. In contrast with studies that use panels as a sampling frame, this type of ad hoc recruitment could increase participant engagement in the study, decrease demand effects (i.e. participants who participate in experiments more often end up being able to detect the precise goal of the study and adapt their behaviour), and may even increase representativeness (Hays et al., 2015; Sharpe Wessling et al., 2017).

Although the European Commission's Joint Research Centre was mentioned during recruitment and in the consent form, the study was not blatantly advertised as a European Commission sponsored study. This was done in an effort to decrease the chance of self-selection in recruitment, as well as the risks of strategic bias (i.e. see above), demand effects (i.e. participations misrepresenting their true behaviour to influence policymaking decisions), and protest behaviour (i.e. participants refusing to 'play the game') in the experiment (Galesic & Tourangeau, 2007; Groves et al., 2012; Villanueva, Glenk, et al., 2017).

Farmers had to meet the following **eligibility criteria** associated with the **target population** to participate in the experiment:

- being a farmer, currently active;
- being actively involved in making important decisions on the farm, such as which crop to grow or which livestock to breed;
- having received direct payments from the CAP in 2019;
- not having participated in a survey on environmentally friendly agriculture less than a month ago – this criterion was included as one of the measures to avoid double participation;
- being 18 years old or older.

We requested that 200 participants be recruited in each of the three selected Member States. We determined this **sample size** based on a statistical power analysis ([7]), a technique to ensure that effects existing in reality have a sufficient chance of being detected in the experiment.

The goal of this project was not to get precise estimates of population values, as is generally the case in surveys. Therefore, we aimed at a *fairly* representative sample. To do so, we introduced **soft quotas** on farm size, farmer age and type of farming, based on Eurostat data.

Fieldwork started on 24 September 2020 and ended on 14 October 2020.

6.2. Sample

6.2.1. Introduction

As requested, the final sample consists of 200 farmers in each of the selected Member States, with a total of 600 farmers who completed the whole questionnaire.

In the next sections, we detail the characteristics of the sample. Where possible and relevant, we compare the sample with Eurostat data. Three words of caution are worth mentioning. First, as mentioned before, the goal was to obtain a fairly representative, rather than a perfectly representative, sample. Second, Eurostat data is based on the Farm Structure Survey, which is not a census and is therefore not fully representative of the farmer population. Finally, the available Eurostat data does not always fully correspond to the target population

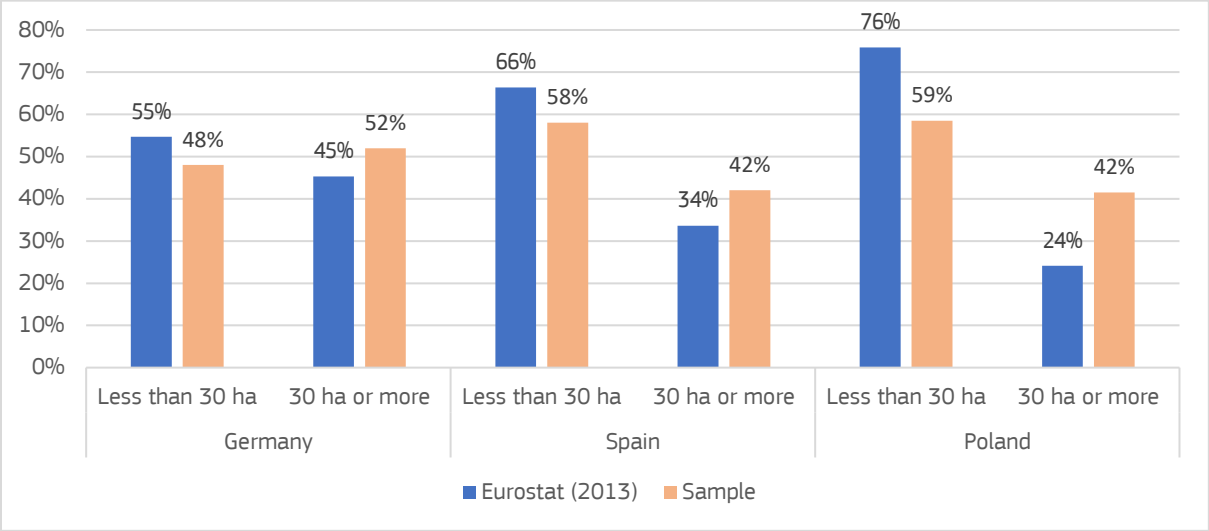
([7]) At country level, there are 33 participants per condition between subjects (considering the first level of the within-subject factor as a between-subject factor), and 100 if we pool the three decisions associated with within-subject treatments. This allows us to detect large effects (Cohen's *d* of 0.8) at common levels of alpha = 0.05 and beta = 0.2/*P* = 0.8 in a two-sided two-sample *t*-test at country level. As we did not know the distribution of the outcome and there were no good priors, we used *t*-tests to guide our sample size calculations. Because we collected data in three countries and expected to do additional within-subject tests (which have greater statistical power), we also expected to be able to detect smaller effects for other tests (following the previous logic of using *t*-tests to guide the deliberations). For instance, a two-sided one sample *t*-test for a Cohen's *d* of 0.5/0.2 requires a sample size of 34/199 subjects per condition (for alpha = 0.05 and beta = 0.2).

of this study, rendering the comparison not entirely valid. The target population of the Farm Structure Survey is, essentially, all farms of 1 ha or more (European Parliament & European Council, 2008), whereas one of the criteria for the target population of this study was that farmers should receive direct payments from the CAP.

6.2.2. Farm size

Figure 10 presents the comparison of the farm size distributions between Eurostat data and the sample for this study.

Figure 10. Sample representativeness of farm size (utilised agricultural area)



Source: Eurostat (ef_kvftaa) and authors' own elaboration. Total farm size in the sample was determined by adding up participants' replies to the following question: 'In 2019, approximately how many hectares did you allocate to annual/temporary crops, permanent crops and permanent grassland/pasture?' Participants were provided with an explanation of each type of land use.

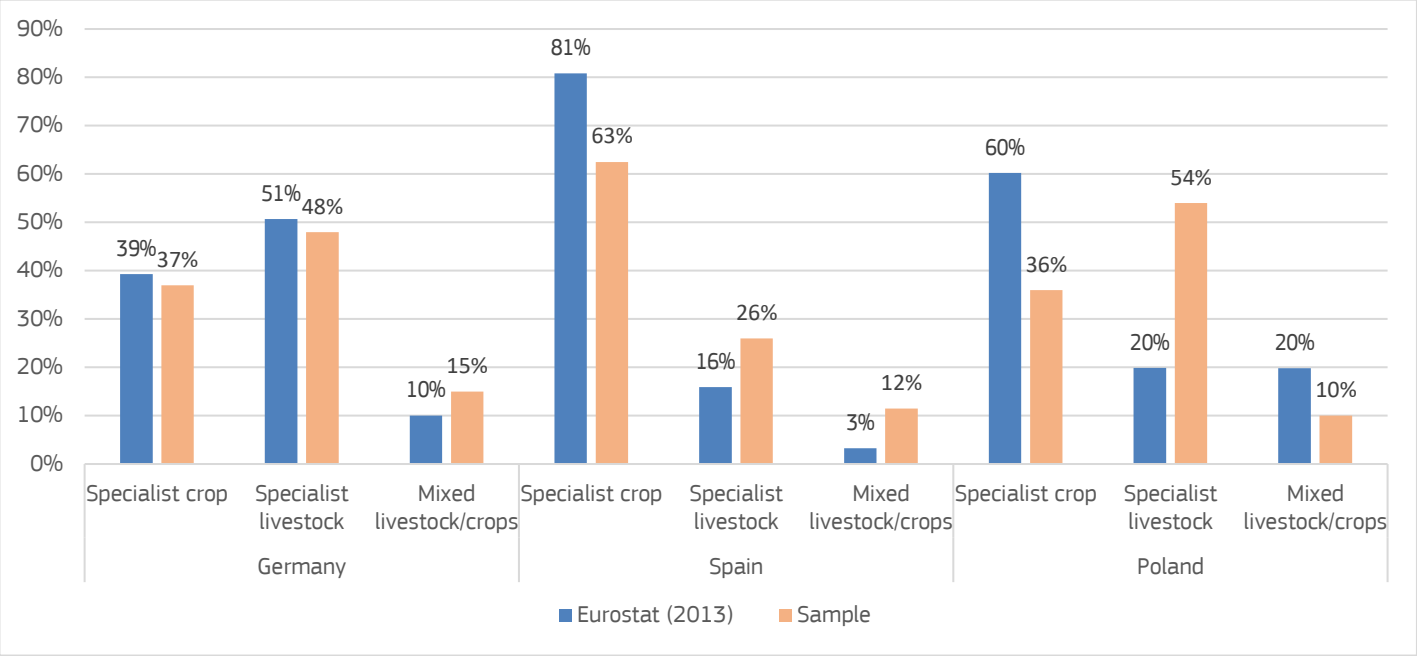
Regardless of the caveats about comparing the sample with Eurostat data (see Section 6.2.1), one can observe that the sample is fairly representative with respect to farm size, deviating by 7 percentage points in Germany and 8 percentage points in Spain. In Poland, and to a lesser extent in the two other countries, small farms are under-represented. The higher likelihood of bigger farms to participate in surveys and studies is a recurrent issue (see for instance the survey of Polish farmers referred to in Section 3.4). However, these deviations are all within the acceptable margins established for the soft quotas established before fieldwork.

6.2.3. Type of farming

As shown in Figure 11, the sample is fairly close to Eurostat figures in Germany in terms of types of farming, with deviations of no more than 5 percentage points. In Spain, livestock specialists are over-represented and crop specialists under-represented. The sample in Poland comprises more than double the proportion of livestock specialists in comparison with Eurostat data.

Following Eurostat's approach, the classification of participants into crop specialists, livestock specialists and mixed livestock/crops was based on participants' assessment of whether the share of crops or livestock represented more or less than 66 % of their yearly income from selling crops or livestock. We cannot rule out the possibility that farmers did not read this question properly and misunderstood the denominator as profits or all income (i.e. including non-farm-related income).

Figure 11. Sample representativeness of type of farming

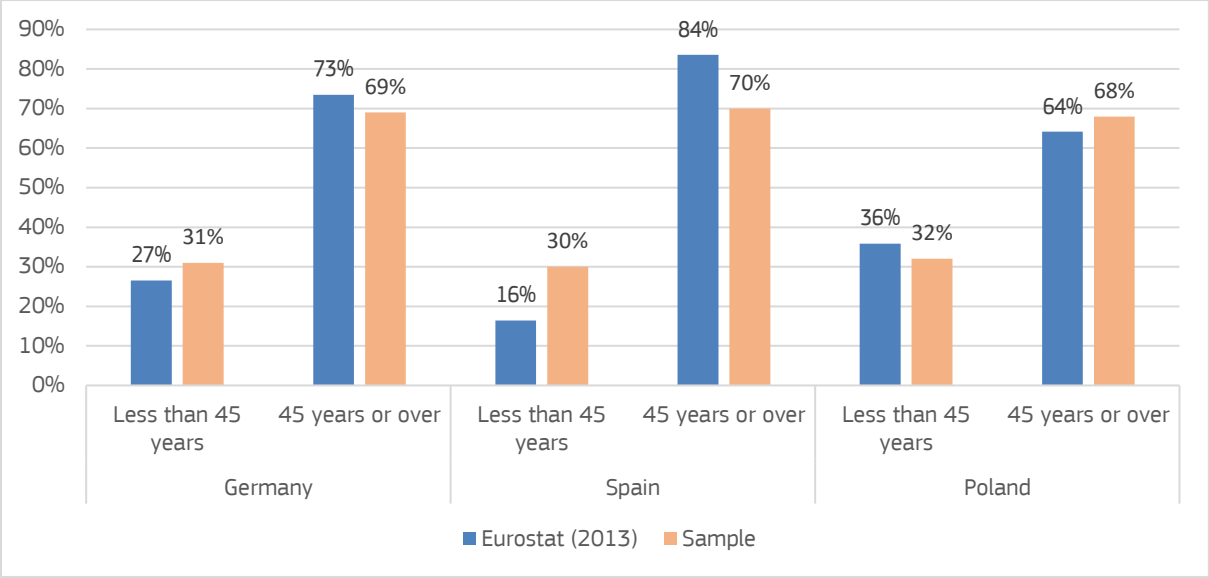


Source: Eurostat (ef_kvftaa) and authors' own elaboration. Type of farming in the sample was determined based on the replies to the following question: 'Think of the total yearly income you get from selling crops and livestock. Would you say that livestock/crops represent(s) more than ⅔ (= 66 %) of this income?'

6.2.4. Farmer age

Figure 12 shows the distribution of participants in each country with respect to their age, and the same distribution in the population. Note that the latter is based on data about farm managers (Eurostat: ef_mptrainman). In contrast, the target population of this study included not only, strictly speaking, farm managers, but also any farmer who participates in important decisions related to their farm, for instance which crops to grow or which type of livestock to breed. Therefore, one should be cautious when assessing the sample representativeness based on age.

Figure 12. Sample representativeness of farmer age



Source: Eurostat (ef_mptrainman) and authors' own elaboration. Farmer age in the sample was based on farmer birth year.

In spite of this caveat, one can assume that the sample is fairly representative of the farmer population when it comes to age. In each of the three selected Member States, older farmers are under-represented, but the deviation is within what was considered acceptable ex ante (i.e. through the soft quotas).

6.2.5. Other variables

As shown in Table 7, there is a significant share of female participants in each of the three Member States.

The share of farmers in the sample who engage in certified organic agriculture ranges between 28 % in Germany and 31 % in Poland. Almost half (47.5 %) of participants in Poland are enrolled in AECMs. This proportion is 29 % in Spain and 39 % in Germany. The available statistics for actual organic farming and AECM adoption refer to the share of agricultural land that they cover, rather than to the share of farmers who adopt them (Eurostat, 2020). However, it is safe to assume that the sample is made up of farmers who are more prone to adopt environmentally friendly farming practices than the general farmer population. We assume that this over-representation of 'green' farmers is at least partly due to self-selection bias. In compliance with the existing ethical requirements related to behavioural experiments (e.g. American Psychological Association, 2017), potential participants were informed of the general topic of the experiment (i.e. environmentally friendly agriculture) during recruitment and, prior to starting the experiment, in the consent form. Then, when they were exposed to the instructions, participants also quickly realised that the experiment was about environmentally friendly farming practices. Farmers were free to decline to participate in the first place, and free to abandon the experiment at any stage. Therefore, this self-selection bias is inevitable. However, its effects can be mitigated by assessing and, if relevant, controlling for them in the statistical analyses (see Sections 7.2.3 and 7.3.3).

Table 7. Sample description: farmer gender, organic farming and participation in AECMs

		Country		
Variable	**Value**	**Germany**	**Spain**	**Poland**
Farmer gender ([a])	Male	92.5%	93.5%	93.5%
	Female	7.5%	6.5%	6.5%
Organic farming ([b])	Organic	28.0%	29.0%	31.0%
	Non-organic	68.5%	71.0%	64.5%
	Don't know	3.5%	0.0%	4.5%
AECM ([c])	Currently participates	29.0%	39.0%	47.5%
	Does not currently part.	67.5%	61.0%	51.5%
	Don't know	3.5%	0.0%	1.0%

([a]) Based on reply to question 'Are you…?' 'Male – Female – Other – I don't want to reply'.
([b]) Based on reply to question 'Do you engage in certified organic agriculture?'
([c]) Based on reply to question 'Are you currently participating in an "agri-environment-climate measure"?' Participants were provided with an explanation of AECMs.

Table 8 shows the geographical locations of the participants' farms in each of the three Member States. Although no (soft) quotas were established for farm location, virtually all regions are represented in the sample.

Table 8. Sample description: farm location

Germany		Spain		Poland	
Baden-Württemberg	7.0%	Andalusia	20.0%	Dolnośląskie	2.0%
Bavaria	17.0%	Aragon	4.0%	Kujawsko-pomorskie	5.5%
Berlin	2.0%	Asturias	3.0%	Łódzkie	4.5%
Brandenburg	4.5%	Balearic Islands	3.5%	Lubelskie	6.5%
Bremen	3.0%	Basque Country	4.0%	Lubuskie	3.5%
Hamburg	5.0%	Cantabria	4.0%	Małopolskie	6.0%
Hessen	8.5%	Castile and Leon	6.0%	Mazowieckie	17.0%
Lower Saxony	9.0%	Castile-La Mancha	9.0%	Opolskie	6.0%
Mecklenburg-Western Pomerania	6.5%	Catalonia	6.0	Podkarpackie	5.0
North Rhine-Westphalia	9.0%	Extremadura	5.5%	Podlaskie	6.5%
Rhineland-Palatinate	8.5%	Galicia	6.5%	Pomorskie	8.0%
Saarland	4.0%	La Rioja	4.0%	Śląskie	4.5%
Saxony	6.5%	Madrid	4.5%	Świętokrzyskie	7.5%
Saxony-Anhalt	5.0%	Murcia	4.0%	Warmińsko-mazurskie	7.0%
Schleswig-Holstein	1.5%	Navarre	6.5%	Wielkopolskie	5.0%
Thuringia	3.0%	Valencia	9.5%	Zachodniopomorskie	5.5

6.2.6. Integrated assessment of the sample's representativeness

The sample in this study can be considered fairly, but not perfectly, representative of the farmer population in Germany, Spain and Poland. The sample is made up of farmers who, compared with Eurostat data, may be slightly younger, more likely to be specialised in livestock (especially in Poland), likely to have a bigger farm and much more likely to have adopted environmentally friendly practices.

This imperfect representativeness implies that between-country comparisons should be interpreted with caution.

6.3. Quality controls

6.3.1. Fieldwork monitoring

We personally monitored the recruitment of participants by listening to some of the calls made by the contractor in charge of recruitment. This fieldwork monitoring revealed that, by and large, recruiters respected the script for calling farmers. We also conducted follow-up interviews with participants who volunteered to be called again. These follow-up interviews confirmed that they had a correct understanding of the general instructions for the experiment and that participants in general entered their data correctly.

6.3.2. Comprehension check questions

We included four comprehension check questions that assessed if participants paid attention to and understood the instructions. These questions also helped to reinforce participants' understanding of the instructions. Participants received feedback on their reply (correct vs incorrect answer). In cases of incorrect answers, participants were given an explanation in order to reinforce their comprehension. For three of these four questions, we obtained more than 85 % correct replies. The fourth question, which related to the random selection of one of the three decisions for the implementation of the real incentives, received 51 % correct answers.

6.3.3. Duration

One important way to assess the quality of data is to see how much time participants took to reply. If the completion time is too short, this may be an indication that participants did not pay attention to the instructions or replied randomly. The average, as well as the median, duration for completing the whole questionnaire was 24 minutes, with a minimum of 18 minutes and a maximum of 36 minutes.

On the basis of fieldwork monitoring, the answers to the comprehension check questions and the time taken to complete the questionnaires, none of the participants was dropped from the sample.

7. Findings

7.1. Introduction

This chapter presents the main findings from the experiment, starting from the general effects to then go into more detailed analyses. Box 4 summarises the methodological approach to the statistical analyses. The chapter is structured as follows.

First, we report the effect of varying the mandatory contribution to the environment. This effect is assessed successively on different outcome variables:

- voluntary contribution to the environment;
- total contribution to the environment;
- the proportion of (non-)contributors;
- fairness perceptions;
- likelihood of enrolling in AECMs.

Second, we follow the same sequence to analyse the effect of varying the amount of direct payments.

Finally, we compare the effect of the two framings of variation, that is, variation in mandatory contribution versus variation in direct payments.

Throughout this chapter, we propose initial, short policy messages, which we then develop and discuss further in Chapter 8.

We strongly encourage readers to consider the assumptions and simplifications of the experiment (see Section 5.4) and the representativeness of the sample (see Section 6.2.6) prior to reading these findings and the associated snapshot policy messages.

Box 4. Methodological approach to the statistical analyses

- For all statistical analyses, we pooled the data from the three levels of the within-subject treatments (i.e. the three decisions that each participant took). Although this approach is subject to carry-over effects (Charness et al., 2012), the fact that only one of the three decisions was implemented in the incentive scheme (see Section 5.6) increased the chance of independence between the outcome variables (Charness et al., 2016). In addition, such pooling allowed us to conduct analyses that broke down the sample by country with sufficient statistical power (see Section 6.1).
- We report the mean contribution for all levels. However, all the outcome variables are non-normally distributed (all Shapiro–Wilk p-values < .05). Therefore, we systematically use non-parametric pairwise comparisons to assess whether or not the variables' distributions are statistically different from one another.
- We report only absolute contributions to the environment, owing to their policy relevance. However, in some cases, the range of permissible absolute contributions varies across levels and across treatments. We replicated the analyses considering relative contributions with respect to the maximum permissible contribution as an outcome variable, and found similar patterns.

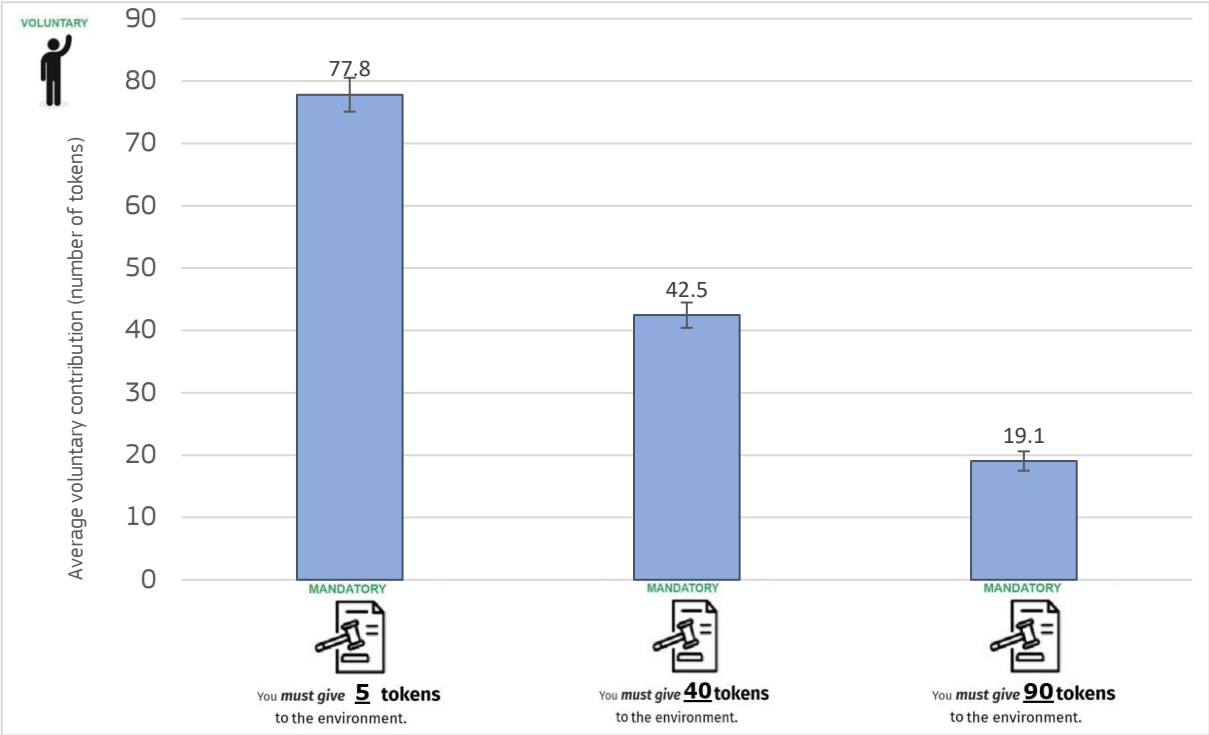
7.2. Variation in mandatory contribution

As mentioned previously, half of the participants were randomly allocated to the experimental condition in which their mandatory contribution varied. For those participants, the initial net farm income was always 300 tokens in all three situations. The number of tokens that participants were obliged to contribute to the environment without any compensation in return, as a mandatory contribution, was 5, 40 or 90. In all situations, participants would get back *compensation worth 90 %* of the number of tokens given as voluntary contributions.

7.2.1. Effect on voluntary contribution

We first assess the effect of the variation in the mandatory contribution on participants' voluntary contribution (see Figure 13).

Figure 13. Average absolute voluntary contributions under different levels of mandatory contribution



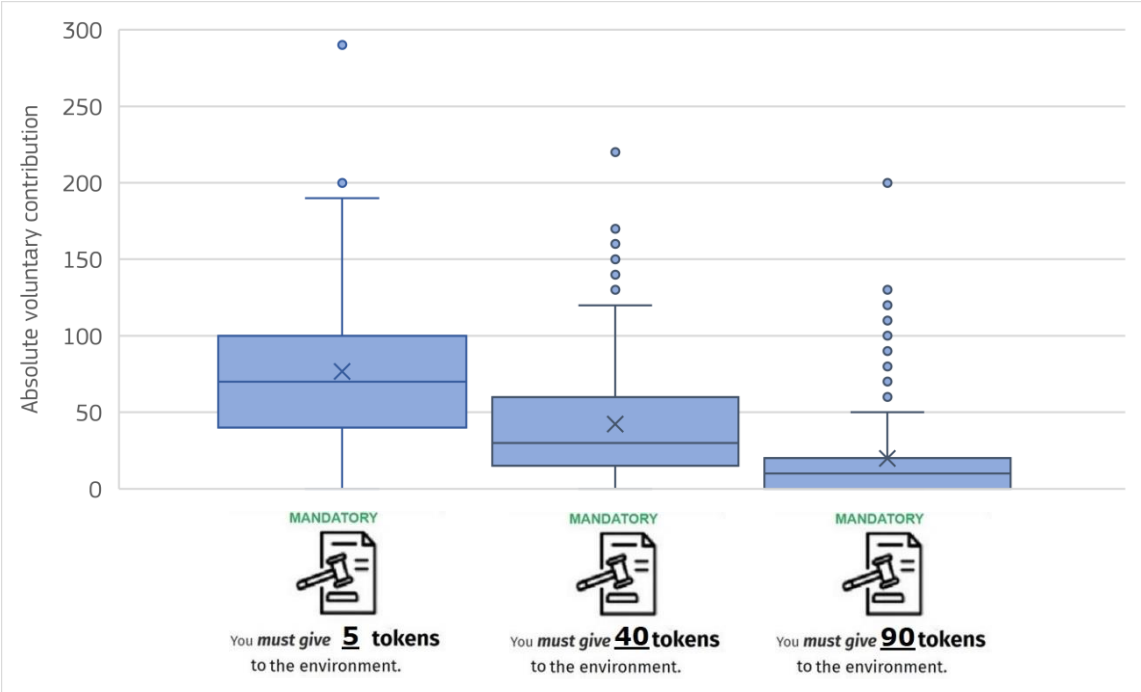
Error bars represent ±1 standard error.

When the mandatory contribution was 5 tokens, participants voluntarily contributed, on average, 78 tokens to the environment. When this mandatory contribution was 35 tokens higher (i.e. 40 tokens in total), participants' average voluntary contribution was 36 tokens lower (i.e. 42 tokens). This represents an almost perfect substitution between the increase in mandatory contribution and the decrease in voluntary contribution. Rather than sending a signal of appropriate behaviour and thereby encouraging farmers to voluntarily contribute more to the environment (see Box 1 in Section 4.1), increasing the mandatory contribution to the environment decreased average voluntary contributions, and it did so by a similar magnitude.

In the extreme situation in which participants had to give 90 tokens as a mandatory contribution (i.e. 50 more than in the second level), we also see a lower voluntary contribution. However, in this case, the decrease in voluntary contribution (23 tokens) was less than proportionate to the increase in mandatory contribution. However, this is partly an artefact of the design, since the average voluntary contribution in Level 2 (42.5 tokens) was lower than the increase of the mandatory contribution between Level 2 and Level 3 (50 tokens).

In Figure 14, we show the distribution of the absolute voluntary contribution in each of the three levels of mandatory contribution, through box plots. The distributions of voluntary contributions in all three levels of mandatory contributions are significantly different from one another (all Wilcoxon test *p*-values < .001).

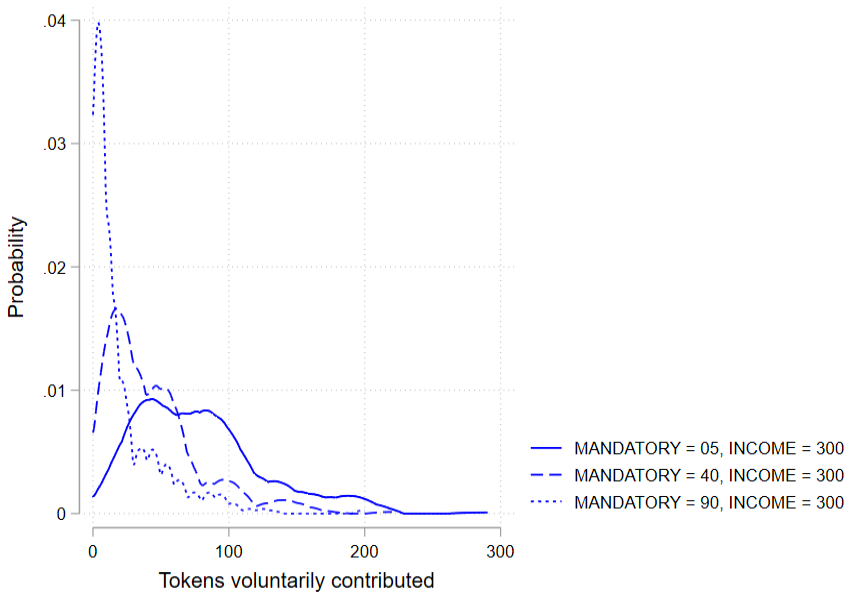
Figure 14. Box plots of absolute voluntary contributions under different levels of mandatory contribution



The horizontal line in the box represents the median. The X in the box represents the mean.
The lower line of the box represents the first quartile. The upper line of the box represents the third quartile.
The whiskers have a value of 1.5 × the interquartile range (third quartile – first quintile). Dots outside the whiskers represent outliers.

Figure 15 shows the (kernel-smoothed) probability density function of the absolute voluntary contributions for the three different levels of mandatory contribution. The x-axis shows the number of tokens voluntarily contributed, and the y-axis shows the probability density. The area under the curve is normalised to 1. The figure shows that increased mandatory contributions led to lower voluntary contributions – the distributions shift to the left with increasing mandatory contributions.

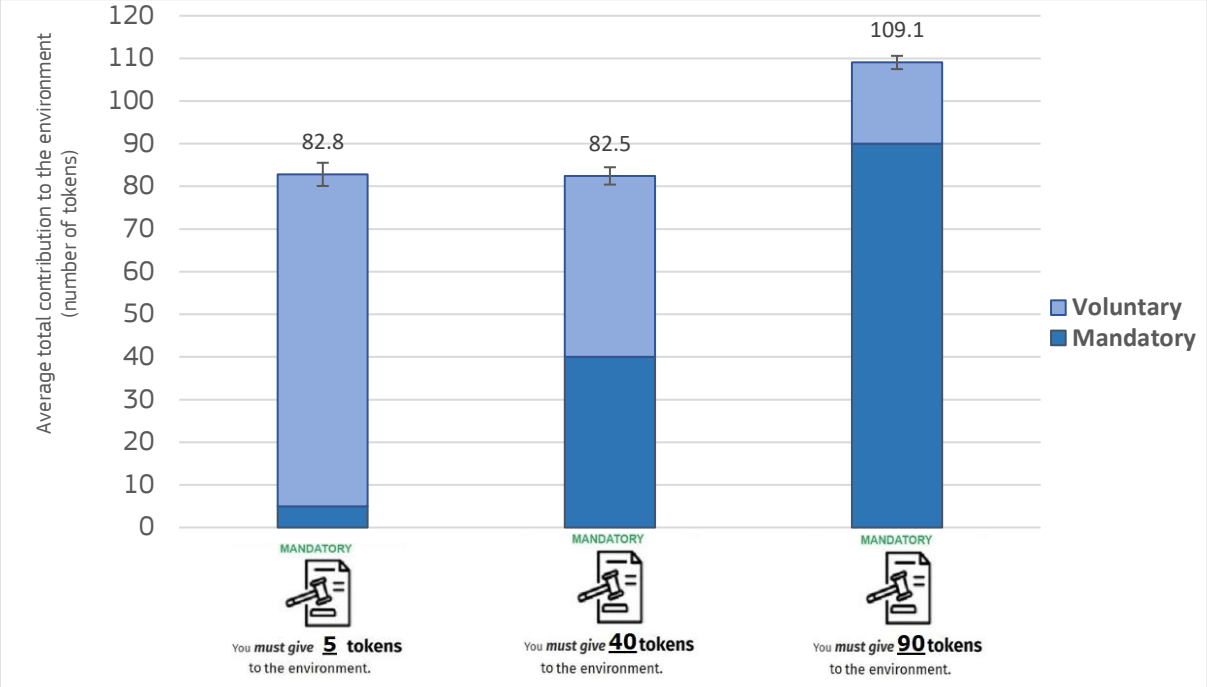
Figure 15. Probability density function of the absolute voluntary contributions under different levels of mandatory contribution



7.2.2. Effect on total contribution

Focusing now on the effect of the variation in mandatory contribution on participants' total contribution to the environment, Figure 16 stacks both mandatory and voluntary contributions.

Figure 16. Average absolute total contributions under different levels of mandatory contribution

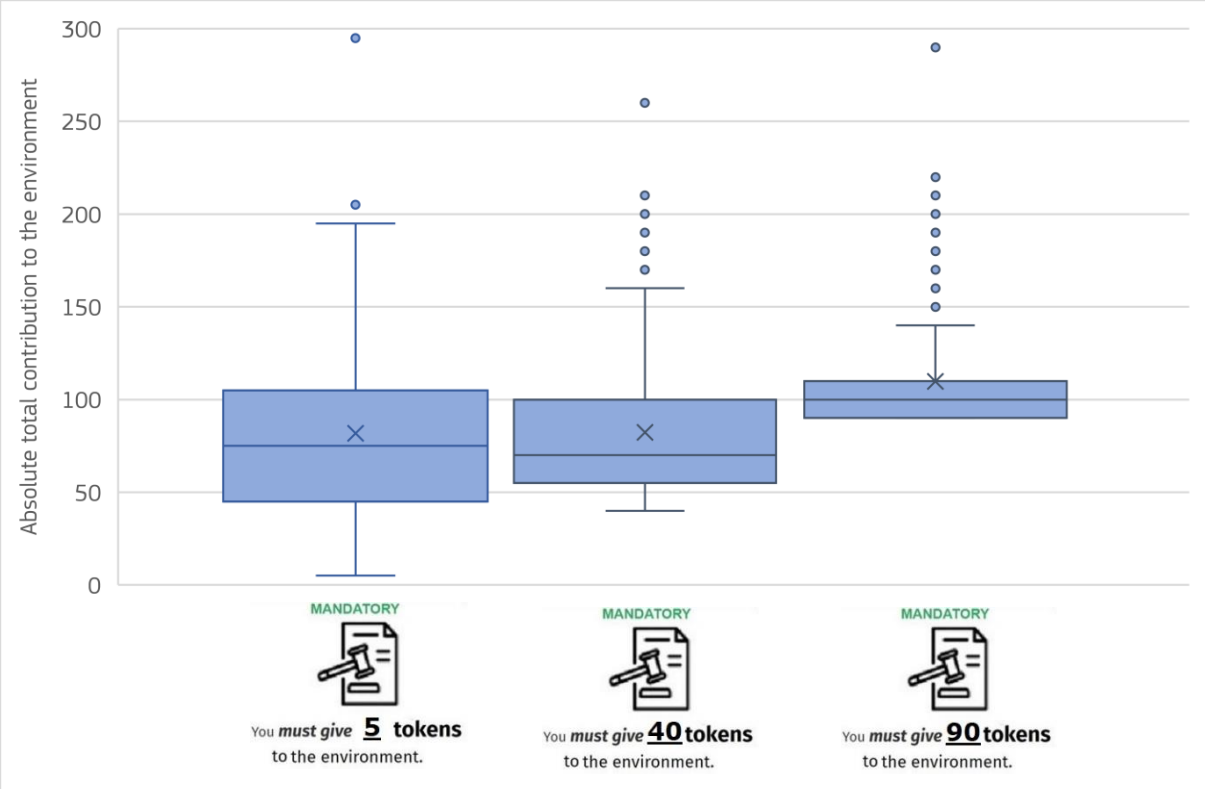


Error bars represent ±1 standard error.

As hinted in the previous section, it seems as if the average total contribution does not differ substantially between the situation in which participants had to give 5 tokens as a mandatory contribution (average total contribution = 82.8 tokens) and the situation in which they were required to give 40 tokens (average total contribution = 82.5 tokens). The data are consistent with the idea of farmers maintaining their total contribution constant between these two levels. In contrast, the 90-token mandatory contribution led to a higher total average contribution (109.1 tokens) than the first two levels. These differences are, to a great extent, driven by the design of this third level – the mandatory contribution in this situation was about 8 tokens higher than the average total contribution in the first level and in the second level.

Figure 17, in turn, shows the distributions (box plots) of the total contributions to the environment. The distribution of the total contribution when the mandatory contribution was 40 tokens is not significantly different from the distribution when the mandatory contribution was 5 tokens (Wilcoxon test *p*-value = .33). In contrast, the distribution of the total contribution when the mandatory contribution was 90 tokens is significantly different from the distribution in the previous two levels (Wilcoxon test *p*-values < .001).

Figure 17. Box plots of absolute total contributions under different levels of mandatory contribution



The horizontal line in the box represents the median. The X in the box represents the mean.
The lower line of the box represents the first quartile. The upper line of the box represents the third quartile.
The whiskers have a value of 1.5 × the interquartile range (third quartile – first quintile). Dots outside the whiskers represent outliers..

Policy messages: snapshot

- Increasing mandatory requirements for farmers to adopt more environmentally friendly practices may not necessarily lead to higher overall adoption of environmentally friendly practices. The impact differs depending on the magnitude of the mandatory contribution.
- When the increase in mandatory requirements is moderate, farmers may reduce their voluntary adoption of more environmentally friendly practices by the same magnitude, leaving the total adoption unchanged.
- The increase in mandatory requirements may need to be substantial in order to exceed the resulting decrease in voluntary contribution and actually increase total adoption. When the increase in mandatory requirements is substantial, farmers still contribute voluntarily, although to a much lesser extent.

7.2.3. Effect on total contribution by different farmer profiles

In this section, we break down the general effect of varying the mandatory contribution on total contribution, by different farmer profiles. In Table 9, we display the average and median total contributions by country, farm size, type of farming, birth year, share of direct payment with respect to income, adoption of organic farming, adoption of AECM, dependence on direct payments, environmental concern and level of trait reactance.

Table 9. Average and median total contributions under different levels of mandatory contribution by farmer profiles

		Mandatory contribution (tokens)					
		5		**40**		**90**	
		Total contribution (tokens)					
Variable	**Value**	**Average**	**Median**	**Average**	**Median**	**Average**	**Median**
Participant's country	Germany	86.5	80.0 [a]	81.9	80.0 [a]	110.3	100.0 [b]
	Spain	85.1	85.0 [a]	79.7	77.5 [a]	105.1	100.0 [b]
	Poland	76.8	55.0 [a]	85.8	60.0 [b]	111.8	95.0 [c]
Farm size (ha)	< 20	82.0	75.0 [a]	86.0	80.0 [a]	112.0	100.0 [b]
	≥ 20 and ≤ 30	87.1	85.0 [a]	82.5	75.0 [a]	107.4	100.0 [b]
	> 30	79.9	75.0 [a]	78.9	65.0 [a]	107.6	100.0 [b]
Type of farming	Specialist livestock	82.0	75.0 [a]	83.1	72.5 [a]	109.7	100.0 [b]
	Specialist crops	85.2	85.0 [a]	83.3	75.0 [a]	110.0	100.0 [b]
	Mixed crops/livestock	74.5	55.0 [a]	75.8	60.0 [a]	101.7	95.0 [b]
Birth year	1971 or before	79.9	75.0 [a]	82.1	70.0 [a]	108.6	100.0 [b]
	1972 or after	86.0	80.0 [a]	82.8	70.0 [a]	109.5	100.0 [b]
Share of direct payments / total income (%)	0-9	80.1	80.0 [a]	76.9	70.0 [a]	105.7	100.0 [b]
	10-19	86.3	85.0 [a]	84.4	77.5 [a]	113.1	100.0 [b]
	20-29	85.8	85.0 [a]	84.2	80.0 [a]	111.1	100.0 [b]
	≥ 30	79.6	70.0 [a]	83.8	65.0 [a]	106.6	95.0 [b]
Organic farming	Has organic agriculture	87.6	85.0 [a]	83.9	70.0 [a]	109.0	100.0 [b]
	Does not have organic agriculture	81.5	75.0 [a]	82.4	72.5 [a]	109.4	100.0 [b]
AECM	Has an AECM	87.6	85.0 [a]	88.9	85.0 [a]	110.7	100.0 [b]
	Does not have an AECM	79.9	75.0 [a]	78.1	70.0 [a]	108.3	100.0 [b]
Environmental concern index (*)	Average (≤ 5)	79.9	55.0 [a]	81.6	70.0 [a]	109.7	100.0 [b]
	High (> 5 and ≤ 6)	78.3	65.0 [a]	78.3	70.0 [a]	104.4	95.0 [b]
	Very high (> 6)	89.0	90.0 [a]	86.5	85.0 [a]	112.2	100.0 [b]
Trait reactance index (*)	Low (< 3.3)	77.3	75.0 [a]	81.2	60.0 [a]	110.9	100.0 [b]
	Average (>=3.3 and <= 4.5)	83.0	70.0 [a]	80.8	75.0 [a]	108.3	100.0 [b]
	High (> 4.5)	85.4	85.0 [a]	83.4	85.0 [a]	107.5	100.0 [b]

How to read this table. Within each row, (1) distributions with different superscript letters (and in different colours) are significantly different from one another (Wilcoxon test *p*-value <.05) and (2) distributions with the same superscript letter (and in the same colour) are not significantly different from one another (Wilcoxon test *p*-value ≥ .05).
(*) Cut-off points for the three groups were determined based on terciles.

We explored differences in the distributions of the total contributions to the environment by using non-parametric tests ([8]). The **general pattern for the whole sample holds true across farmer profiles**, i.e. there are no differences in the distribution of the total contribution between the 5- and 40-token mandatory contribution levels, but large differences between the 90-token mandatory contribution level and the first two.

There is one exception: we cannot reject the null hypothesis of equal distributions of the total contributions by farmers in the sample who are located in Poland when the mandatory contribution was 40 tokens versus when it was 5 tokens. If we look at the average total contributions in Table 9, we see that sampled farmers in Poland have a higher total contribution when the mandatory contribution is 40 tokens than when it is 5 tokens. Hence,

([8]) In the interpretation of statistical differences in Table 9, we tested 75 hypotheses tests in total. This large number of tests increases the chance of finding false positive test results. A more conservative approach would be to apply a Bonferroni correction, i.e. to apply a new p-value threshold of 0.05/75 = 0.0006666. Under this substantially stricter threshold, some of the differences in distributions might not be statistically significant different from one another any longer.

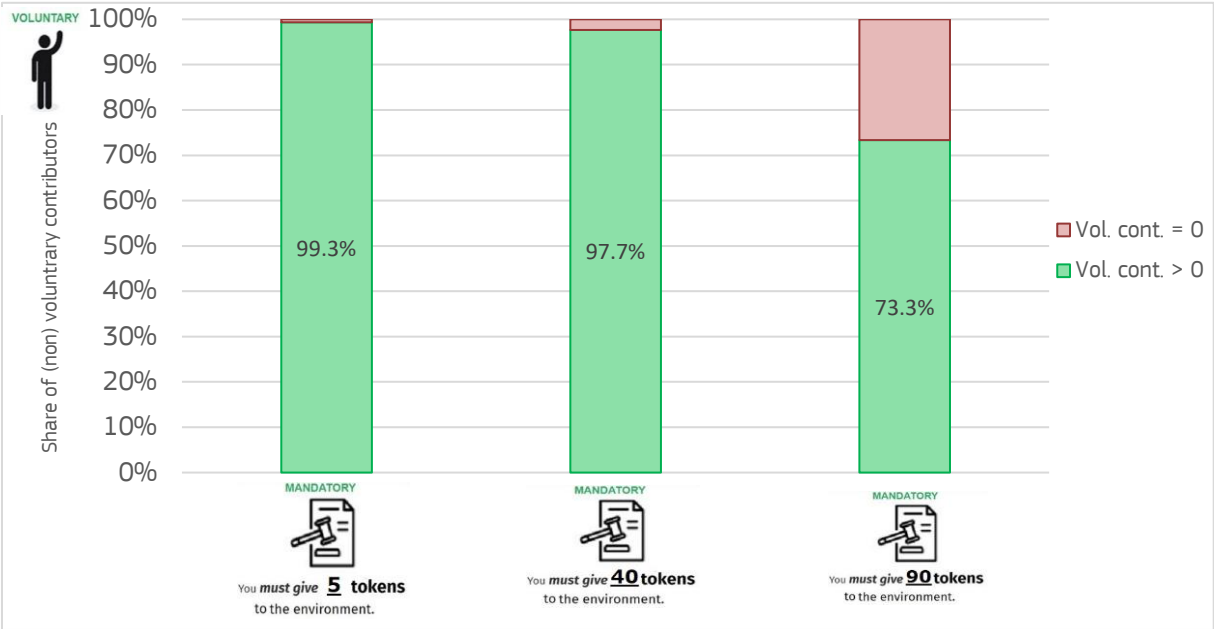
for these farmer profiles, the reduction in voluntary contribution is lower than the increase in mandatory contribution. However, we remind readers that the sample in Poland is not fully representative – therefore, we would wary against drawing any conclusions related to Polish farmers based on this data.

7.2.4. Effect on share of (non-)contributors

Besides the number of tokens contributed to the environment, one may also consider the number of farmers who (do not) contribute at least 1 token. This participation rate may be another indicator of interest.

As shown in Figure 18, in the situation where the mandatory contribution amounted to 5 tokens, virtually all participants (99.3 %) gave at least 1 token as a voluntary contribution to the environment. This proportion was marginally lower (97.7 %) when the mandatory contribution was 40 tokens (*p*-value of two-sided two-sample test of proportions = .09). Finally, when the mandatory contribution was 90 tokens, the participation rate was about three quarters of the study participants, which is significantly lower in than the first two levels (two-sided two-sample test of proportions *p*-values < .001).

Figure 18. Share of voluntary contributors under different levels of mandatory contribution



Policy messages: snapshot

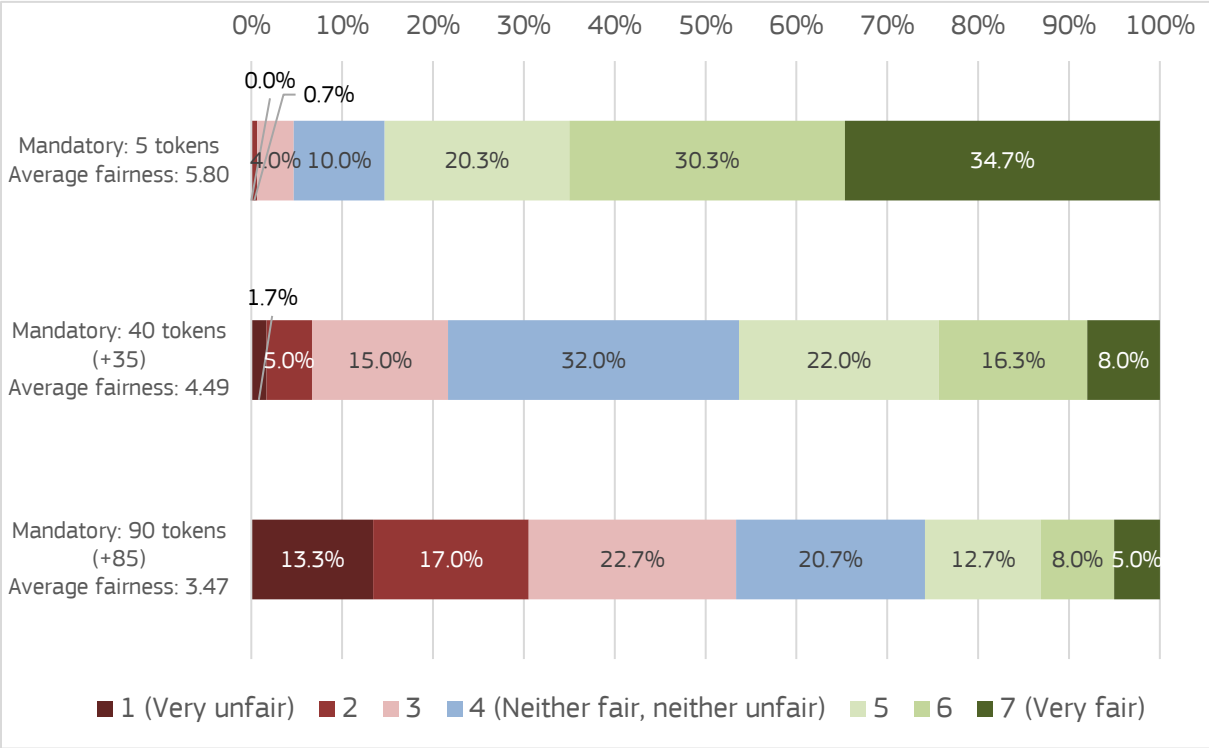
- A moderate increase in the mandatory requirements to adopt more environmentally friendly farming practices should only have a small effect on farmers' likelihood of enrolling in voluntary schemes.
- A major increase in the mandatory requirements to adopt more environmentally friendly farming practices will discourage a substantial share of farmers from participating in voluntary schemes at all.

7.2.5. Effect on fairness perceptions

Immediately after participants made their three decisions regarding the token allocation task, they were asked to rate their perceived fairness of the three levels of mandatory contribution, on a scale from 1 (very unfair) to 7 (very fair), with 4 (neither fair nor unfair) as the scale's midpoint.

As shown in Figure 19, a majority (85 %) of participants considered 5 tokens fair as a mandatory contribution to the environment (i.e. a rating of 5 or above). In this situation, the average fairness rating is 5.80. The proportion of participants who judged the mandatory contribution fair fell to 46 % when the mandatory contribution was 40 tokens, and to 25 % when the mandatory contribution was 90 tokens. The average fairness scores are 4.49 and 3.47, respectively. The distributions of all average fairness scores in all three levels of mandatory contribution are significantly different from each other (all Wilcoxon *p*-values < .001).

Figure 19. Fairness perceptions under different levels of mandatory contribution



Question: 'In the study, your initial net (farm) income was always 300 tokens. How fair or unfair do you judge each of the following mandatory contributions to the environment?'

Policy message: snapshot

Farmers may perceive an increase in conditionality requirements as unfair, although it depends on the magnitude of the increase.

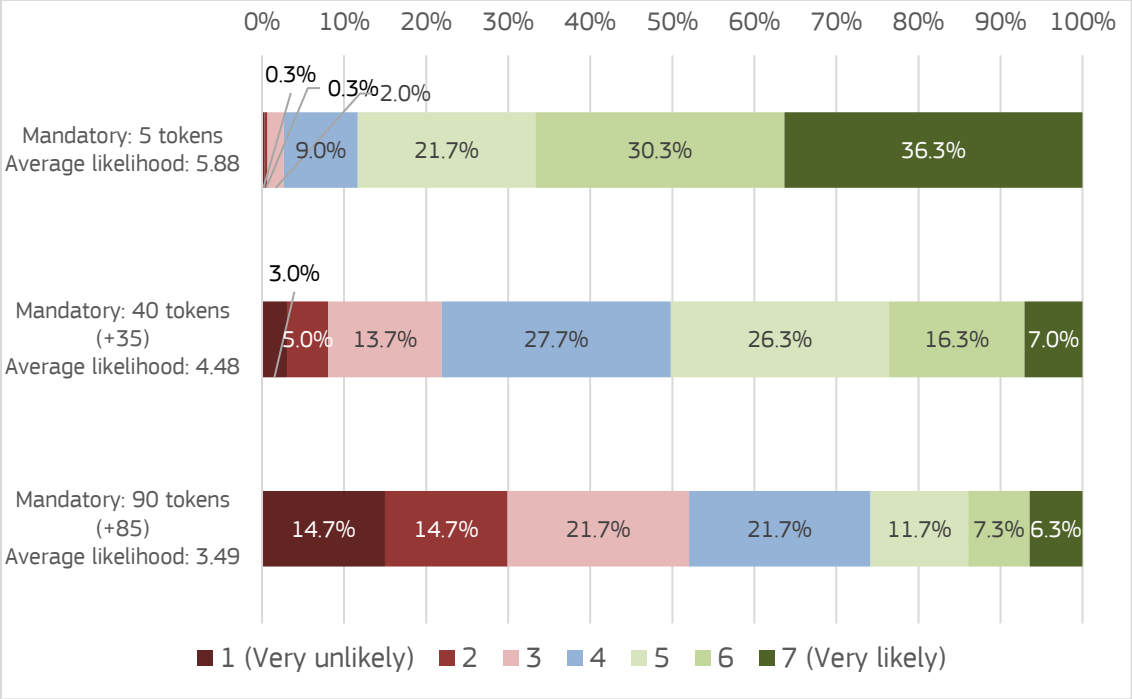
7.2.6. Effect on likelihood of enrolling in agri-environment-climate measures

In addition to the token allocation task, participants were subsequently asked to indicate, on a scale from 1 (very unlikely) to 7 (very likely), their likelihood of participating in a multiannual, more demanding AECM in each of the three levels of mandatory contribution.

Figure 20 shows that, when the mandatory contribution was 5 tokens, approximately 88 % of participants stated they would probably (i.e. answer ≥ 5) enrol in an AECM. This proportion is much higher than the share of participants in the sample who actually enrol in an AECM in real life (i.e. from 29 % to 47 % in the three Member States), illustrating the hypothetical nature of this question. The proportion of participants who indicated they would 'very likely' enrol in an AECM (i.e. 36.3 %) in this baseline situation is closer to the real figure. The proportion of participants who gave a likelihood score of 5 or higher fell to 50 % when the mandatory contribution amounted to 40 tokens, and to 25 % when the mandatory contribution was 90 tokens. The distributions of the mean likelihoods of participating in an AECM are all significantly different from each other (all Wilcoxon test *p*-values < .001).

In this experiment, it is difficult to directly compare eco-scheme adoption with AECM adoption. This is because the measurement tool was different: eco-scheme adoption was measured through the token allocation task, with potential real consequences for participants, and AECM adoption was measured through the self-declared likelihood scale described in the first paragraph. With all these caveats in mind, there *seems* to be some indication that increasing mandatory contributions (i.e. conditionality) would lead to a bigger decrease in participation in AECMs than in participation in eco-schemes. When the mandatory contribution was 40 (vs 5) tokens, 97.7 % (vs 99.3 %) of participants still gave at least 1 token (a proxy for participation in eco-schemes). In the case of AECMs, with the same difference in mandatory contribution, the likelihood of participation (i.e. likelihood ≥ 5) was reduced from 88 % to 50%. Considering that only a response of 7 (very likely) would reflect actual enrolment, the share of farmers participating in AECMs would fall even more significantly (to 36.3%, 7.0 % and 6.3 % for each of the levels considered).

Figure 20. Self-reported likelihood of enrolling in AECM under different levels of mandatory contribution



Question: 'Consider now that you could participate in an agri-environmental scheme. This type of voluntary scheme would be more demanding, but also more targeted to your farm. You would enrol for several years. You would receive compensation covering 90 % of the costs you incur. How likely is it that would you participate in a more demanding, multiannual agri-environmental scheme with 90 % compensation for your costs, in each of the following situations? In all situations, your initial net (farm) income is always 300 tokens.'

Policy message: snapshot

Enhancing conditionality may strongly reduce farmers' willingness to enrol in AECMs.

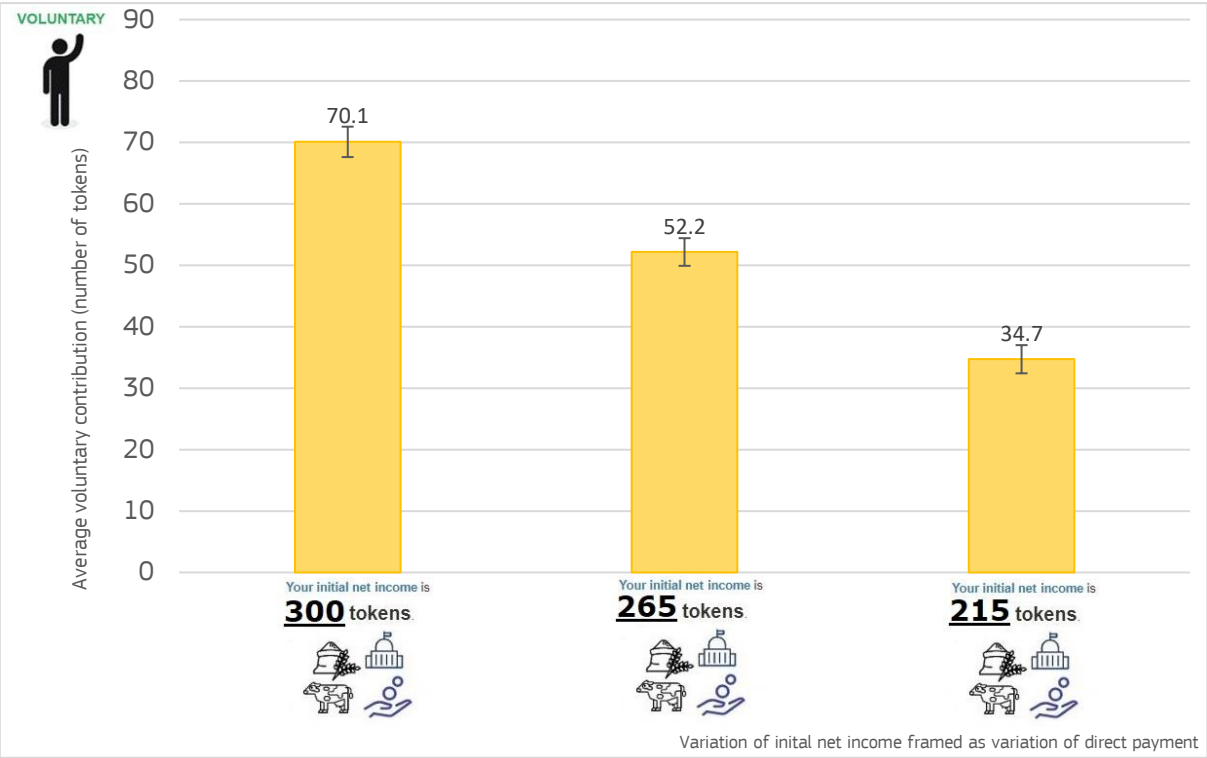
7.3. Variation in direct payments

The other half of the participants were randomly allocated to the experimental condition in which mandatory contributions were kept constant while their income varied. In the experiment, this was shown as a variation in participants' initial net income in order to keep a cognitively manageable amount of information that participants had to consider. However, participants in this experimental condition were told, prior to being exposed to the three different levels, that the variations in initial net income were due to a variation in their direct payments. In all three decisions, participants' mandatory contribution was always 5 tokens. The number of tokens that participants received as initial net income (whose variation was framed as a variation in direct payments) was 300, 265 or 215 tokens. In all situations, participants would get back *compensation worth 90 %* of the number of tokens given as a voluntary contribution.

7.3.1. Effect on voluntary contribution

We first assess the effect of varying the amount of direct payments on the average number of tokens that participants voluntarily contributed to the environment on top of the mandatory contribution. As shown in Figure 21, as direct payments decreased, average voluntary contributions decreased as well. This decrease was less than proportionate: whereas direct payments decreased by 35 tokens between Level 1 and Level 2, and by 50 tokens between Level 2 and Level 3, the average voluntary contribution decreased by about 18 tokens in both cases.

Figure 21. Average absolute voluntary contribution under different levels of direct payments



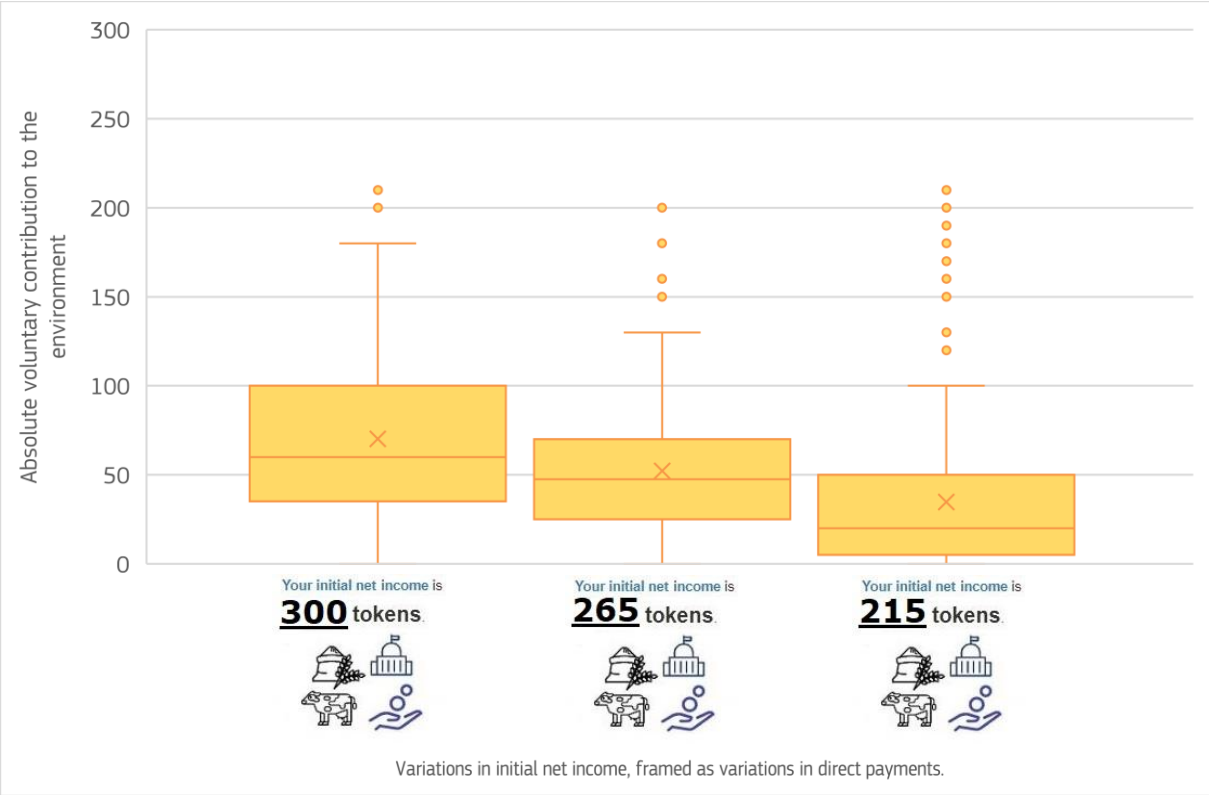
Error bars represent ± 1 standard error.

These findings should be interpreted in the light of the experimental setting, in which the calculation of costs and benefits was immediate and transparent. Let us take the example of participants who were exposed first to 300 tokens as their initial net income, and second to 265 tokens as their initial net income. According to the instructions, they should interpret this as a decrease in direct payments of 35 tokens. These participants could decide to give 39 tokens as a voluntary contribution, to get back 35 tokens as compensation (i.e. 90 % of their voluntary contribution), and thereby keep their initial level of direct payments. However, in the experiment, the cost of the voluntary contribution was immediate and transparent. Getting back to our example, participants' final net income would be reduced by 4 tokens (35 tokens compensation – 39 tokens voluntary contribution) between the two situations, even though their direct payment would remain constant.

To assess the statistical significance of the differences in absolute voluntary contributions under different levels

of direct payments, we use the distribution rather than the mean (see Figure 22 showing the box plots). All three distributions are significantly different from each other (all Wilcoxon test *p*-values < .001).

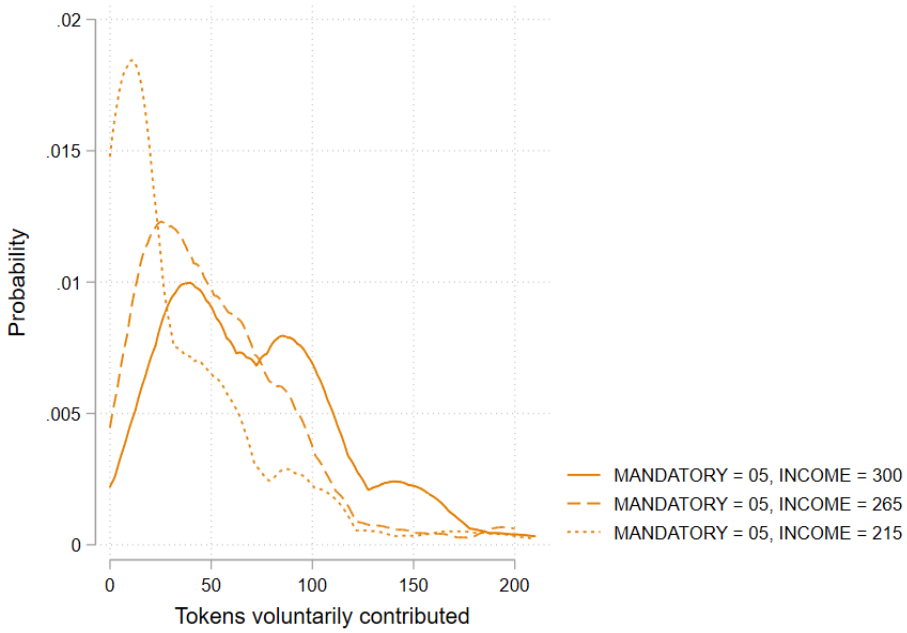
Figure 22. Box plots of absolute voluntary contributions under different levels of direct payments



The horizontal line in the box represents the median. The X in the box represents the mean.
The lower line of the box represents the first quartile. The upper line of the box represents the third quartile.
The whiskers have a value of 1.5 × the interquartile range (third quartile – first quintile). Dots outside the whiskers represent outliers.

Figure 23 shows the (kernel-smoothed) probability density function of the absolute voluntary contributions for the three different income / direct payment levels. The x-axis shows the number of tokens voluntarily contributed, and the y-axis shows the probability density. The area under the curve is normalised to 1. The figure shows that lower income / direct payments led to smaller absolute voluntary contributions – the distributions shift to the left with decreases in income / direct payments.

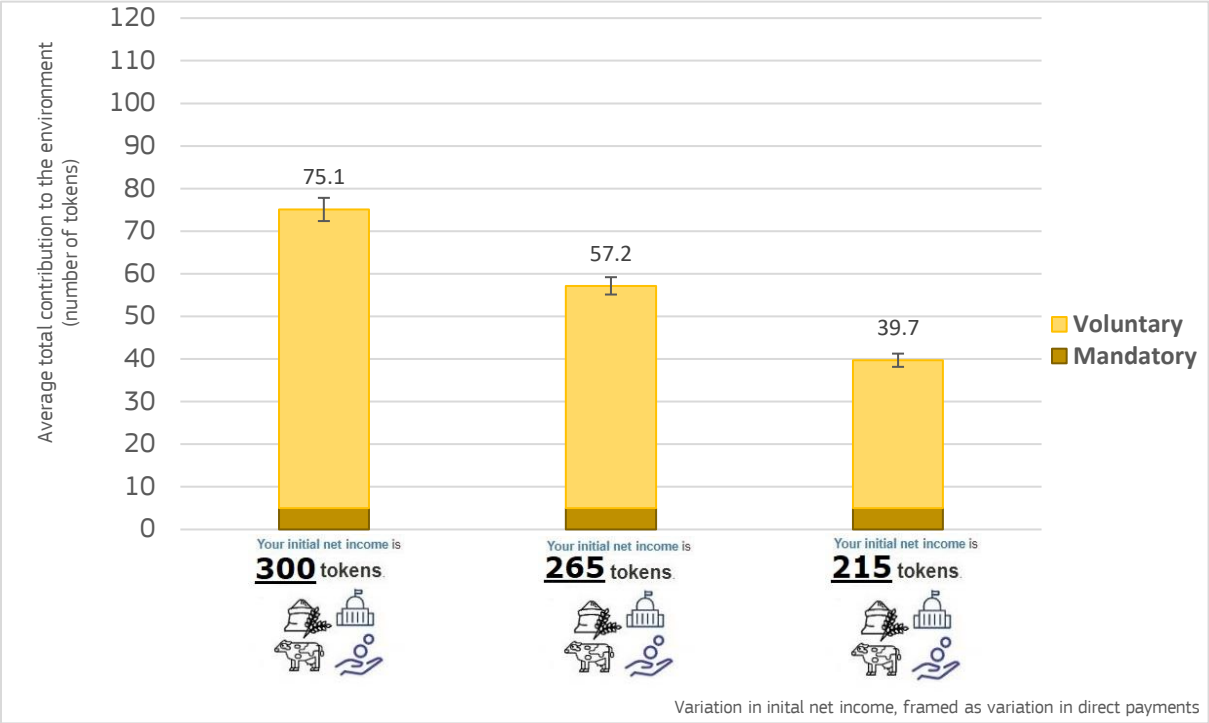
Figure 23. Probability density function of the absolute voluntary contributions under different levels of mandatory contribution



7.3.2. Effect on total contribution

Figure 24 stacks the mandatory contribution with the average voluntary contribution across the three levels of direct payments to illustrate the total contribution to the environment. Since the mandatory contribution was held constant at 5 tokens across all three levels of direct payments, the pattern for the total contribution exactly mirrors that of voluntary contribution. That is, we observe a decrease in the total contribution as direct payments decrease.

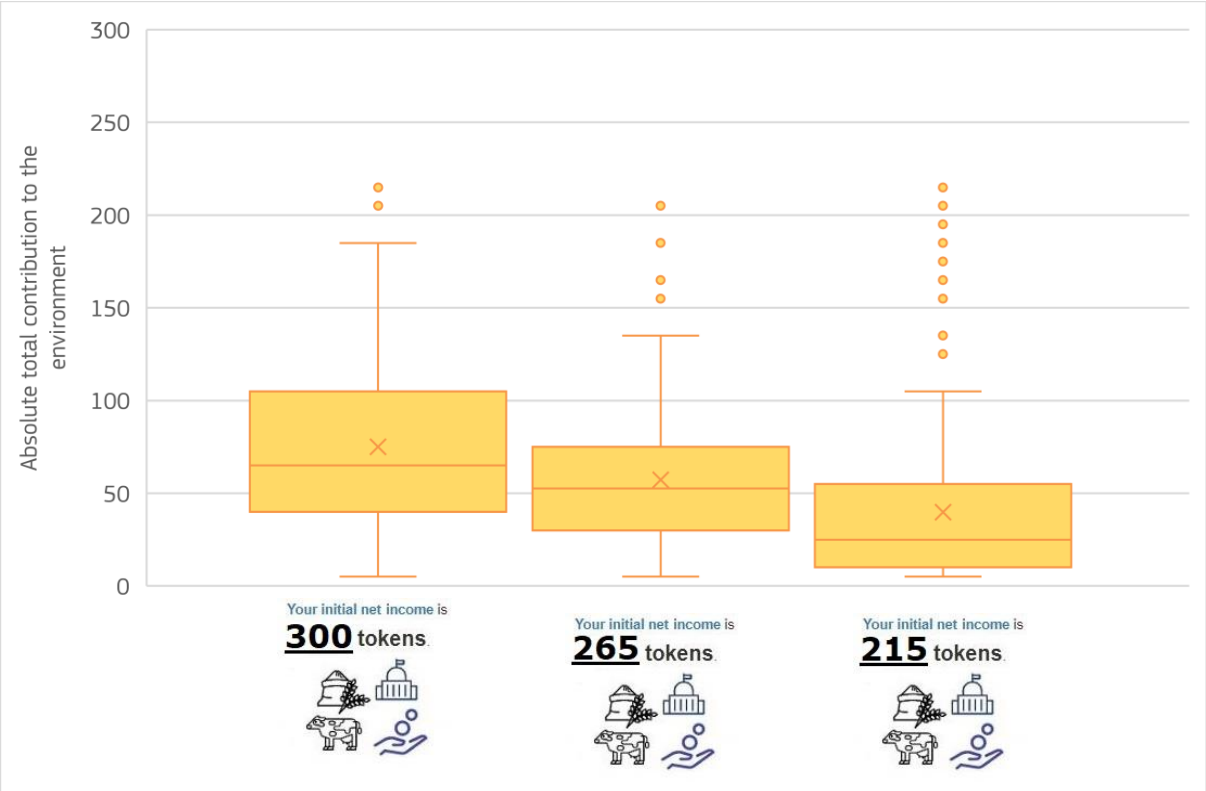
Figure 24. Average absolute total contribution under different levels of direct payments



Error bars represent ± 1 standard error.

We focused on the distribution of the total contribution to the environment (see Figure 25) to assess if the differences were statistically significant. We found that the different levels of direct payments led to statistically different distributions of the total contribution (all Wilcoxon *p*-values < .001).

Figure 25. Box plots of absolute total contributions under different levels of direct payments



The horizontal line in the box represents the median. The X in the box represents the mean.
The lower line of the box represents the first quartile. The upper line of the box represents the third quartile.
The whiskers have a value of 1.5 × the interquartile range (third quartile – first quintile). Dots outside the whiskers represent outliers.

Policy messages: snapshot

- A reduction in BISS may lead to a reduction in farmers' level of participation in voluntary schemes, and in farmers' total adoption of environmentally friendly practices.
- The reduction in the level of adoption is less than proportionate to the reduction in BISS.
- Shifting budget from BISS to eco-schemes may not produce higher adoption of environmentally friendly practices when farmers are not fully compensated for their costs incurred and income forgone.

7.3.3. Effect on total contribution by different farmer profiles

Table 10 presents the average total contribution across the three levels of direct payments, breaking them down by different farmer profiles, such as country, type of farming and farm size.

Table 10. Average and median total contribution under different levels of direct payments, broken down by farmer profiles

		Initial net income (tokens) (Variation framed as variation in direct payments)					
		300		**265**		**215**	
		Total contribution (tokens)					
Variable	**Value**	**Average**	**Median**	**Average**	**Median**	**Average**	**Median**
Participant's country	Germany	78.9	85.0 [a]	53.4	55.0 [b]	33.1	25.0 [c]
	Spain	75.8	75.0 [a]	55.3	55.0 [b]	33.1	20.0 [c]
	Poland	70.7	55.0 [a]	62.7	40.0 [b]	52.8	25.0 [c]
Farm size (ha)	< 20	76.6	75.0 [a]	57.1	55.0 [b]	40.5	20.0 [c]
	≥ 20 and ≤ 30	77.4	65.0 [a]	58.3	55.0 [b]	39.4	25.0 [c]
	> 30	72.3	60.0 [a]	56.5	45.0 [b]	39.4	25.0 [c]
Type of farming	Specialist livestock	77.8	75.0 [a]	59.4	50.0 [b]	42.8	25.0 [c]
	Specialist crops	75.1	65.0 [a]	59.0	55.0 [b]	38.2	25.0 [c]
	Mixed crops/livestock	67.0	55.0 [a]	44.9	40.0 [b]	34.9	17.0 [c]
Birth year	1971 or before	69.3	57.5 [a]	53.7	45.0 [b]	36.4	20.0 [c]
	1972 or after	81.1	75.0 [a]	60.7	55.0 [b]	43.2	25.0 [c]
Share of direct payments / total income (%)	0–9	71.7	67.5 [a]	47.0	45.0 [b]	24.9	15.0 [c]
	10–19	84.2	85.0 [a]	62.3	55.0 [b]	41.7	25.0 [c]
	20–29	79.5	80.0 [a]	54.2	47.5 [b]	38.1	30.0 [c]
	≥ 30	65.9	50.0 [a]	60.0	45.0 [b]	47.1	25.0 [c]
Organic farming	Has organic agriculture	77.8	65.0 [a]	63.0	60.0 [b]	46.9	40.0 [c]
	Does not have organic agriculture	75.0	70.0 [a]	55.9	50.0 [b]	37.7	20.0 [c]
AECM	Has an AECM	79.5	67.5 [a]	67.3	62.5 [b]	50.1	42.5 [c]
	Does not have an AECM	73.4	67.5 [a]	52.6	45.0 [b]	34.9	20.0 [c]
Environmental concern index (*)	Average (≤ 5)	74.6	65.0 [a]	52.1	45.0 [b]	35.2	20.0 [c]
	High (> 5 and ≤ 6)	73.3	65.0 [a]	60.5	50.0 [b]	44.3	25.0 [c]
	Very high (> 6)	76.7	72.5 [a]	57.8	57.5 [b]	36.7	25.0 [c]
Trait reactance index (*)	Low (< 3.3)	68.4	65.0 [a]	46.0	40.0 [b]	26.7	15.0 [c]
	Average (≥ 3.3 and ≤ 4.5)	79.6	75.0 [a]	60.0	50.0 [b]	43.3	25.0 [c]
	High (> 4.5)	75.7	60.0 [a]	64.2	65.0 [b]	46.9	45.0 [c]

How to read this table. Within each row, (1) *distributions* with different superscript letters (and in different colours) are significantly different from one another (Wilcoxon test *p*-value < .05) and (2) distributions with the same superscript letter (and in the same colour) are not significantly different from one another (Wilcoxon test *p*-value ≥ .05).
(*) Cut-off points for the three groups were determined based on terciles.

We explored differences in the distributions of the total contributions using non-parametric tests ([9]). The general pattern of the pooled data holds true across farmer profiles, that is, there are significant differences in the distributions of the total contributions between all levels of direct payments / income.

Policy message: snapshot

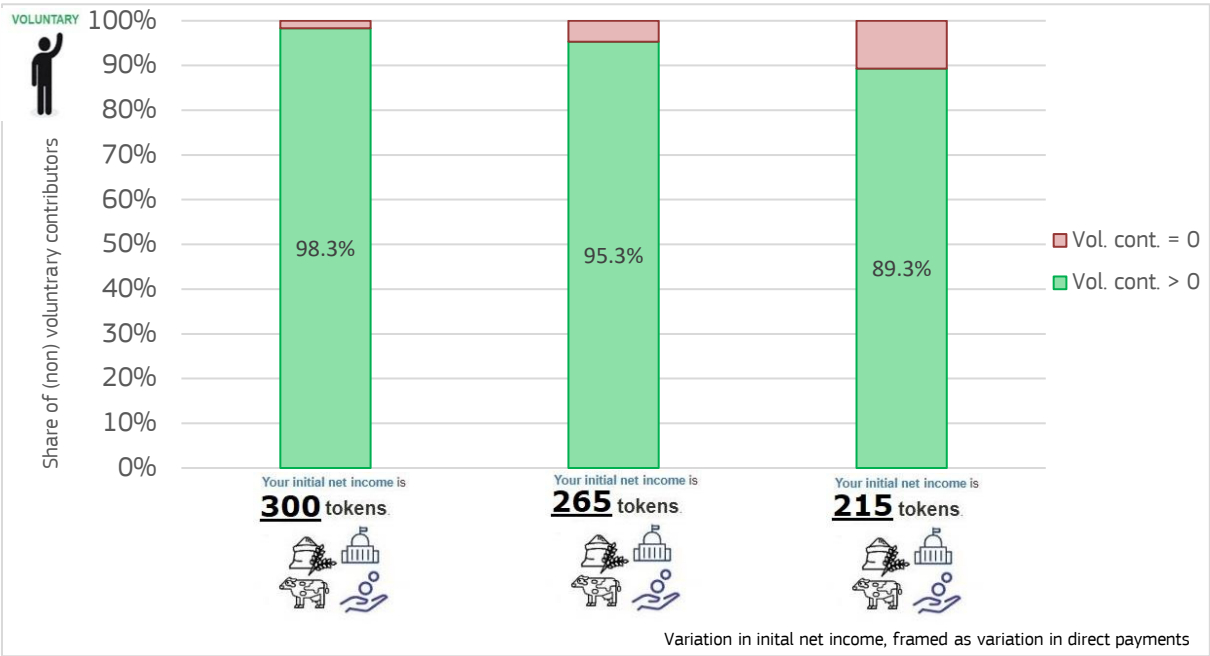
For virtually all farmer profiles, decreasing BISS may lead to a lower total adoption of environmentally friendly farming practices. This is assuming a compensation level for voluntary contributions set at 90 %.

([9]) In the interpretation of statistical differences in Table 9, we tested 75 hypotheses tests in total. This large number of tests increases the chance of finding false positive test results. A more conservative approach would be to apply a Bonferroni correction, i.e. to apply a new p-value threshold of 0.05/75 = 0.0006666. Under this substantially stricter threshold, some of the differences in distributions might not be statistically significant different from one another any longer.

7.3.4. Effect on share of (non-)contributors

In Figure 26, we illustrate, for each level of direct payment variation, the proportion of participants who voluntarily contributed at least 1 token (vs no token at all) to the environment.

Figure 26. Share of (voluntary) contributors under different levels of direct payments



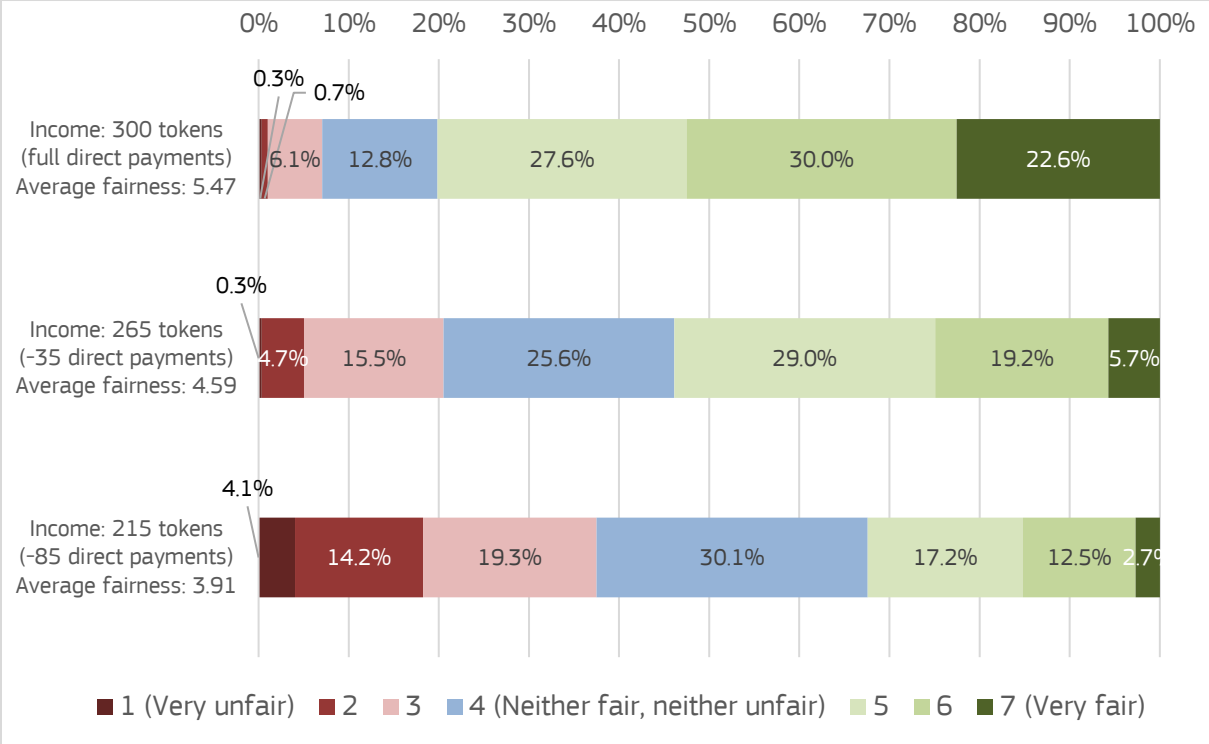
In the situation in which participants received 300 tokens as their initial net income, virtually all of them voluntarily contributed at least 1 token to the environment. Compared with this first level, there is a small, yet significant (*p*-value for two-sided two-sample test of proportions = .04) difference in the participation rate when direct payments were 35 tokens lower (i.e. initial net income was 265 tokens). Finally, the participation rate also was also significantly lower (*p*-values for two-sided two-sample tests of proportions < .01) with respect to the first two levels when the initial net income was 215 tokens (i.e. reduction of direct payments by 85 tokens). It is worth noticing, however, that even in this situation the participation rate was quite high, reaching almost 9 in 10 participants.

7.3.5. Effect on fairness perceptions

Immediately after the three token allocation decisions, participants were asked to rate, on a scale from 1 (very unfair) to 7 (very fair) the fairness of the different levels of direct payments. In the first level (initial net income = 300 tokens), the indication 'full direct payments' was added.

As Figure 27 shows, 8 out of 10 participants considered keeping their full direct payments fair (i.e. fairness score of 5 or higher), with an average fairness score of 5.47. A reduction of direct payments by 35 tokens (roughly corresponding to 10 % of the initial net farm income in the first level) was still seen as fair by about half of participants (53.9 %), although the proportion of participants who saw this as 'very fair' fell from 22.6 % to 5.7 %. The proportion of farmers who gave a positive fairness score (5 or higher) dropped to about one third (32.4 %) when direct payments were reduced by 85 tokens. The distributions of all average fairness scores in all three levels of mandatory contribution are significantly different from each other (all Wilcoxon *p*-values < .001).

Figure 27. Fairness perceptions under different levels of direct payments



Question: 'In the study, your mandatory contribution to the environment was always 5 tokens. How fair or unfair do you judge each of the following net (farm) incomes?'

Policy message: snapshot

Farmers generally see a lower level of direct payments as less fair than their current (full) direct payments.

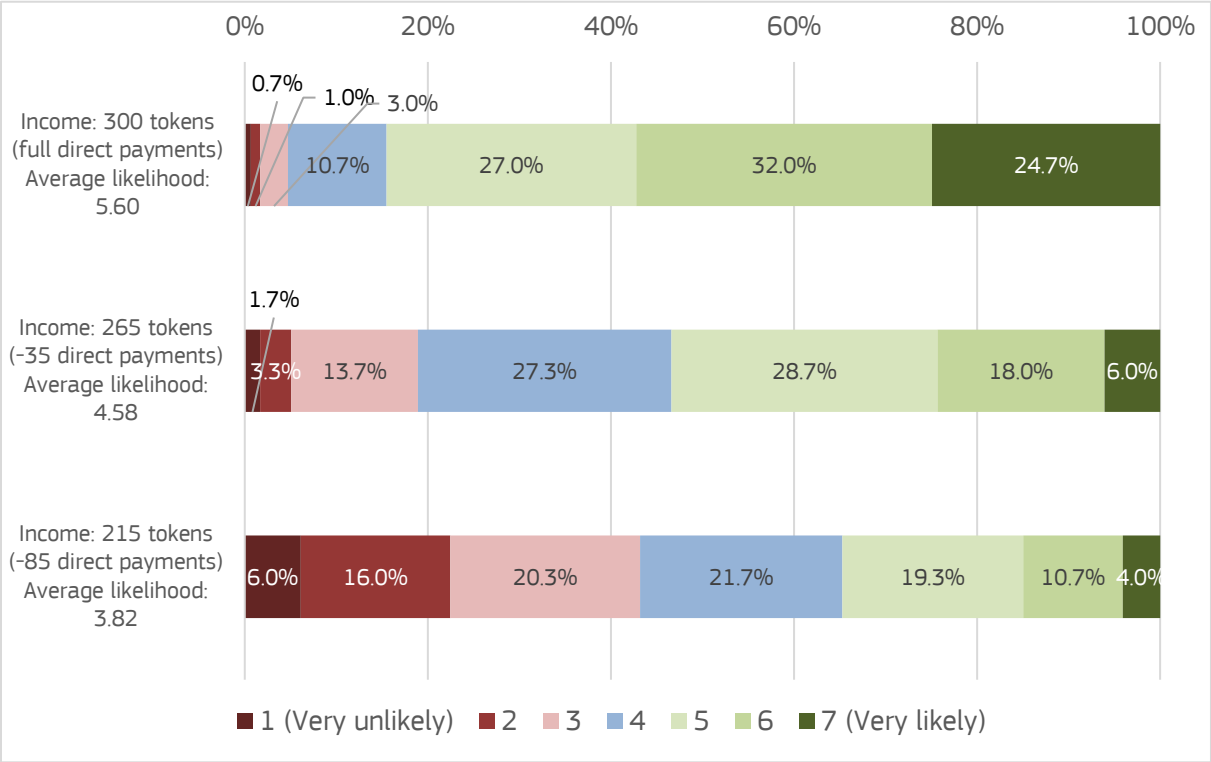
7.3.6. Effect on likelihood of enrolling in agri-environment-climate measures

Figure 28 presents participants' self-declared likelihood of participating in a multiannual AECM when faced with the different levels of direct payments, on a scale from 1 (very unlikely) to 7 (very likely).

When participants were told that they would keep their full direct payments, a quarter of them (24.7 %) said they would be 'very likely' to enrol in an AECM, a proportion similar to the proportion of participants who reported actually being committed to an AECM in real life. In total, about 8 in 10 participants (83.7 %) gave a score of 5 or more on their likelihood of participating in an AECM when direct payments were 'full'. The proportion of likely enrolments (i.e. score ≥ 5) fell to 52 % when direct payments were reduced by 35 tokens, and to 34 % when the reduction in direct payments amounted to 85 tokens. If we focus on the proportion of 'very likely' adopters (score = 7), the adoption fell from 24.7 % to 6 % and just 4 % in the third level. The distributions of all average likelihood scores in all three levels of direct payments are significantly different from each other (all Wilcoxon *p*-values < .001).

Despite the caveats about comparing the self-declared likelihood of participating in AECMs with the token allocations in which participants faced potential real consequences of their decisions (which mimic adoption of eco-schemes), it seems as if an equivalent decrease in direct payments could decrease the probability of participation more strongly for AECMs than for eco-schemes.

Figure 28. Self-reported likelihood of enrolling in AECMs under different levels of direct payments



Question: 'Consider now that you could participate in an agri-environmental scheme. This type of voluntary scheme would be more demanding, but also more targeted to your farm. You would enrol for several years. You would receive a compensation covering 90 % of the costs you incur. How likely is it that you would participate in a more demanding, multiannual agri-environmental scheme with 90 % compensation for your costs, in each of the following situations? In all situations, your minimum mandatory contribution to the environment is always 5 tokens.'

Policy message: snapshot

Reducing BISS may reduce farmers' likelihood of enrolling in AECMs.

7.4. Comparison of variation in mandatory contribution with variation in direct payments

7.4.1. Introduction

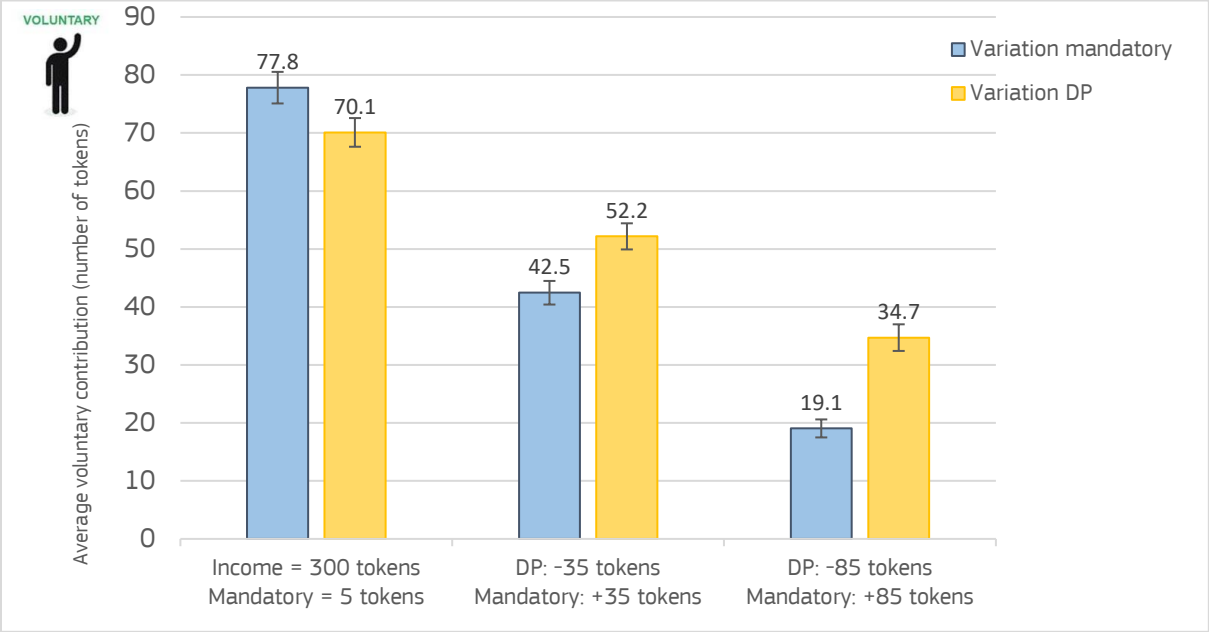
In this section, we compare the effect of varying mandatory contributions to the environment with the effect of varying direct payments. Participants were randomly allocated to one of these two framings of variation. As shown in Table 4. Experimental design and levels (see Section 5.5), the absolute gap between levels was the same, whether it was the mandatory contribution or the amount of direct payments that varied. Within each level, the disposable initial net income (i.e. the net income after the mandatory contribution was deducted) was the same. This design makes it possible to compare the effects according to the framing of the variation.

To illustrate these differences in effects, we combine the bars presented in the sections above, and we perform the relevant statistical analyses to compare the effects.

7.4.2. Effect on voluntary contribution

Let us first compare the effect of varying the mandatory contribution with that of varying direct payments on the (absolute) voluntary contribution. As we have seen, both higher mandatory contributions and lower direct payments led to a lower voluntary contributions. Figure 29 allows us to compare the effect of these variations according to their framing.

Figure 29. Average absolute voluntary contribution under different levels of mandatory contribution versus direct payments



DP, direct payments.
Error bars represent ± 1 standard error.

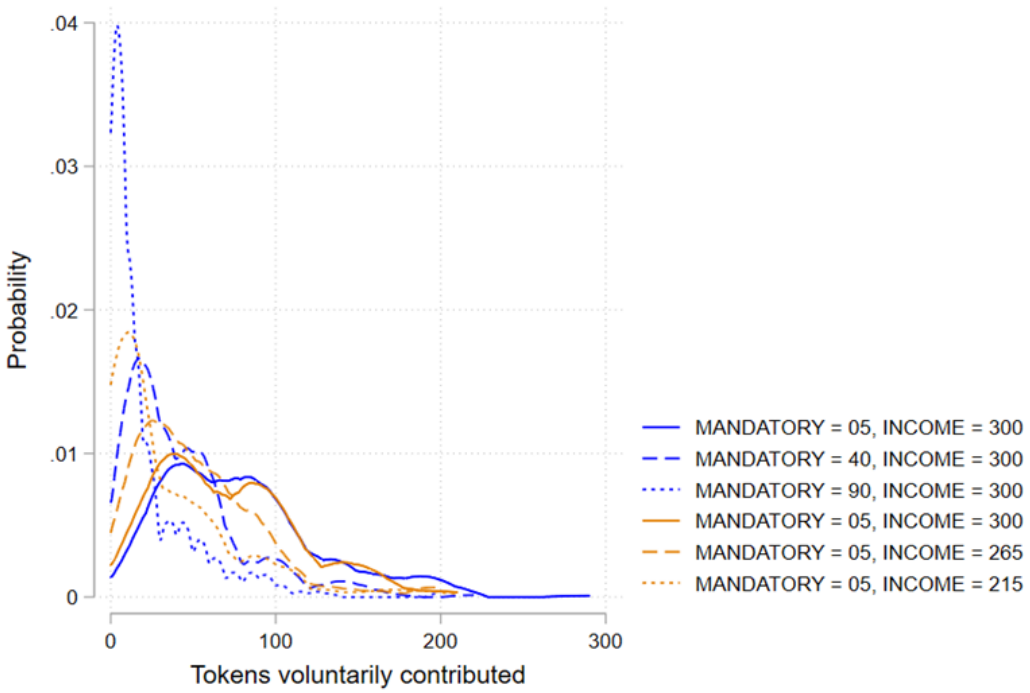
The voluntary contributions at the baseline level (i.e. Level 1), in which the initial net income was 300 tokens and the mandatory contribution was 5 tokens, are similar. A Mann–Whitney test reveals a marginally significant different distribution (p-value = .08), whereby participants in the 'variation in direct payments' condition made a slightly lower voluntary contribution than participants in the 'variation in mandatory contribution' condition.

More interestingly, in Level 2, a Mann–Whitney test reveals a significant difference in the distributions of voluntary contributions (p-value < .001). Compared with Level 1 (average contribution = 77.8 tokens), participants who were exposed to variations in mandatory contributions voluntarily contributed 45 % less tokens in Level 2 (average contribution = 42.5 tokens). That is in stark contrast with the 25 % relative decrease in voluntary contribution between Level 2 and Level 1 when considering participants who were exposed to variations in direct payments (70.1 tokens in Level 1 versus 52.2 tokens in Level 2).

A similar pattern emerges for Level 3. Again, participants in the mandatory contribution variation condition voluntarily contributed, on average, less tokens than participants in the direct payments variation condition. The distributions are significantly different (Mann–Whitney *p*-value < .001). The relative gap in voluntary contribution between Level 2 and Level 3 is again higher when mandatory contributions varied (–55 %) than when direct payments varied (–34 %).

In Figure 30, we plot the (kernel-smoothed) probability density function of the absolute voluntary contributions for the three different levels of mandatory contribution (blue lines) and for the three levels of income (framed as levels of direct payments – orange lines). The unbroken lines show the first level, where the decision parameters (initial net income and mandatory contribution) are equal – unsurprisingly, the probability density function is very similar across the between-subject treatments. The dashed lines (– – –) represent the same function when the mandatory contribution was 35 tokens higher than in Level 1 (total mandatory contribution = 40 tokens) and when the direct payment was 35 tokens lower than in Level 1 (income = 265 tokens). The dotted lines (.....) relate to a mandatory contribution 85 tokens higher than in Level 1 (mandatory contribution = 90 tokens) and to direct payments 85 tokens lower than in Level 1 (income = 215 tokens). Comparing these dashed lines and dotted lines across framings of variations (i.e. blue vs orange), one can clearly see that the probability of lower voluntary contributions was higher when mandatory contributions increased than when direct payments decreased by the same absolute magnitude.

Figure 30. Probability density function of the absolute voluntary contributions
under different levels of mandatory contribution versus different levels of direct payments / income



Policy messages: snapshot

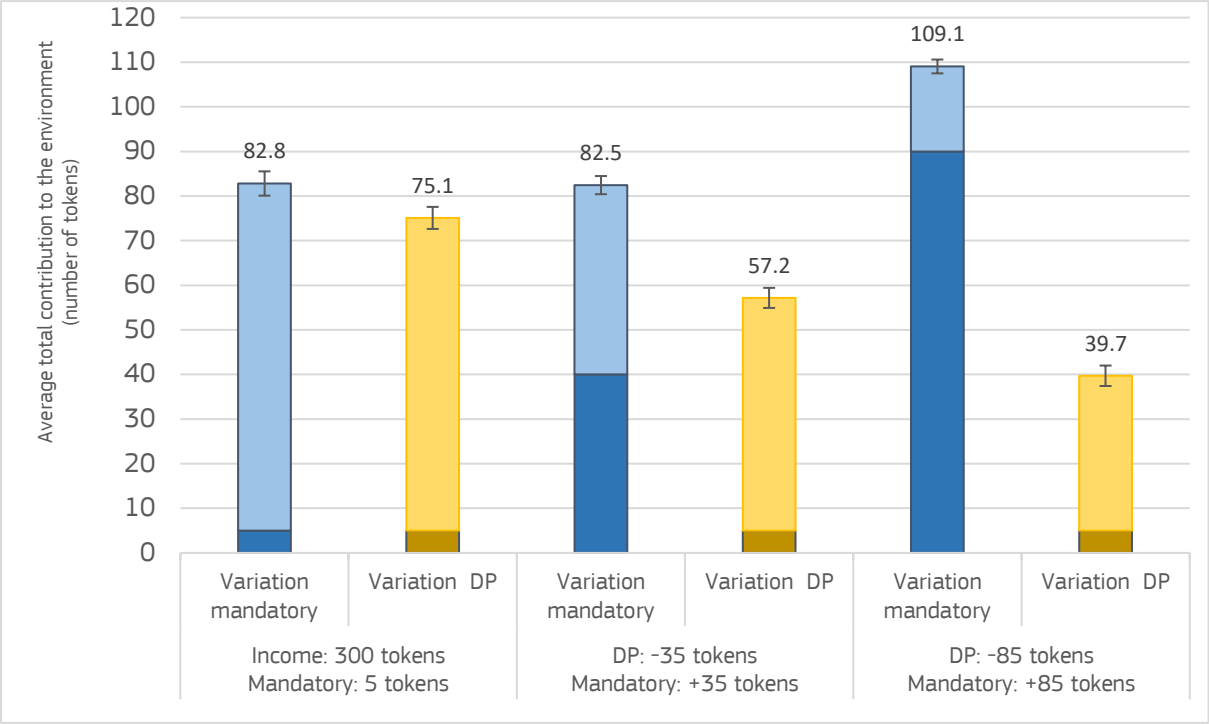
- Increasing mandatory requirements for farmers to adopt more environmentally friendly practices may lead to a bigger decrease in absolute voluntary contributions to the environment than decreasing BISS payments by the same amount.
- Farmers' willingness to voluntarily contribute to the environment through incentivised schemes is less sensitive to BISS variations than to mandatory contributions.

7.4.3. Effect on total contribution

From a policy perspective, an outcome variable of major interest is the total contribution to the environment, which serves as a proxy for the total environment and climate performance.

As shown in Figure 31, the only experimental condition in which the average total contribution to the environment is higher than the baseline (Level 1) was the one in which the mandatory was 90 tokens (+85). The condition that led to the lowest total number of tokens contributed to the environment was when direct payments decreased by the same absolute amount (–85). Note that, since the range of permissible total contributions is different across between-subject treatments, pairwise comparisons on absolute total contribution are not appropriate.

Figure 31. Average absolute total contribution under different levels of mandatory contribution versus direct payments



Darker colours refer to mandatory contribution. Lighter colours refer to voluntary contribution.
DP, direct payments.
Error bars represent ± 1 standard error.

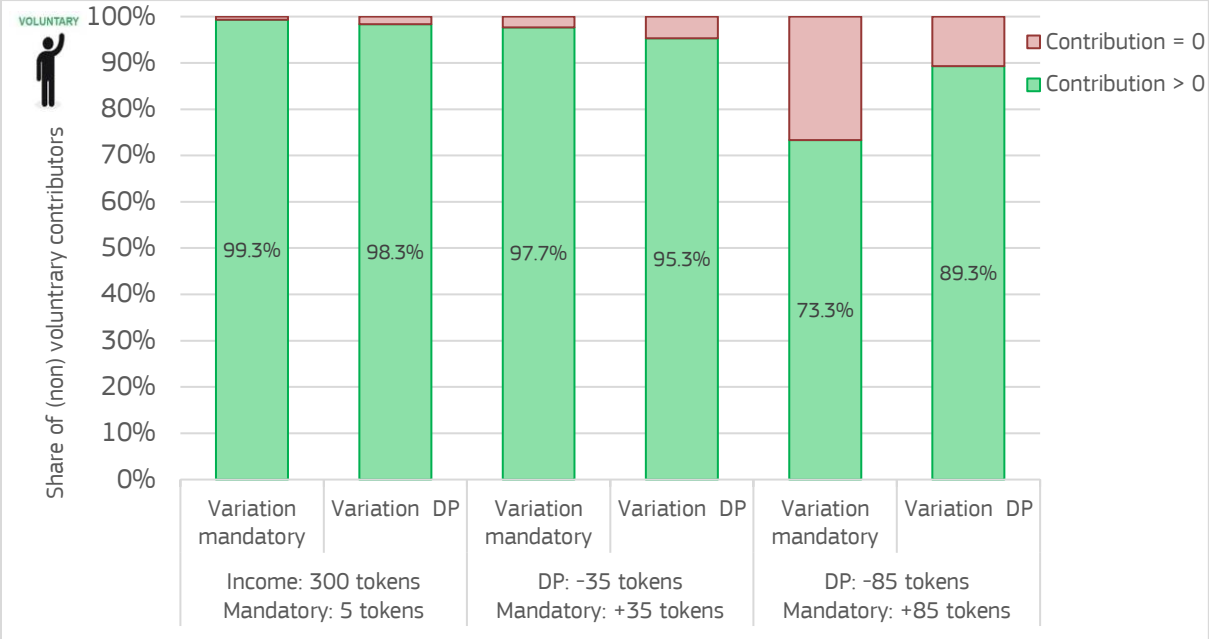
Policy message: snapshot

In a scenario in which voluntary adoption of environmentally friendly practices are compensated at 90 % by CAP payments, substantially enhancing conditionality may be the option that leads to the highest level of total adoption.

7.4.4. Effect on share of (non-)contributors

As shown in Figure 32, participation rates are similar in the first two levels, whether the mandatory contribution or direct payments varied (*p*-values of two-sided two-sample test of proportions = .25 and .12, respectively). Conversely, in Level 3, the proportion of participants who voluntarily contributed at least 1 token is significantly lower when the mandatory contribution was 85 tokens higher than in Level 1 (73.3 %) than when direct payments were 85 tokens lower than in Level 1 (89.3 %).

Figure 32. Share of (voluntary) contributors under different levels of mandatory contribution versus direct payments



DP, direct payments.

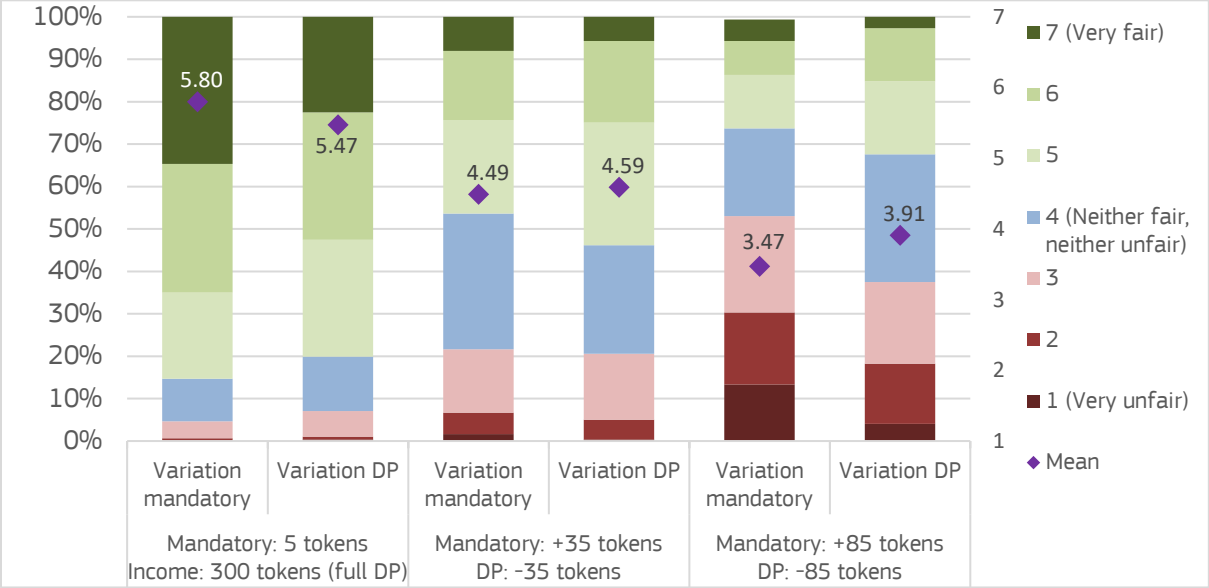
Policy message: snapshot

Strongly increasing conditionality may lead to fewer farmers participating in voluntary schemes than a decrease in BISS of the same magnitude in terms of effect on farmer income.

7.4.5. Effect on fairness perceptions

Figure 33 maps the distribution of the fairness perceptions across the three levels of mandatory contribution and the corresponding levels of direct payments. The diamonds represent the average fairness perception score, on a scale from 1 to 7. In Level 1, participants who were exposed to a variation in direct payments viewed this situation as slightly, yet significantly, less fair than participants in the "variation in mandatory contribution" condition (Mann–Whitney U test: *p*-value < .001). There is no significant difference of the distributions across the between-subject treatments for Level 2 (Mann–Whitney U test: *p*-value = .31). Finally, in Level 3, participants considered an increase of 85 tokens in mandatory contribution (with respect to Level 1) to be significantly less fair than a decrease of 85 tokens in direct payments (Mann–Whitney U test: *p*-value< .001).

Figure 33. Fairness perceptions under different levels of mandatory contribution versus direct payments



DP, direct payments.

Policy message: snapshot

Farmers seem to find major increases in conditionality as less fair than major decreases in BISS of the same magnitude.

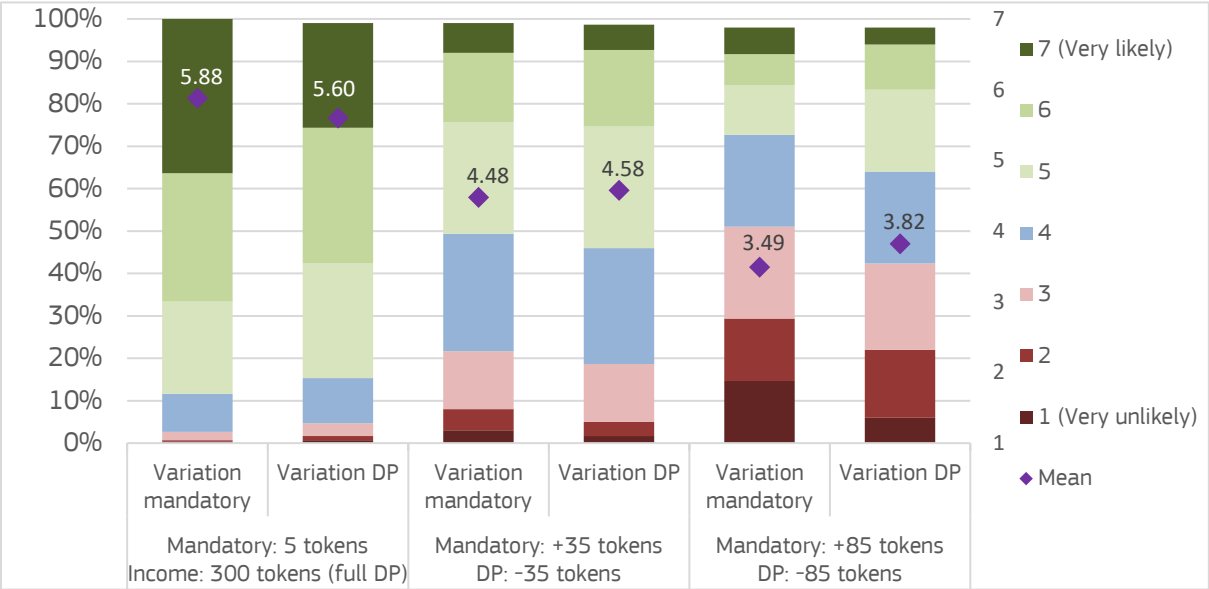
7.4.6. Effect on likelihood of enrolling in agri-environment-climate measures

In Figure 34, we plot the distribution and the mean likelihood of enrolling in AECM, comparing Level 2 and Level 3 with the baseline (Level 1) according to the framing of the variation in disposable income (variation in mandatory contribution vs variation in direct payments).

A first look at the distribution of answers on the scale from 1 (very unlikely) to 7 (very likely) suggests that the pattern is similar for Level 1 and Level 2 when we compare the treatment "variation in mandatory contribution" with the treatment "variation in direct payments". However, for Level 1, the distribution of the mean likelihood of participating in an AECM is significantly different when mandatory contribution or direct payments varied (Mann–Whitney U test: *p*-value = .002). In Level 2, we cannot rule out the null hypothesis that the distributions of the mean likelihoods of participating in AECM are different across the between-subject treatments (Mann–Whitney U test: *p*-value = .42).

In the extreme case (Level 3), in which the disposable income was 85 tokens lower than in Level 1, the distributions of the mean likelihood of participating in an AECM are significantly different across treatments (Mann–Whitney U test: *p*-value = .009). When the mandatory contribution was 90 tokens (i.e. 85 tokens more than in Level 1), 51 % of participants said they would be unlikely (rating ≤ 3 – red shades in Figure 34) to enrol in an AECM, including 15 % who said they would be 'very unlikely' to do so. When the initial income was 215 tokens (i.e. an 85-token reduction in direct payments in relation to Level 1), the corresponding proportions are 42 % and 6 %.

Figure 34. Likelihood of enrolling in AECMs under different levels of mandatory contribution versus direct payments



DP, direct payments.

Policy messages: snapshot

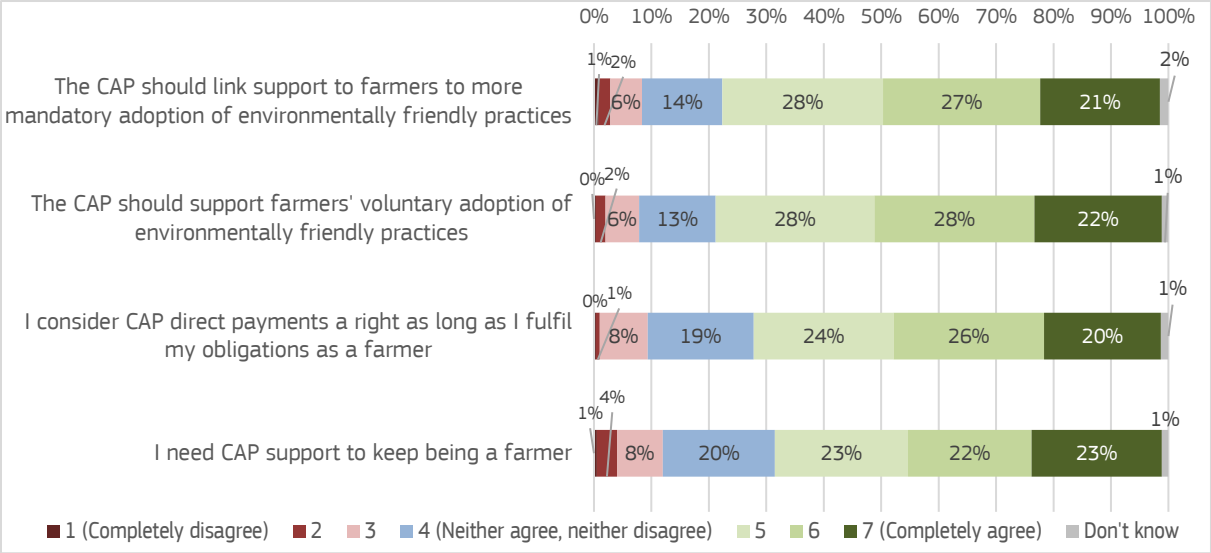
- A moderate increase in conditionality or an equivalent decrease in BISS could decrease farmers' likelihood of participating in AECM by the same order of magnitude.
- A major increase in conditionality may have a stronger negative effect on the likelihood of enrolling in AECM than a decrease in BISS of the same magnitude.

7.5. Opinion on the common agricultural policy

Participants indicated their level of agreement with a number of statements related to the CAP, on a Likert scale from 1 (strongly disagree) to 7 (completely agree). The wording of these statements was drafted together with the Directorate-General for Agriculture and Rural Development. Before we analyse the replies to these questions, it is important to keep in mind that these data *cannot be considered perfectly representative* of the farmer population, since this study was not a survey. Given this, one should look at these figures in not absolute but relative terms – in other words, we can compare the agreement with each statement.

The overall picture (see Figure 35) suggests strong agreement with each of the statements and little difference between the different statements. Participants generally agree with the idea of increasing the mandatory requirements to adopt more environmentally friendly practices, but they seem to have the same degree of agreement with the idea of focusing on voluntary practices. Most participants agree with the idea of considering CAP direct payments a right and with the fact that they need the CAP to keep being farmers.

Figure 35. Opinions on the CAP



8. Discussion, policy messages, and conclusion

8.1. Strengths and limitations of this study

The sample is fairly representative, but is not and was not meant to be perfectly representative of the farmer population.

Based on farmer age, farm size and type of farming, the sample is fairly representative of farmers in the three selected Member States (Germany, Spain and Poland) (see Section 6.2).

There is an over-representation of big farms and of livestock-specialised farms in the sample. The sample also strongly over-represents environmentally conscious farmers, which might be due to self-selection.

Because of this imperfect representativeness of the sample, we caution against interpreting between-country differences in the findings. That is why we talk, for instance, about 'Spanish participants' rather than about 'Spanish farmers'.

However, findings are similar across farmer profiles, suggesting a certain degree of generalisability.

When analysing the results, we assessed if the effects depended on farm and farmer characteristics, and found few differences in the general direction of the effects (see Table 9 and Table 10). This suggests that the general findings seem to be valid for most farmer profiles, even though the sample is not perfectly representative of the farmer population, and even though the strength of the effects may differ slightly.

This experiment used a highly controlled and well pretested design.

The experiment allowed the isolation of the causal effect of the policy changes on farmer behaviour, controlling for confounding effects as much as possible. This good internal validity allowed a clear comparison of the effects by farmer profile, as all participants were likely to have similar interpretations of this decision setting.

Some participants received an online retail voucher whose value depended on their decisions in the experiment (see Section 5.6). Their contributions to the environment in the experiment were converted into actual donations to an environmental programme. Participants were informed of these potential real consequences of their decisions in the experiment. This mechanism was meant to decrease the hypothetical bias.

In line with best practice in behavioural research (van 't Veer & Giner-Sorolla, 2016), we also preregistered the experiment on a dedicated online platform, whereby – before data collection – we presented the experimental setting and explained our data analysis approach.

The experiment went through a long process of pretesting and piloting with actual farmers, who gave us extensive feedback. Based on these insights, we iteratively revised the experiment.

Finally, the experiment was relatively simple, to ensure that participants understood the instructions. Participants watched an instruction video before making their decisions in the experiment. The experiment used many icons to better visualise the key components of the decision settings (see Figure 9). Comprehension check questions confirmed that, on the whole, participants understood the experiment (see Section 6.3.2).

All of these measures allowed us to observe changes in behaviour with a high degree of confidence.

The decision task in the study was a simplified representation of real life and relied on a number of assumptions.

Participants in the experiment received a certain number of tokens, which represented their farm income and their CAP direct payments. They had to choose how many of these they were willing to contribute to the environment. This semi-contextualised design entailed a certain number of simplifications and assumptions with respect to real life (see Box 3 in Section 5.4).

The simplifications included full compliance with mandatory environmental requirements, no budget restrictions for compensations, and the facts that decisions were static, short-term in nature and made in social isolation. Perhaps the most important assumption is the **90 % compensation** that participants received in the experiment in exchange for the tokens they voluntarily contributed to the environment. This level of compensation was chosen to *approximately* reflect the real-life additional costs (e.g. administration, behavioural change) a farmer would face when participating in a voluntary scheme such as eco-schemes compensated for at 100 %.

Readers should always bear in mind the simplifications and assumptions of the experiment when drawing

inferences from the study findings.

The experiment sheds light on general behavioural patterns but does not generate a precise quantification of the effects occurring in real life.

Because of these assumptions and simplifications, this experiment does not – and was not meant to – quantify effects occurring in real life. Instead, this study does illustrate the direction of general behavioural patterns that are highly relevant to the new green architecture of the CAP. For the same reasons, findings of this experiment should always be examined in relative terms, that is, comparing the outcome variables between experimental conditions and between levels, rather than judging them in absolute terms.

8.2. Policy messages

8.2.1. Enhancing conditionality

Enhancing conditionality may decrease farmers' level of participation in voluntary schemes.

- When participants were obliged to give a higher number of tokens to the environment as a mandatory contribution, the average number of tokens they voluntarily contributed to the environment was lower (see Figure 13).
- This reduction in the level of participation in voluntary schemes appeared not only in the token allocation task (which mimicked eco-scheme adoption), but also in participants' self-declared likelihood of enrolling in multi-annual AECMs (see Figure 20).
- This effect could be due to moral licensing (see Section 4.1 for a full description of this potential behavioural mechanism). When adopting more environmentally friendly farming practices to comply with higher mandatory requirements, farmers may feel moral satisfaction to such an extent that it frees them from doing even more for the environment on a voluntary basis. Alternatively, participants may consider mandatory and voluntary contributions to be interchangeable within a fixed overall contribution to the environment.

This behavioural pattern is consistent across farmer profiles, including 'green' farmers.

- We examined the behavioural pattern across different participant profiles, such as age, type of farming and engagement in organic agriculture (see Table 9).
- Across almost all participants' profiles, we found the same pattern as the one described above. Importantly, we also found the same pattern for organic and conventional farmers, and for participating farmers who participate or do not participate in AECMs. The strength of the behavioural pattern may differ slightly across farmer profiles.

Moderately enhancing conditionality may not necessarily increase the overall adoption of environmentally friendly practices.

- When the increase in mandatory contribution to the environment was small, participants reduced their voluntary contributions by the same amount, leaving the total number of tokens contributed to the environment unchanged (see Figure 16).
- However, in this situation, virtually all participants still contributed at least 1 token to the environment, thus only marginally affecting the participation rate (see Figure 18).
- Almost half of the study participants considered that this small increase of mandatory contribution to the environment was fair (see Figure 19).

Strongly enhancing conditionality could increase the total adoption of environmentally friendly practices, despite the associated decrease in voluntary adoption and in perceived fairness.

- Substantial increases in mandatory contributions led to an increase in the total number of tokens contributed to the environment (see Figure 16).
- In this situation, however, both the number of tokens voluntarily contributed to the environment and the participation rate (see Figure 18) were much lower than in the baseline situation. Participants' self-declared likelihood of participating in AECMs also decreased (see Figure 20).
- Participants perceived such a high mandatory contribution to the environment as less fair than low mandatory contributions (see Figure 19).

These effects could perhaps only occur in the short term.

- In real life, the reduction of voluntary adoption due to the increase of mandatory requirements may fade in the long term (for an example of such short-lived effects outside agriculture, see Vollaard & van Soest, 2020).
- Farmers may make some investments to comply with the mandatory requirements under conditionality, leading to some sunk-cost effects (see Box 1 in Section 4.1). They may learn from the adoption of mandatory requirements, and may discover that they are profitable in the long term. Some social dynamics may develop whereby environmentally friendly practices increasingly become the social norm.
- We did not test these sequential and social dynamics in the experiment, and we call for more research in this domain.

8.2.2. Reducing basic income support for sustainability payments

Decreasing BISS payments *(to increase the budget availability for eco-schemes)* ***may decrease farmers' level of participation in undercompensated voluntary schemes.***

- The number of tokens that participants contributed to the environment was lower when the number of tokens they received as BISS was lower (see Figure 21).
- This finding was valid for both voluntary contributions and total (i.e. including mandatory) contributions (see Figure 24).
- We found this pattern both in the number of tokens that participants contributed to the environment (which mimicked eco-schemes) and in the self-declared likelihood of adopting AECMs (see Figure 28).

This behavioural pattern is consistent across farmer profiles.

- Across virtually all farmer profiles (e.g. regardless of farmer age and farm size), we found a decrease in voluntary and total contributions to the environment as tokens received as BISS payments decreased (see Table 10). The extent of this decrease may, however, differ across farmer profiles.

The direction of this effect could be different for higher compensation rates of voluntary schemes.

- In the experiment, participants received a **90 % compensation rate** in exchange for their voluntary contributions to the environment.
- We chose this compensation rate to reflect a 100 % compensation minus the administrative cost and behavioural change cost associated with the adoption of eco-schemes.
- Should the compensation rate be set above 100 %, a classic profit maximisation function would predict a completely different behavioural pattern from the one we observed in the experiment.

In real life, costs and benefits are not as transparent as in this experiment, and farmers may consider compensation differently.

- In real life, farmers may not perfectly assess the income forgone and costs incurred through the adoption of environmentally friendly practices. In the experiment, this (short-term) loss in profit was very salient and very transparent, because participants chose how many tokens they would agree to forgo in order to benefit the environment. The compensation rate was also very precise and transparent, which may not be the case for farmers in real life.
- In real life, farmers may also use mental accounting (Heath & Soll, 1996), whereby direct payments and the short-term losses in profit associated with environmentally friendly practices could constitute two separate 'accounts'. If that is the case, a decrease in BISS could lead to an increase in the adoption of eco-schemes, as the compensation received in exchange could be seen as a way to increase the direct payment account balance, independently from the costs associated with this adoption.

8.2.3. Conditionality versus basic income support for sustainability

Farmers' enrolment in voluntary schemes could be more sensitive to enhancing conditionality than to decreasing BISS.

- When participants' mandatory contributions increased, their voluntary contributions to the environment decreased more than when the tokens they received as BISS decreased by the same amount (see Figure 29).
- We found converging evidence of this effect, whether we considered the number of tokens voluntarily contributed to the environment, the proportion of participants who voluntarily contribute at least 1 token (see Figure 32) or the likelihood of enrolling in AECMs (see Figure 34). In the first two cases, the difference only occurred for substantial increases in mandatory contributions or substantial decreases in BISS.

Total adoption of environmentally friendly practices may be highest under strongly enhanced conditionality.

- The total number of tokens contributed to the environment was always higher when mandatory contribution varied than when BISS varied by the same absolute amount (see Figure 31).
- Among all the situations analysed, the only scenario that led to a higher total contribution to the environment than the baseline was when the mandatory contribution was greatly increased. This is even though this scenario was also the one in which the absolute voluntary contribution was the lowest and the share of non-contributors was the highest.

Farmers perceive both enhancing conditionality and reducing BISS as unfair, but enhancing conditionality even more so.

- Participants considered higher mandatory contributions to the environment and lower BISS less fair than the baseline situation (see Figure 33).
- However, participants perceived a strong increase in mandatory contribution to the environment as less fair than an equally strong decrease in their BISS (see Figure 33).

Distributional aspects matter.

The distribution of environmental contributions matters when it comes to environmental performance. When only a few farmers contribute a lot to the environment, this does not deliver the same environmental benefits as when many farmers contribute a little. In other words, the same total contribution may be more beneficial to the environment if it is spread over many farmers (when the emphasis is put on mandatory schemes) than fewer (when the emphasis is put on voluntary schemes).

8.3. Concluding remarks

This research aimed to provide behavioural evidence to inform the implementation of the new green architecture of the CAP. More precisely, it aimed to assess:

- the effect of increasing farmers' obligations to adopt environmentally friendly practices, through an enhancement of the CAP conditionality requirements,
- and the effect of a budget shift from BISS to eco-schemes
- on farmers' voluntary and total adoption of environmentally friendly practices, a proxy for agriculture's environmental and climate performance.

An online experiment with farmers in Germany, Spain and Poland was undertaken, using a system of tokens to simulate the decision to adopt more environmentally friendly farming practices and the consequences associated with it. One must consider the simplifications and assumptions of the experiment to interpret its findings correctly.

The study sheds light on behavioural patterns underlying potential trade-offs in the new CAP green architecture. These behavioural patterns are consistent with the ideas that:

(1) strongly enhancing conditionality may increase farmers' total adoption of environmentally practices, even though doing so may deter them from enrolling in voluntary schemes,

(2) reducing farmers' BISS may not necessarily increase the total adoption of environmentally practices when voluntary schemes do not entirely compensate farmers for income forgone and cost incurred.

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Abbreviations

AECM	agri-environment-climate measure
AES	agri-environmental schemes
BISS	basic income support for sustainability
CAP	common agricultural policy
GAEC	good agricultural and environmental conditions
NGO	non-governmental organisation
SMR	statutory and mandatory requirement

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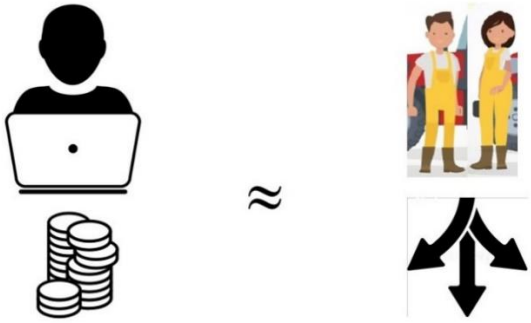
Annexes

Annex 1. Written instructions for the experiment

In what follows, you will participate in an **online study** that uses **tokens** to **simulate some of the decisions** that you take as a farmer.



You will **receive for yourself a certain number of tokens**:

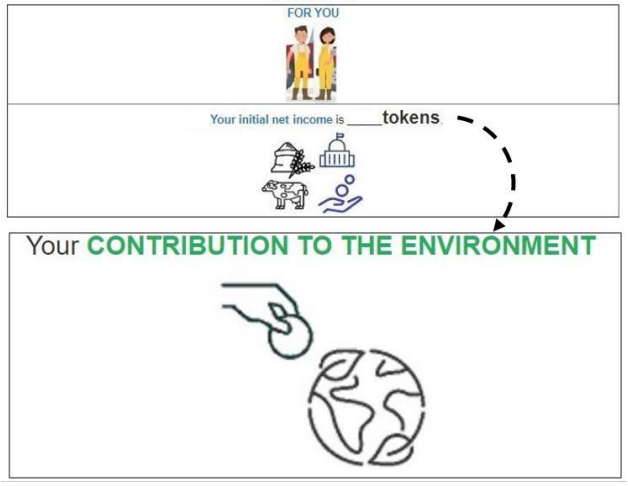
These tokens represent your **initial net income** from your farming activities.

This initial **net (farm) income** includes:

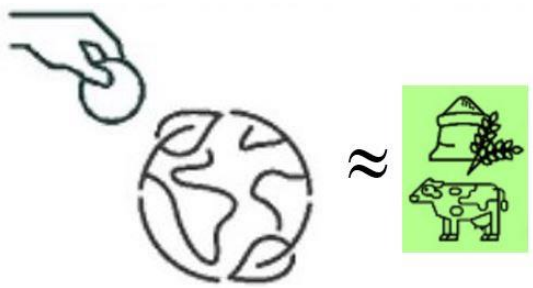
- the **profits** you make from selling your crops or livestock products, that is, the money you receive minus the costs and taxes you have to pay

- and the **direct payments** you receive from the common agricultural policy

You will decide **how many of these tokens** you take from your initial net income and **give to the environment**.

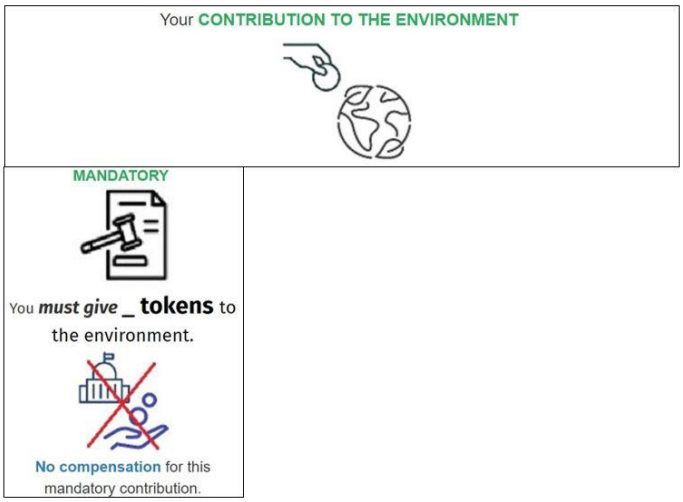


The tokens you give to the environment in the study are meant to represent the **reduction of profits** that you face in the short term when you adopt more **environmentally friendly farming practices**.



There are **two types of contributions to the environment**.

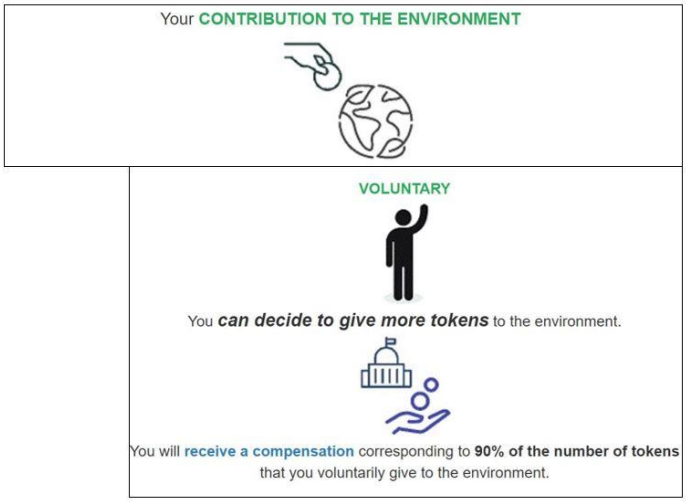
The **first type** is **mandatory contribution to the environment**:



This means you ***must* give** a certain number of tokens to the environment.

You will **not receive any compensation** for this mandatory contribution to the environment

The **second type** is **voluntary contribution to the environment:**



This means you ***can decide* to give** more tokens to the environment if you want to.

When you decide to give more tokens to the environment as a voluntary contribution, you will **receive for yourself some tokens as a compensation**.

This compensation will be equal to 90 % of the number of tokens that you voluntarily give to the environment.

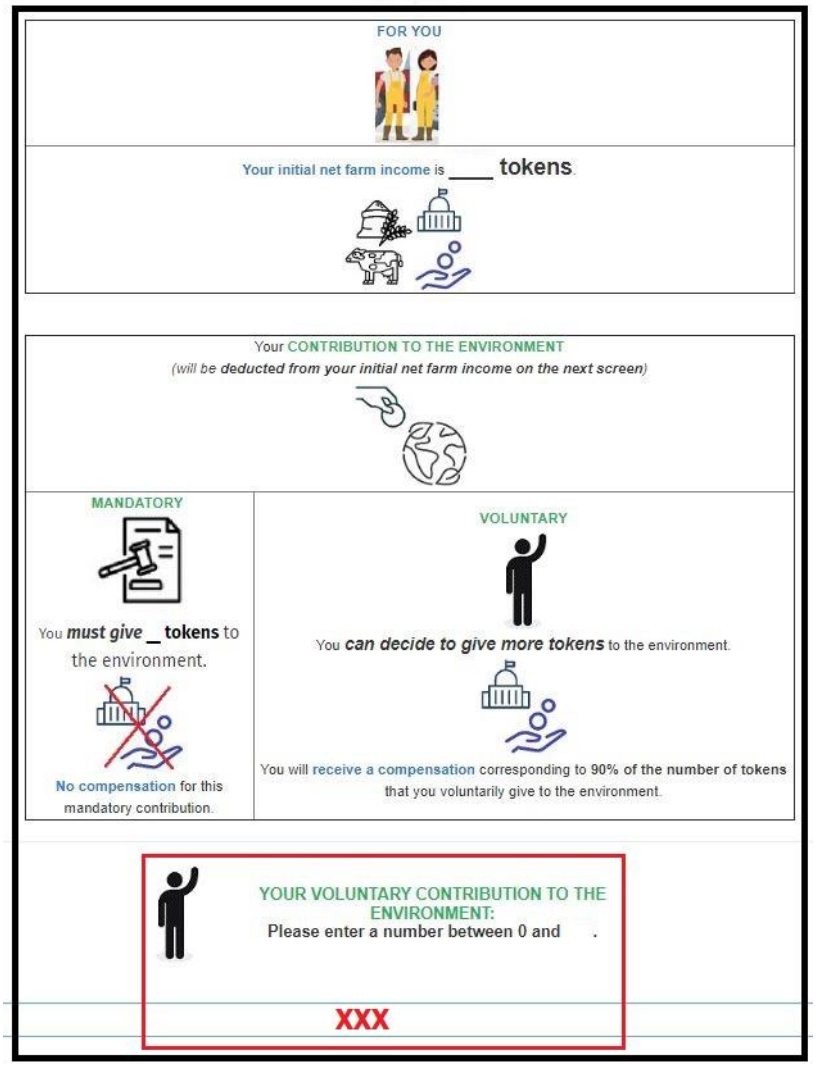
In the study, for every token that you voluntarily contribute to the environment, you **receive a 90 % compensation back**.

For instance,

If you voluntarily contribute…	… tokens to the environment,	you receive…	… tokens back as a compensation
0		0	
1		0.9	
50		45	
100		90	
300		270	

The voluntary contribution would be a **decision that you would have to take every year**. You would also receive the compensation on a yearly basis.

This is what the **first screen** of the study will look like:



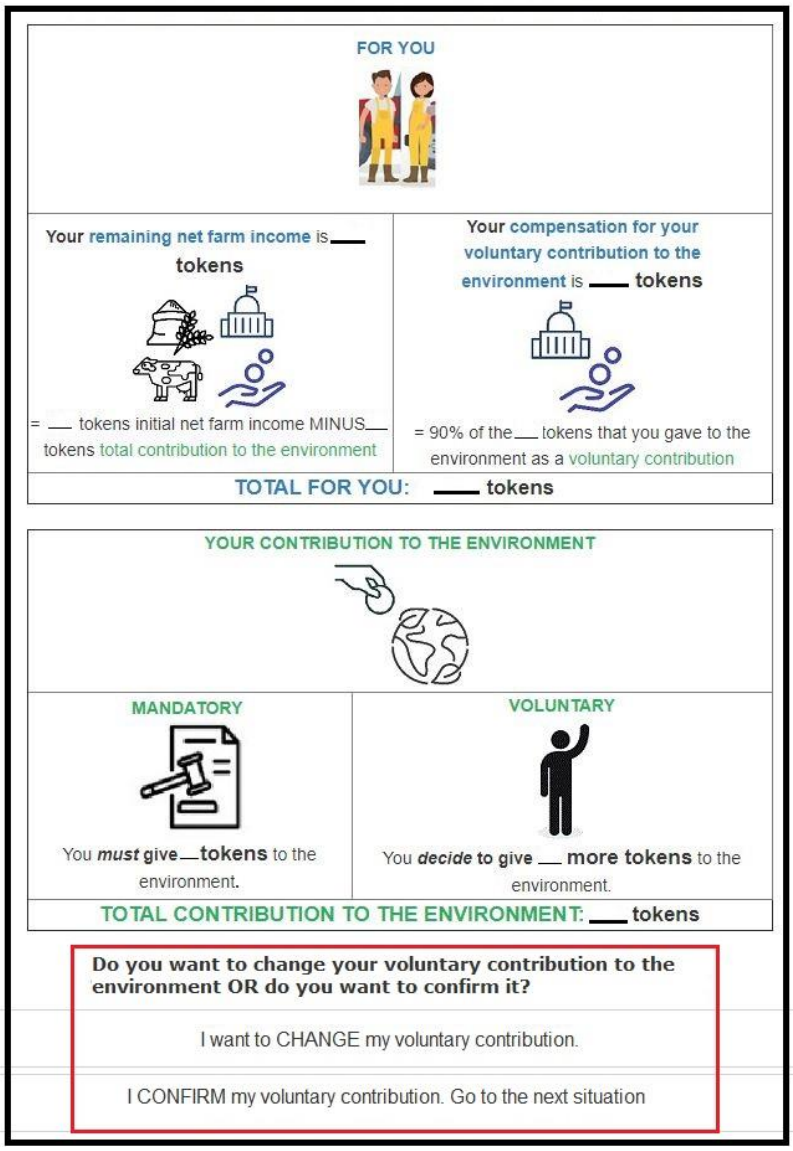
At the **bottom of the screen** (see red box), you will have to **type in the box the number of tokens** that you decide to give to the environment as your **voluntary contribution.**

Then, you will be taken to a **new page** where you will see the **result of your decision**.

Your **initial net income** will be **reduced** by your total contribution to the environment and will now appear as '**remaining net income**'.

You will also see the number of tokens you receive as a **compensation** for your voluntary contribution.

→ The sum of both (= **TOTAL FOR YOU**) will be the amount of tokens that you would receive following your decision.

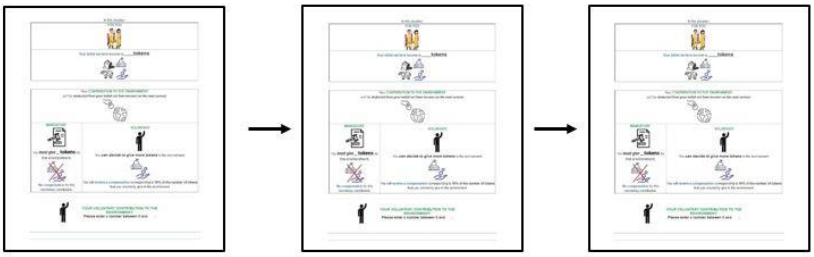


In the lower part, you will see your **TOTAL CONTRIBUTION TO THE ENVIRONMENT (mandatory + voluntary)**.

You can then **decide** (see red box) **whether you want to change your voluntary contribution, or confirm it**.

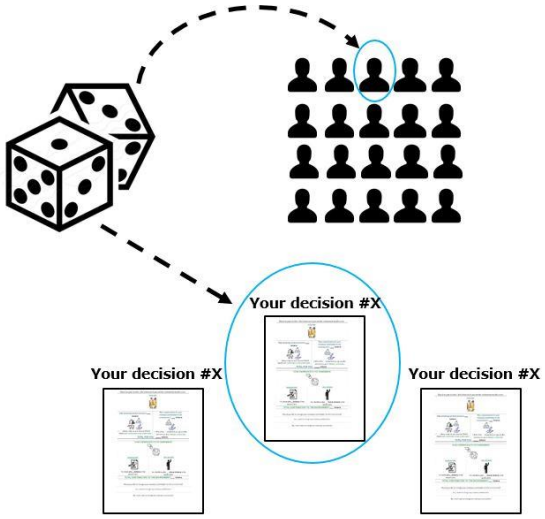
You will be subsequently shown **three different situations:**

Situation 1 → **Situation 2** → **Situation 3**



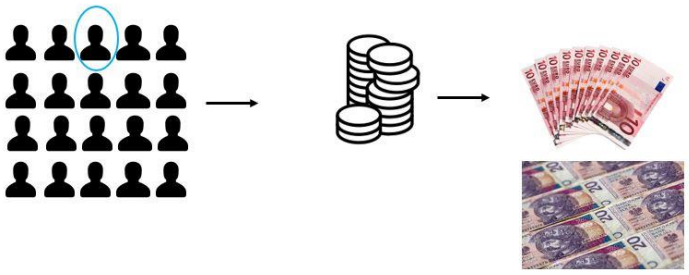
Between each situation, some of the aspects will change. **Please pay attention to these changes.**

At the end of this study, the system will randomly select **1 in each 20 participants**.
If you are one of these selected participants, the system will look at your three decisions and it will randomly select one of them.



<u>If you are one of the randomly selected participants</u>,
the tokens will be converted into euro/zlotys.

100 tokens are equal to **... euro/zlotys**.

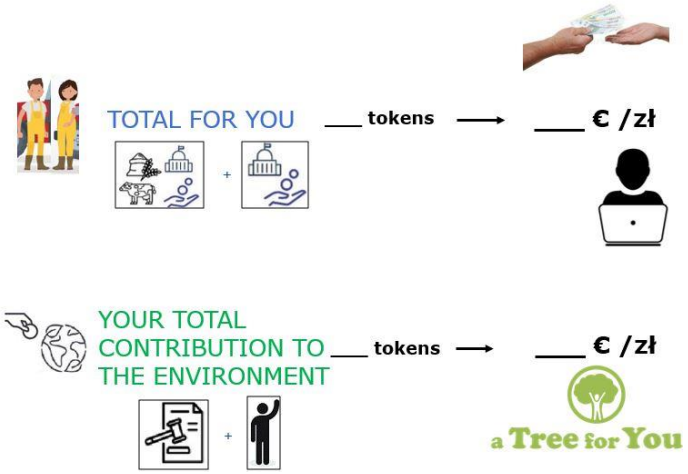


100 tokens = ... €/zł

<u>If you are one of the randomly selected participants,</u>

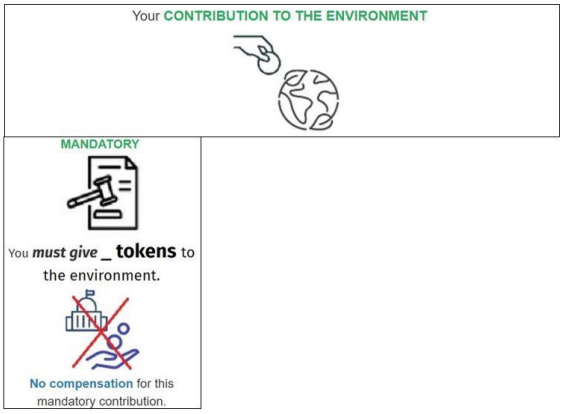
the system will look at the tokens in your randomly selected decision.

- The tokens corresponding to 'TOTAL FOR YOU' (= remaining net income + compensation) will be converted into euro/zlotys and will be **transferred to your bank account or to you in cash**.
- The tokens corresponding to 'YOUR TOTAL CONTRIBUTION TO THE ENVIRONMENT' will be converted into euro/zlotys and will be **transferred to the bank account of the environmental programme 'A Tree for You'**. This programme plants trees for richer biodiversity and to capture CO_2.



[PROG: ONLY SHOW TO participants in BLOCK 004 'variation in mandatory contribution']

Between each situation, the number of tokens corresponding to your mandatory contribution to the environment will vary.

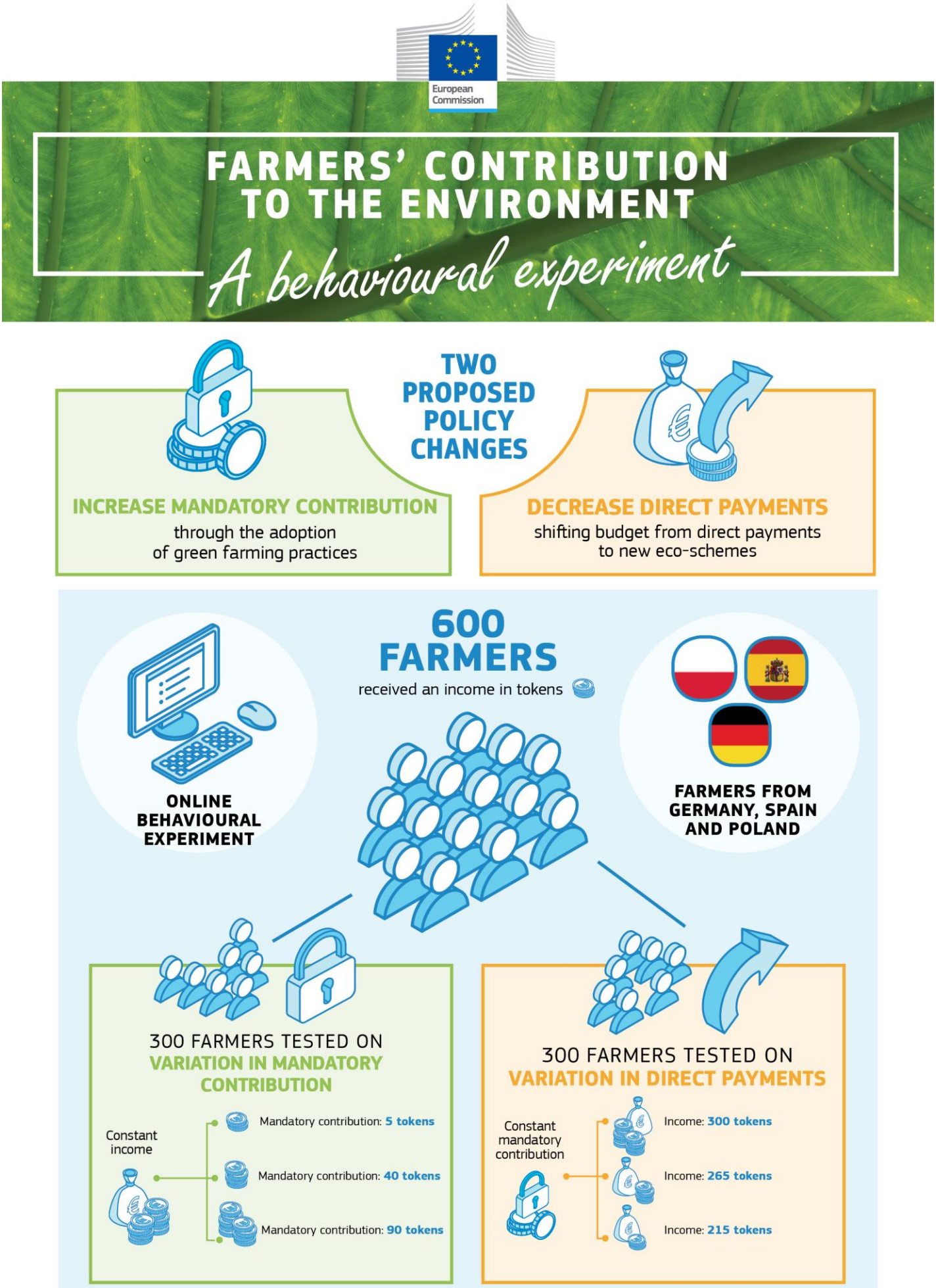


[PROG: ONLY SHOW TO participants in BLOCK 005 – 'variation in income/direct payment']

Between each situation, the number of tokens corresponding to your initial net income will vary.

This variation will be due to a variation in the direct payments you receive from the common agricultural policy.

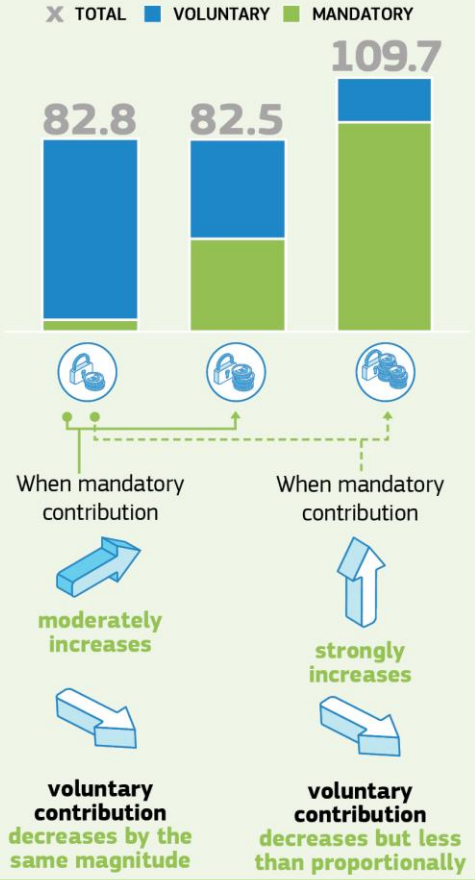
Annex 2: infographic



How many tokens do you voluntarily* give to the environment?

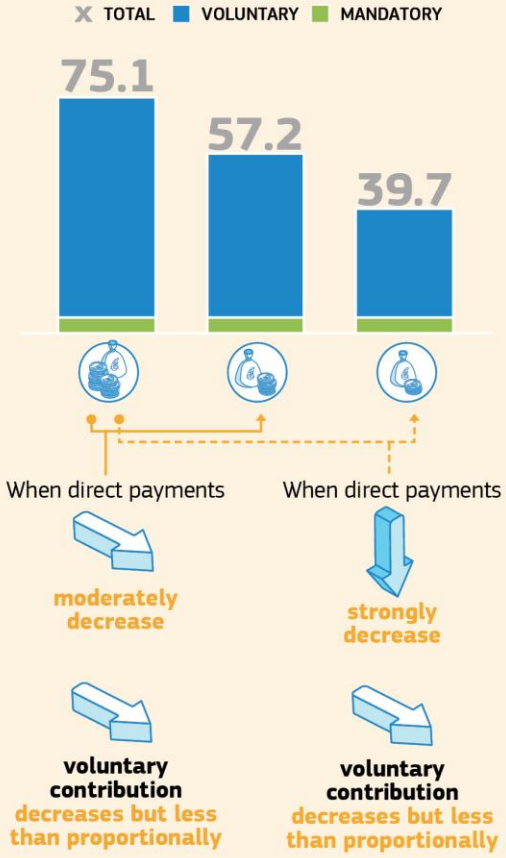
*Farmers received a 90% compensation

Variation in MANDATORY CONTRIBUTION



MORE TOTAL CONTRIBUTION
IF STRONG INCREASE OF MANDATORY CONTRIBUTION

Variation in DIRECT PAYMENTS



LESS TOTAL CONTRIBUTION
IF DECREASE OF DIRECT PAYMENTS

The effects on voluntary contribution: More affected by **mandatory contribution** than by equivalent variation in **direct payments**

Policy MESSAGES

Increasing mandatory contribution to the environment may decrease farmers' voluntary contribution. **A strong increase in mandatory contribution may still increase total contribution.**

Decreasing direct payments may decrease farmers' voluntary and total contribution to the environment when the compensation for such voluntary contribution does not entirely compensate income foregone and cost incurred

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