enfasys

WP5 - Test the potential of systemic and behavioural interventions through experimental research and system dynamic modelling

D5.1: IMPACT OF FARMER NUDGES FOR SFS

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List of abbreviations

AECM - Agri-Environmental and Climate Measures

CAP - Common Agriculture Policy

CATI - Computer Assisted Telephone Interviews

CAWI - Computer Assisted Web Interview

CSC - Case Study Coordinator

DiD - Difference in Differences

EC - European Commission

GA - Grant Agreement

SFS - Sustainable Farming System

WP - Work Package

1 Executive summary

WP5 of the ENFASYS project is designed to test the effectiveness of co-created systemic and behavioural interventions through experimental research (T5.1; T5.2; T5.3) and system dynamic modelling (T5.4). The goal is to evaluate how these interventions perform in real-life contexts, assessing their capacity to foster sustainable farming system transitions at both the case-study level and broader national levels. Task 5.1 contributes to this objective by focusing on behavioural interventions and testing the impact of tailored nudging strategies on farmers' behavioural determinants across a diverse set of farming contexts.

This deliverable reports on the design, implementation, and evaluation of nudging interventions developed through close collaboration with the case study coordinators. Each intervention was tailored to a specific sustainability challenge and target behaviour, aiming to improve the behavioural drivers of sustainable farming. A total of 9 case studies across 8 countries have been included in the experimental phase of Task 5.1. For each of them, a validated nudge intervention has been developed and its effects assessed using a quasi-experimental approach.

All interventions were evaluated adopting a quasi-experimental Difference-in-Differences (DiD) approach (Angrist & Pischke, 2009), comparing behavioural indicators between a control and a treatment group over time. This design was chosen for both ethical and practical reasons, including difficulties in random assignment and the need to ensure feasibility in agricultural contexts. The nudge interventions were implemented through a structured pre/post-survey design based on their influence on a set of psychological and behavioural variables derived from the Theory of Planned Behaviour (Ajzen, 1991), Self-Determination Theory (Deci & Ryan, 1985), the MINDSPACE framework (Dolan et al., 2010) and the RESET model (Lam et al., 2017).

The nudge interventions addressed a variety of behavioural domains, such as the adoption of agri-environmental and climate measures (AECMs), regenerative and biodiversity-friendly practices such as reduction of pesticide use, and participation in direct selling (Palm-Forster et al., 2020; Davidson 2021). All the nudges combined informational and social norm-based elements, tailored to context-specific barriers and motivations identified through scoping reviews and stakeholder engagement.

Each case study developed and tested its nudge message, translated into local languages and disseminated in visually engaging formats. Following the implementation, data were analysed to measure the impact of the intervention on a wide set of behavioural antecedents, such as perceived behavioural control, social norms, behavioural intentions, attitudes, and self-efficacy.

A synthesis of preliminary aggregated results showed a multifaceted impact of the nudging interventions across case studies, highlighting the necessity to tailor behavioural interventions and the practices to be promoted to the characteristics of the target contexts and populations, with a particular focus on the perceived feasibility and familiarity of proposed sustainable practices.

2 Introduction

The transition toward sustainable farming systems (SFS) requires targeted interventions capable of modifying key behavioural determinants among farmers. These systems are defined in ENFASYS as models of agricultural production that simultaneously support **environmental protection**, **economic viability**, and **social sustainability**. Sustainable Farming Systems (SFS), as defined within the ENFASYS project, refer to agricultural systems that combine environmentally sound practices with economic viability and social responsibility. These systems aim to preserve natural resources, sustain farm income and resilience, and foster inclusive participation and equity across food value chains.

Behavioural science provides a robust theoretical and empirical basis to support this transition, offering tools to understand and influence decision-making processes that are not adequately explained by economic or regulatory incentives alone (Thaler & Sunstein 2008; Dolan et al. 2010). Research has consistently shown that farmers' behaviour is shaped by a combination of attitudes, social norms, perceived control, motivational factors, and contextual constraints. Intervening on these determinants through behavioural levers can contribute to more effective, adaptive, and context-sensitive policy instruments (Ajzen, 1991; Dessart et al., 2019).

Task 5.1 of ENFASYS applies this approach by developing and testing **nudging interventions**, behaviourally informed messages designed to influence decision-making without changing economic incentives or imposing regulatory obligations. Nudges are grounded in behavioural economics and cognitive psychology and aim to guide choices by restructuring how options are presented, enhancing salience, invoking descriptive norms, or framing key messages.

In ENFASYS, nudging interventions were co-developed in close alignment with findings from Task 3.2, which identified the main barriers and levers to change through large-scale behavioural surveys. Interventions were implemented across nine ENFASYS case studies, each targeting a specific behaviour aligned with the SFS concept, such as reducing pesticide use, adopting biodiversity-friendly practices, engaging in direct selling, or participating in agro-environmental schemes. The location of the 9 ENFASYS case studies and the target interventions are reported in Table 1

Table 1: the 9 ENFASYS case studies

Case Study Location	Target intervention
CS1: France and Belgium (Wallonia region)	Facilitating the uptake of AECMs scheme by crop farmers
CS2: Serbia	Acceptance and implementation of "new" and sustainable farming practices - regenerative agriculture by Serbian farmers on a wider scale
CS3: Switzerland	Farmers' current/planned engagement in improving their knowledge and skills related to on-farm biodiversity promotion
CS4: France	Develop practices to increase protein self-sufficiency in dairy cattle
CS5: Germany	Adoption of higher animal welfare standards and (fodder-related) environmental standards in conventional pig husbandry systems.
CS6: Greece	Facilitating the implementation of farming practices that have positive impact on environment and profit, such as smart farming practices.
CS7: Slovenia	Integrating business model where is included direct selling
CS8: Italy	Encourage farmers that adopt both conventional and/or integrated production approaches to minimize the use of synthetic pesticides and herbicides
CS9: Ireland	Farmers' current/planned participation in an organic farming scheme

The experimental design adopted in Task 5.1 was a quasi-experimental Difference-in-Differences (DiD) approach (Angrist & Pischke, 2009). This method allows for estimation of causal effects by comparing changes in behavioural variables over time between treated and control groups, under the assumption of parallel trends. This choice reflects both ethical constraints and operational feasibility, given the difficulty of implementing full randomization in real-life agricultural settings.

The behavioural outcomes assessed in the intervention evaluation were based on validated theoretical models, primarily the Theory of Planned Behaviour (Ajzen, 1991), Self-Determination Theory (Deci & Ryan, 1985), the MINDSPACE framework (Dolan et al., 2010) and the RESET model (Lam et al., 2017). Indicators included perceived behavioural control, intention to adopt, attitudes, subjective norms, and self-efficacy. The design also integrated contextual knowledge derived from scoping and stakeholder engagement.

Overall, Task 5.1 contributes to a better understanding of how behavioural interventions can promote transitions toward more sustainable farming systems. Its results will provide input for the other tasks of WP5, which include choice experiments (Task 5.2), lab-in-the-field experiments (Task 5.3), and system dynamic modelling (Task 5.4), aiming at informing policy strategies at both national and EU levels.

3 Theoretical framework

Task 5.1 is grounded in the application of nudging as a behaviourally informed strategy to promote the transition to more sustainable farming systems (SFS). In this context, SFS are understood as systems that ensure environmental protection, economic viability, and social equity, supporting farm profitability and resilience, sustaining social cohesion in rural areas, and enabling fair participation across agri-food value chains.

Nudging refers to low-cost, scalable interventions that influence decision-making by subtly modifying the choice architecture, i.e., how options are presented without restricting freedom of choice or significantly altering economic incentives. As originally defined by Thaler and Sunstein (2008), a nudge is any intervention that predictably alters behaviour while remaining easy and inexpensive to avoid. Instruments such as taxes, subsidies, or mandates fall outside this definition. In ENFASYS, nudges are tested as tools to foster voluntary behavioural change among farmers, supporting transitions toward sustainability without coercion.

Over the last two decades, behavioural economics and cognitive psychology have increasingly informed agricultural policy design, recognizing that farmers, like all decision-makers, rely on heuristics and are influenced by cognitive biases, social norms, and inertia. These insights have opened new pathways to enhance the effectiveness of environmental and agricultural interventions.

In ENFASYS, the design of nudging interventions was inspired by the MINDSPACE framework (Dolan et al., 2010) and by the RESET model (Lam et al., 2017).

The MINDSPACE outlines nine behavioural influences:

- **M - Messenger:** responses vary depending on the credibility of the source delivering the message
- **I - Incentives:** responses differ based on framing of gains or losses
- **N - Norms:** individuals tend to conform to what they believe others are doing
- **D - Defaults:** people are more likely to stick with pre-selected options
- **S - Salience:** attention is captured by what is novel or personally relevant
- **P - Priming, A - Affect, C - Commitments, and E - Ego:** subconscious cues, emotional resonance, promises, and identity all shape behaviour

In addition, the RESET model identifies 5 possible areas for nudging interventions:

- **R - Regulation:** Interventions that mandate or restrict behaviours through laws, rules, or formal standards. These include bans, obligations, and enforcement mechanisms.
- **E - Education:** Interventions that aim to increase awareness, knowledge, and understanding through information campaigns, training, and communication strategies.
- **S - Social Influence:** Interventions that leverage social norms, peer comparison, community identity, or reputational concerns to guide behaviours.
- **E - Economic Incentives:** Interventions that change the cost-benefit structure through financial incentives or disincentives, such as subsidies, taxes, or payments.
- **T - Tools:** Interventions that alter the material environment or provide practical means that make the desired behaviours easier or more convenient. Examples include default options, reminders, digital apps, or infrastructure changes.

Given the characteristics of the case studies and of the characteristics of the participants to this study, and to maximize the potential outcome of the nudging strategy, the nudges were designed through a combination of Educational and Social norms elements.

By applying these behavioural levers in the context of sustainable agriculture, the nudges developed in Task 5.1 targeted a wide range of behaviours across the 9 considered case studies. The nudges predominantly included social norm cues, messages from trusted local actors (such as advisors or peer farmers), and salient content, often through visual framing or simplified language. This combination of social norm cues and informational content was selected for its relevance and adaptability to each farming context, as well as for its documented efficacy in influencing farmer

behaviour without relying on monetary incentives (Čop & Njavro, 2023) and was selected for its high adaptability across the diverse contexts and implementation constraints of the 9 ENFASYS case studies.

Examples of nudges are the communication that "a majority of local farmers already adopt a specific sustainable practice," or present concise infographics on the environmental and economic benefits of a behaviour. In some cases, farmers were presented with personalised messages or peer testimonials, while others received comparisons with regional benchmarks to trigger social comparison. The messages proposed to farmers participating to the research in each case study are presented in detail in the Results section.

The nudging interventions were developed adopting a participatory approach involving ENFASYS CSCs. Each nudging message was co-designed by the project partners acting as case study coordinators, based on the insights collected through during earlier participatory workshops and context-specific analyses. This co-creation process ensured cultural and contextual relevance of the nudging message and enhanced the legitimacy and the applicability of the interventions to the CS context. This aspect is crucial to increase the effectiveness of nudging strategies in agricultural policy, in particular when they are implemented in a participatory setting, to be adapted to local knowledge and socio-cultural conditions (Salembier et al., 2012; Colen et al., 2023; Howley, 2022).

The interventions were tested using the quasi-experimental approach Difference-in-Differences (DiD) (Angrist & Pischke, 2009). Surveys were administered to both treatment and control groups before and after the intervention, enabling causal estimation of the nudges' effects while accounting for unobserved time-invariant heterogeneity. The choice of DiD over Randomized Controlled Trials (RCTs) was driven by practical limitations and the ethical need to maintain strong trust-based relationships with farming communities, where randomization is often unfeasible or culturally inappropriate. This decision aligns with recent recommendations in behavioural policy evaluation, which underline the importance of implementing robust empirical designs under real-world constraints to improve external validity (Shukla et al., 2023).

The evaluation framework integrated constructs from established behavioural theories:

- The **Theory of Planned Behaviour** (Ajzen, 1991), which considers attitudes, subjective norms, and perceived behavioural control as determinants of intention;
- The **Self-Determination Theory** (Deci & Ryan, 1985), highlighting the importance of intrinsic motivation and autonomy;
- The **COM-B model** (Michie et al., 2011), which sees Capability, Opportunity, and Motivation as key conditions for behaviour change.

These constructs guided both the message design (e.g., enhancing perceived behavioural control or strengthening social expectations) and the selection of outcome variables.

Research shows that the application of nudges in the agricultural domain is expanding, particularly in relation to water management, promotion of agro-environmental schemes, adoption of sustainable technologies and behaviours, and participation in certification systems (Palm-Forster et al. 2020; Davidson 2021; Howley and Ocean, 2022; Ouvrard 2023). Also, literature highlighted the effectiveness of **information nudges**, **social comparisons**, and **empowered messengers** in promoting the adoption of pro-environmental action among farmers (Palm-Forster et al.2020; Ouvrard 2023; Davidson 2021). However, the success of these nudges is highly dependent on the context and on specific social dynamics, including trust in the source that promoted the nudging intervention, the compatibility of proposed practices with farming routines, familiarity of farmers with proposed new practices, and perceived benefits (Peth & Mußhoff, 2018).

ENFASY Task 5.1 considered nudging at the core of its theoretical and operational approach to behavioural change. By combining behavioural science, participatory insights from project partners, and empirical evaluation, this task contributes to a growing body of evidence on how specifically targeted interventions can support transitions toward more sustainable and resilient farming systems.

4 Materials and Methods

4.1 Co-design of the Nudge intervention

The development of the nudge interventions followed a structured pre-intervention phase to ensure that the strategies were grounded in both behavioural science and the specific contexts of the case studies. The development of nudging messages started with a literature review on the role of nudging in the agricultural sector, a scoping literature review for each case study and the co-design of interventions in collaboration with the Case Study Coordinators (CSCs), leading to tailored solutions for each experimental setting.

The initial literature review provided broad insights into the effectiveness of different nudging approaches for promoting sustainable farming practices (Čop & Njavro, 2023). Existing research indicates that nudges based on social norms, particularly those leveraging peer influence and descriptive norms, tend to be more effective than interventions relying solely on information and education (Davidson, 2021; Čop & Njavro, 2023). This is particularly relevant in farming contexts where decision-making is often constrained by complexity and information overload (Davidson, 2021). Informational nudges, while useful for raising awareness, have limited impact unless reinforced over time. Moreover, the success of interventions is largely determined by how they are implemented rather than their novelty, with key factors including ease of understanding, perceived cost-benefit balance, and the ability to frame sustainable practices in a way that highlights their positive outcomes rather than imposing behavioural change. Ensuring that communication is clear, accessible, and aligned with farmers' perspectives is also critical.

Building on this analysis, a scoping literature review was conducted for each case study. Unlike the broader literature review, which established general principles for nudging farmers, this step focused on the specific contexts and behavioural targets relevant to each case study. The starting point for this analysis was the knowledge of the diverse agricultural settings and the sustainable practices under investigation, which varied across the case studies. Given this variation, the scoping literature review was essential for identifying the most contextually appropriate content for the nudging messages.

The purpose of the scoping literature review was to develop nudge messages that were tailored to each case study, incorporating both informational inputs on economic advantages and social norm mechanisms relevant to the specific behavioural changes being targeted. Specifically, the messages were designed to emphasize the financial benefits of adopting sustainable farming practices, such as increased profitability, reduced reliance on costly inputs, enhanced access to financial incentives, and greater market opportunities for sustainable products. By examining existing studies, policy frameworks, and regional farming practices, this phase allowed for the selection of relevant data and framing strategies that would enhance the credibility and effectiveness of the nudging interventions. This process ensured that the informational component of the nudge messages was fact-based and aligned with local realities, while the social norm aspect was designed to leverage peer pressure in a meaningful way within each farming community.

Once the preliminary messages were drafted, they were refined through bilateral discussions with the CSCs, who provided further input based on their knowledge of farmers' decision-making processes and the socio-economic and policy landscape of each region. This collaborative process helped to ensure that the interventions were contextually relevant.

After validation by the CSCs, the final nudge messages were translated into the respective local languages and formatted into standardized graphical templates to optimize clarity and engagement. This final step ensured that the interventions maintained a structured yet adaptable format suitable for implementation across multiple European case studies.

4.2 Implementation of the nudge

The nudging intervention has been implemented trough a two steps survey, involving two samples of farmers operating in the countries and sectors related to each case study. This data collection strategy was adopted to implement a quasi-experimental approach, which allowed to assess the impact of the nudge messages.

The survey was based on a set of questionnaires co-designed with the CSCs and including 27 5-points Likert scale questions and 12 close-ended questions. The structure of the questions allowed comparability of the results over the Case Studies. This approach ensured a cross-case comparability of the effects of the interventions.

The first step of the survey included questions related to behavioural factors related to the adoption of SFS, agricultural practices adopted, possible interventions to be implemented in the farm, socio-demographic characteristics of the farmers was submitted to a sample of farmers, named baseline group. Data collection for this step was conducted through Computer Assisted Web Interview (CAWI) and Computer Assisted Telephone Interviews (CATI) methodologies in November 2024. In this phase, no nudging was implemented to the respondents.

On the second step of the survey, a subset of the questions proposed in the first step and investigating behavioural factors related to the adoption of SFS, and socio-demographic characteristics of the farmer and characteristics of the farm, was submitted to a sample of farmers with characteristics comparable to those interviewed in the previous step. The new questionnaire included 17 5-points Likert scales and 9 close-ended questions.

Within this sample, the nudging message was sent to randomly selected sub-sample of farmers, named treatment group, while the other sub-sample of farmers was not targeted by the intervention. Randomization allowed the comparability between the two subgroups Data collection for this step was conducted through CAWI and CATI methodologies in February 2025.

This study has been authorized by the Ethical Committee of the University of Bologna on 29th of April 2024 (authorisation n° 0133096 of May 14th, 2024) and pre-registered. Data were collected with the support of a marketing agency operating in the EU and complying with the EU regulation on data protection (GDPR).

4.3 Data analysis

The first step of data analysis consisted in the cleaning of collected datasets, to delete inconsistent or incomplete observations. The final number of valid observations for the 9 ENFASYS Case Studies was 3,382. The number of observations for each Case Study is summarized in Table 2.

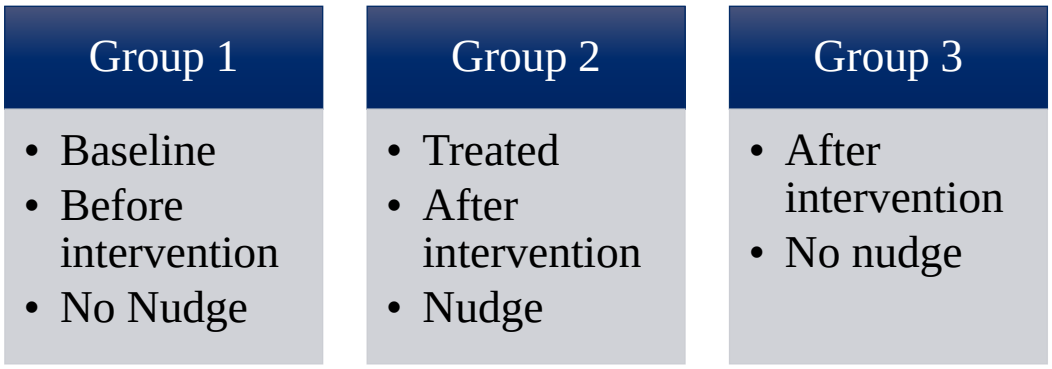
Table 2: number of total observations for each case study before and after the matching process

Case Study	Baseline group Nov - 2024	Treated group Feb - 2025	Control group Feb - 2025	Total
CS1 - Belgium & France	205	94	91	390
CS2 - Serbia	208	95	92	395
CS3 - Switzerland	205	94	91	390
CS4 - France	201	98	93	392
CS5 - Germany	205	92	91	388
CS6 - Greece	200	81	82	363
CS7 - Slovenia	201	91	95	387
CS8 -Italy	180	93	90	363
CS9 - Ireland	150	85	79	314

Then data were then analysed adopting a Difference-in-Differences (DiD) approach (Angrist & Pischke, 2009), to test the potential impact of the nudging messages on farmers intention to adopt SFS.

The Difference-in-Differences method is a widely adopted quasi-experimental econometric approach to estimate causal effects of interventions or policy changes (Angrist & Pischke, 2009). It compares the changes in outcomes over time between a group exposed to an intervention (the treatment group) and a group not exposed (the control group), as summarized in Figure 1. By evaluating the difference in the differences in outcomes before and after the intervention between these two groups, DiD allows to consider the impact of confounding factors and to isolate the causal impact of the intervention (Angrist & Pischke, 2009; Bertrand et al., 2004).

Figure 1: groups considered for DiD analysis



DiD is a validated approach for evaluating nudges, which are often implemented at small scale and outside of controlled experimental settings, making randomized control trials (RCTs) difficult to be implemented. DiD offers a robust alternative for impact evaluation in real-world contexts. Moreover, nudges frequently promote behavioural change through tailored information cues or framing. The DiD framework can capture these effects by identifying natural or planned variation in exposure to the nudge across time and space. When reliable pre-intervention data are available, DiD allows to estimate the counterfactual trajectory of outcomes in the absence of the nudge, thus enabling a valid estimation of its impact (Gertler et al., 2016; Wing et al., 2018).

DiD relies on three assumptions (Callaway and Sant'Anna, 2021; Gertler et al., 2016; Lechner, 2010). The first is the comparability of baseline group interviewed in step 1 and the control group interviewed in step 2, combined with the absence of spillovers between the groups. This assumption was satisfied by selecting farmers who were comparable in terms of socio-demographic characteristics, typology of production and characteristics of the farm. Also, the design of the experiments allowed to avoid spillovers, since the nudging message was provided to members of treatment group at the same time of the questionnaire and farmers dropping out from the interview before completing it were excluded from the final analysis.

The second assumption is that no other interventions or external shocks occurred during the study period that could have affected the outcome in different ways among the treatment and control groups. This condition was met by collecting the data in a short period of time, during which no major external shocks were reported in the considered case studies.

The third and most impactful assumption is the presence of parallel trends, requiring that treated and control groups would have evolved similarly over time in the absence of the intervention. The parallel trend assumption is supported by the short period occurred between the two phases of the survey, by the absence of relevant exogenous shocks in the considered period and by the implementation of a Propensity Score Matching (PSM)[1] prior to the Difference-in-Differences (DiD) estimation.

PSM was adopted to balance the samples of treated and control farmers relying on a set of covariates, including age, gender, education, income, membership of a farmers' association/union, risk aversion, and characteristics of the farmers specific for each case study. The adoption of the PSM allowed to make the parallel trend assumption more plausible, by ensuring that the control group more closely resembled the treated group in terms of observable characteristics. This combined approach is widely adopted in the literature (Heckman et al., 1997; Stuart, 2010; Blundell & Dias, 2009) as it increases the reliability of impact evaluation results.

[1] PSM was implemented adopting a 1-to-1 nearest neighbour matching without replacement

Table 3 summarizes the distribution of observations across treatment and time groups, both before and after matching.

Table 3: distribution of observations before and after matching

Case Study	Control group Nov - 2024	Control group Feb - 2025	Treated group Feb - 2025	Matched Control group Nov - 2024	Matched Control group Feb - 2025	Matched Treated group Feb - 2025
CS1 - Belgium & France	205	94	91	38	53	91
CS2 - Serbia	208	95	92	59	33	92
CS3 - Switzerland	205	94	91	48	43	91
CS4 - France	201	98	93	45	48	93
CS5 - Germany	205	92	91	63	28	91
CS6 - Greece	200	81	82	36	46	82
CS7 - Slovenia	201	91	95	47	48	95
CS8 -Italy	180	93	90	61	29	90
CS9 - Ireland	150	85	79	67	12	79

The PSM process ensured that treated units were matched with control units having similar characteristics, thus improving comparability and reinforcing the validity of the parallel trends assumption required by the DiD approach.

After the matching, an OLS Difference in Differences model was estimated for each of 13 outcome variables, summarized in Table 4: list of outcome variables, to assess the impact of the nudging intervention on farmers' behavioural factors related to the adoption of the sustainable practices proposed in the 9 ENFASYS Case Studies. The first 3 outcome variables are related to the implementation of the proposed practice and to its perceived feasibility, while the remaining 9 are investigating factors that could have an indirect impact on the decision to adopt the practice. The outcome variables were identified independently from the structure of the nudging intervention, which was designed to promote the adoption of the proposed sustainable practices at a broader level.

Table 4: list of outcome variables

Label	Outcome variable
Behaviour1	I'm planning to adopt the practice
Behav_Int	I plan to adopt the practice within the coming 3 years.
Goal_Feas	It is feasible for me to adopt the practice within the coming 3 years.
Attitude1	Adopting this practice for my farm is advantageous for me.
Attitude2	It is important to me that this practice is applied for my farm.
Per_Nor	I think that adopting the practice is the right thing for me to do.
Soc_Norm	People who are important to me (farmers, advisers, family, friends) encourage me to adopt the practice
Pos_Emot	Adopting the practice would make/makes me feel positive about my environmental impact
Neg_Emot	Adopting the practice would/does causes me stress.
PBC1	Adopting the practice would be very easy for me.
PBC2	I do not depend on anyone to adopt the practice
M_Self_Eff	I am able to maintain implementation of the practice despite potential barriers.
R_Self_Eff	In the event of problems, I have the ability to still successfully adopt the practice

The estimated models are described by the equation:

$$Y_i = \alpha + \beta_1 treat_i + \beta_2 time_t + \beta_3 (treat_i \, x \, time_t) + \beta_n covariates_{i,t} + \epsilon_1$$

Where:

- Y_i = considered outcome variable
- β_3 = coefficient of the net effect of the nudge
- $Treat_i$= dummy equals to 1 if farmer received the nudge, equal to 0 elsewhere
- $Time_i$= dummy equals to 1 if survey was conducted in February 2025 (second step of the survey), equal to 0 elsewhere
- β_n = coefficient of the net effect of covariates: age, gender, education level, income level, being member of a farmers association or union, risk aversion

The adoption of a linear model in presence of ordinal variables is justified in empirical and methodological literature. First, OLS provides coefficients that are easier to interpret as average treatment effects, this making this approach more efficient for policy evaluations (Angrist & Pischke, 2009; Gertler et al., 2016). Also, simulation-based literature shows that considering ordinal variables as continuous, in particular those with four or more categories, leads to negligible bias while yielding efficiency gains (Rhemtulla et al., 2012; Robitzsch, 2020).

The next section presents nine briefs outlining the context of each case study, the nudge message, and its estimated impact on behavioural factors influencing farmers' intention to adopt the proposed sustainable farming practice.

5 Results: impact of Nudges in the 9 ENFASYS CS

5.1 Case Study 1: Belgium and France - Encouraging the Adoption of Agri-Environmental and Climate Measures (AECMs)

5.1.1 Context and target behaviour

This case study addresses the low adoption rate of Agri-Environmental and Climate Measures (AECMs) among crop farmers in Wallonia (Belgium) and Hauts-de-France (France). The objective is to facilitate farmers' engagement with AECM schemes, which aim to enhance territorial biodiversity objectives. These measures, supported by the Common Agricultural Policy (CAP), are crucial for promoting environmentally sustainable practices without being limited to specific value chains.

A scoping literature review was conducted to identify evidence-based messages to be incorporated into the nudge, ensuring that the intervention was grounded in economic incentives and peer influence mechanisms. The analysis focused on two main aspects: (1) the financial viability of AECMs, particularly how eco-schemes provide economic stability and reduce dependency on costly inputs, and (2) the role of social peer pressure in influencing farmers' decision-making regarding environmental commitments.

Findings from the literature highlighted that financial uncertainty and perceived transaction costs are major concerns when adopting AECMs (Riccioli et al., 2023). However, well-designed financial incentives, such as those provided through eco-schemes, can offset potential profit losses and encourage farmers to transition towards sustainable practices (Poppe & Koutstaal, 2020). Additionally, social norms play a crucial role in reinforcing behavioural change—when farmers perceive that their peers are engaging in AECMs, they are more likely to follow suit and maintain these practices over time (Le Coent et al., 2021).

These insights are the theoretical foundation for the creation of the nudge message, ensuring that both the economic benefits of AECMs and the influence of peer networks were effectively communicated.

5.1.2 Nudge intervention design

The intervention was structured around a combination of informational inputs and social norm mechanisms, leveraging both economic incentives and peer influence to encourage participation in AECMs.

The informational component focused on clear and concrete financial messages, emphasising how eco-schemes provide subsidies that help maintain farm profitability, compensate for investment costs, and ensure economic stability. Research indicates that farmers engaged in eco-schemes tend to be less reliant on pesticides, which can further reduce input costs while maintaining productivity (Poppe & Koutstaal, 2020). By making these financial benefits explicit, the intervention aimed to mitigate concerns regarding profitability and financial risk.

The social norm component leveraged peer influence and descriptive norms to encourage adoption. Evidence suggests that farmers are more likely to commit to sustainable practices if they see their peers doing the same, and this effect extends beyond initial adoption to the long-term maintenance of AECMs (Le Coent et al., 2021). To reinforce this mechanism, the intervention highlighted the role of local advisory structures, such as Natagriwal, which provide dedicated support for farmers engaging in AECMs. Additionally, the message included references to regional success stories, showcasing how local farmers have successfully implemented eco-schemes, benefiting both environmentally and economically.

By integrating these elements, the intervention aimed to address financial concerns while fostering a sense of collective participation, making AECM adoption more attractive and accessible.

5.1.3 Final validated nudge message

The final nudge message, validated by Case Study Coordinators, was formulated as follows:

> *"Consider this: Managing high biological value meadows, maintaining grassy headlands (buffer strips), working on fodder autonomy… All of these initiatives are concrete examples of agri-environmental and climate measures (AECMs) that can be implemented to improve landscape and on-farm biodiversity.*
>
> *9 AECMs are currently supported in Wallonia through dedicated CAP subsidies (5 basic, 3 targeted, and 1 result-oriented measure). The commitments are made over 5-year periods, with annual compensation for investments when specific requirements are met.*
>
> *Feeling hesitant? You're not alone. Across Wallonia, a dedicated structure (Natagriwal) helps farmers join the scheme and implement AECMs on their farms. Their agri-environmental advisors carry out diagnostics prior to commitment and provide support in complying with the specifications.*
>
> *Still unsure? Local experience and regional exemplar models are being developed to showcase practical examples of successful AECMs implementation. These examples help to raise awareness of the accessibility, achievable benefits, and practical challenges associated with the implementation of AECMs. Additionally, some local actors (GALs) also contribute to organising promotional events."*

This message was structured to ensure that farmers feel supported, informed, and connected to a broader network of peers and advisors, reducing uncertainty and perceived risks associated with AECM adoption. Following validation by the Case Study Coordinators (CSCs), the nudge was translated into the local language and formatted into a graphical document, ensuring clarity and accessibility for the target audience.

Figure 2: final version of the nudge, as presented in its visual format.

5.1.4 Impact of nudge on famers' behavioural factors related to the adoption of SFSs

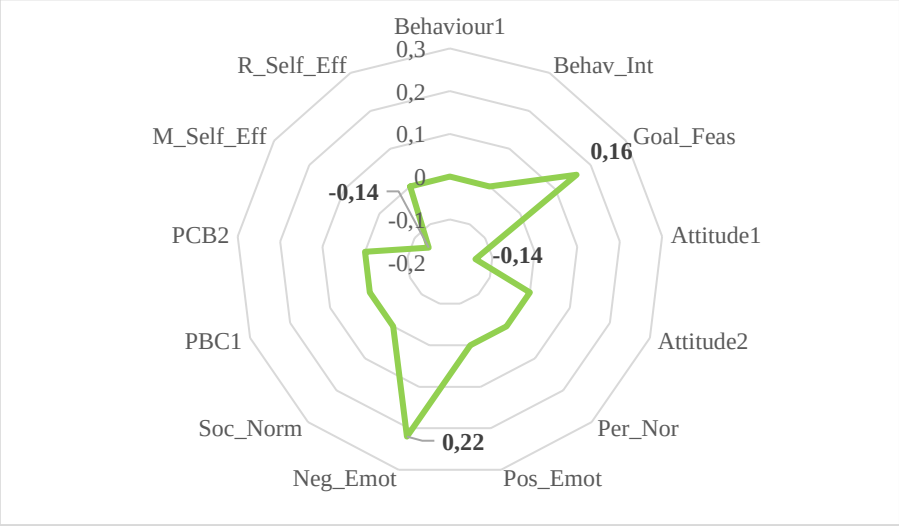
Table 5 and Figure 3: impact of nudge on farmers' behavioural factors for CS 1 summarize the results of the estimations of the Difference-in-Differences models for the considered outcome variables. The models estimated for this case study do not include risk aversion as covariate. This choice was made due to the higher level of fit registered for this version of the DiD estimation.

Table 5: impact of the nudge and of socio-demographic variables on farmers' behavioural factors for CS 1:

	Impact of nudge	Age	Gender	Education Level	Income	Member of Farmers Union	R^2
Behaviour1	-0.06	-0.18***	-0.50***	0.09*	-0.03	-0.17	0.17
Behav_Int	-0.03	0.09	0.01	0.04	0.04	-0.07	0.05
Goal_Feas	0.16*	-0.17***	-0.50***	0.05	0.06**	-0.30*	0.12
Attitude1	-0.14*	-0.07	-0.23	0.05	0.01	-0.20	0.05
Attitude2	0.06	0.04	0.00	0.04	0.04	-0.06	0.02
Per_Nor	0.03	0.01	-0.11	0.09*	0.03	-0.07	0.05
Soc_Norm	0.05	-0.09	-0.65**	0.04	0.00	-0.29	0.12
Pos_Emot	-0.06	-0.16***	-0.36***	0.03	-0.01	0.29**	0.10
Neg_Emot	0.22	0.03	0.01	0.06	0.00	-0.18	0.05
PBC1	-0.12	0.03	-0.14	-0.01	-0.04	-0.08	0.01
PBC2	-0.12	-0.12**	-0.27	-0.01	0.02	0.18	0.01
M_Self_Eff	-0.14**	-0.02	-0.10	0.03	0.02	-0.12	0.02
R_Self_Eff	0.08	0.04	-0.08	0.00	-0.04	0.12	0.01

Note: ***= significant at 1% level; **= significant at 5% level; *= significant at 10% level

Figure 3: impact of nudge on farmers' behavioural factors for CS 1



The impact of the nudging intervention in Case Study 1 results to be mixed. While the intervention positively influenced the perceived feasibility of adopting Agri-Environmental and Climate Measures (*Goal_Feas*), it generated negative effects on farmers perceived added value of implementing the practice (*Attitude1*) and on their confidence in maintaining its implementation despite potential barriers (*M_Self_Eff*).

Considering socio-demographic variables, age negatively moderated the impact of the nudge on the intention to adopt the practice (*Behaviour1*), perceived feasibility (*Goal_Feas*), and the declared positive motions generated by the adoption of the Agri-Environmental and Climate Measures (*Pos_Emot*). This suggests that older farmers were less

likely to plan adoption, since they perceived it as difficult to implement, and linked the adoption of AECM with fewer positive feelings even after the implementation of the nudge.

Gender had a statistically significant negative effect on the intention to adopt the practice (*Behaviour1*), perceived feasibility (*Goal_Feas*), perceived peer pressure to adopt the practice (*Soc_Norm*), and on perceived positive emotions generated by the adoption of AECM. This suggest that female farmers perceived the practice as less feasible, felt less encouraged by peers, and experienced lower emotional engagement after the nudge intervention.

Education level register a positive influence on the intention to adopt AECM (*Behaviour1*) and on personal norms (*Per_Nor*), suggesting that more educated farmers were more likely to intend to adopt the practice and to perceive it as the right thing to do. Income was positively associated with perceived feasibility of adopting ACM (*Goal_Feas*), suggesting that farmers with higher income levels found it more feasible to adopt the practice.

Finally, membership in a farmer's union showed a mixed pattern: it negatively affected perceived feasibility (*Goal_Feas)*, but positively influenced perceived positive emotions related to the environmental impact of adopting AECM (*Pos_Emot*). This suggests that farmers who are members of unions felt more positive about the environmental relevance of the practice, while remaining sceptical on the feasibility of the measure.

5.2 Case Study 2: Serbia - CAP-proofing Serbian Agriculture

5.2.1 Context and target behaviour

This case study addresses the limited adoption of regenerative agriculture practices among farmers in Vojvodina, Serbia's main agricultural region. The sector is dominated by mid-size and large farms engaged in high-input conventional crop production, with widespread use of synthetic fertilisers and pesticides. At the same time, demographic decline, ageing rural populations, and low investment in innovation contribute to stagnation. Soil degradation and erosion are growing concerns, yet few incentives exist to support the transition to more sustainable practices.

The objective of the intervention is to encourage farmers to adopt regenerative techniques, such as crop rotation, cover cropping, and no-till farming, to improve soil health, reduce input dependency, and enhance long-term resilience and profitability.

A scoping literature review was conducted to inform the nudge design, focusing on two key elements: (1) the economic benefits of regenerative farming, particularly in reducing input costs and improving yields over time; and (2) the role of peer influence in shaping adoption, especially through exposure to local success stories and informal networks.

Studies indicate that farmers are more likely to consider regenerative practices when they see concrete economic advantages and when these practices are endorsed by trusted peers. In Serbia, where formal advisory structures are limited, peer learning and visible examples of success are crucial drivers of change.

These insights guided the development of the nudge, which communicates both the potential profitability of regenerative farming and the fact that a growing number of farmers in the region are already making this transition.

5.2.2 Nudge intervention design

The intervention was structured around a combination of informational and social norm components to address both financial concerns and behavioural influences. Economic constraints remain a primary concern for Serbian farmers, as the cost of transitioning to regenerative agriculture can be perceived as an initial financial burden despite long-term benefits. However, studies indicate that regenerative practices reduce input costs over time, particularly by eliminating expenses related to pesticides and fertilizers (Forbes, 2020). Additionally, research highlights that educational initiatives and advisory support play a crucial role in farmers' willingness to adopt sustainable practices, as knowledge gaps and lack of technical guidance often hinder transitions (RegenX, 2023).

The informational component emphasized the economic benefits of regenerative agriculture, particularly the reduction in operational costs by eliminating pesticide and fertilizer expenses. Specific examples, such as the impact of cover cropping on soil fertility and water retention, were highlighted to provide concrete financial advantages. The message also underscored how regenerative farming practices enhance long-term resilience against climate variability, reducing farmers' dependency on costly external inputs.

Social norms also significantly influence decision-making among farmers. When producers observe their peers adopting regenerative agriculture and witnessing its benefits, they are more likely to follow suit. Studies emphasize the importance of peer influence in reinforcing behaviour change, particularly in rural agricultural communities where knowledge-sharing networks and demonstration farms create strong incentives for widespread adoption (The Sowell, 2022).

The social norm component leveraged peer influence and collective action to encourage adoption of regenerative agriculture techniques. Farmers were presented with examples of successful local adopters of regenerative agriculture, illustrating how these practices have led to improved yields and profitability. The intervention also referenced potential policy developments, such as new subsidy programs under IPARD Measure 4, which could further support the transition in the coming years. By positioning regenerative agriculture as an emerging standard within the farming community, the intervention sought to create a ripple effect, where early adopters influence their peers to follow suit.

5.2.3 Final validated nudge message

The final nudge message, validated by Case Study Coordinators, was formulated as follows:

> *"Looking to boost profits and environmental sustainability on your farm? Consider regenerative practices.*
>
> - *Cover Cropping*
> - *Crop Rotation*
> - *Agroforestry*
> - *No-Till Farming*
> - *Composting and Organic Amendments*
> - *Rainwater Harvesting and Drip Irrigation*
>
> *Switching to these methods can significantly reduce operational costs by eliminating pesticide and fertilizer expenses. For example, planting cover crops like legumes or grasses during off-seasons or between cash crops helps reduce erosion, improve soil fertility, and suppress weeds naturally. Efficient water management techniques, such as rainwater harvesting and drip irrigation, further reduce irrigation needs and energy costs.*
>
> *Moreover, regenerative practices foster a healthier ecosystem with improved soil quality, increased biodiversity, and greater resilience against pests and diseases.*
>
> *Remember, as more farms adopt these practices, the collective impact grows stronger. Be a leader in your community and join the movement towards sustainable agriculture."*

This message was structured to ensure clarity, credibility, and engagement, making it accessible to Serbian farmers. It was translated in Serbian and formatted into a graphical document for widespread distribution.

Figure 4: translated message in Serbian

5.2.4 Impact of nudge on famers' behavioural factors related to the adoption of SFSs

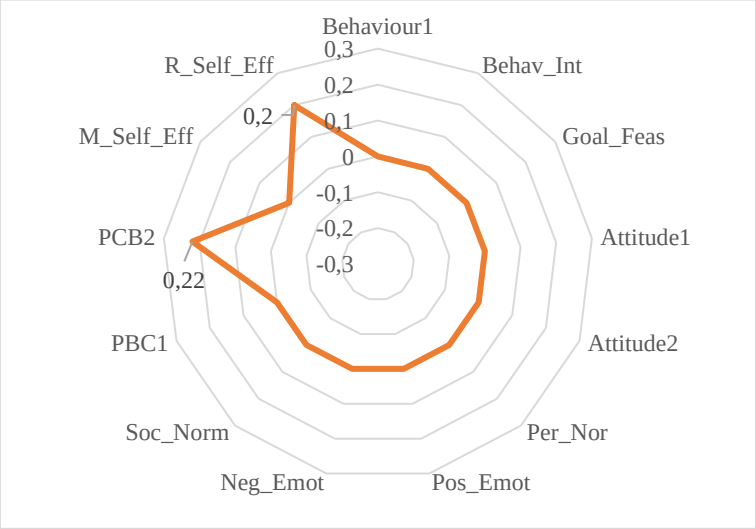
Table 6 and Figure 55 summarize the results of the estimations of the Difference-in-Differences models for the considered outcome variables. The models estimated for this case study do not include risk aversion as covariate. This choice was made due to the higher level of fit registered for this version of the DiD estimation.

Table 6: impacts of the nudge and socio-demographic variables on farmers' behavioural factors for CS 2:

	Impact of Nudge	Age	Gender	Education Level	Income	Member of Farmers Union	R^2
Behaviour1	0.08	-0.02	-0.25*	0.07	0.01	-0.09	0.04
Behav_Int	0.02	-0.05	-0.08	0.03	0.02	-0.06	0.03
Goal_Feas	0.14	0.01	0.00	-0.02	0.03	0.22	0.03
Attitude1	0.00	-0.04	0.00	0.05	0.05**	-0.08	0.08
Attitude2	-0.03	0.07	-0.20	0.10**	0.00	0.10	0.09
Per_Nor	0.04	0.06	-0.04	0.04	-0.02	-0.13	0.02
Soc_Norm	0.00	0.01	0.06	0.14***	0.03	-0.13	0.06
Pos_Emot	-0.13	0.00	0.32**	-0.06	0.04*	0.32*	0.07
Neg_Emot	0.05	-0.19*	-0.01	0.02	-0.02	0.21	0.08
PBC1	0.16	0.03	0.11	0.01	0.00	-0.02	0.05
PBC2	0.22**	-0.06	-0.11	0.05	0.04	-0.07	0.06
M_Self_Eff	0.03	-0.09*	0.19	-0.03	0.01	0.00	0.03
R_Self_Eff	0.21**	-0.09	0.13	0.07	0.01	0.26	0.08

Note: ***= significant at 1% level; **= significant at 5% level; *= significant at 10% level

Figure 5: impact of nudge on farmers' behavioural factors for CS 2



The impact of the nudging intervention in Case Study 2 results appear to be positive. The intervention had a positive impact on perceived independence on the adoption of regenerative practices (*PCB2*) and on their reflective self-efficacy (*R_Self_Eff*), or the confidence in adopting the practice even in the face of potential barriers.

Considering socio-demographic variables, age had a negative effect on perceived stress associated with the adoption of the practice (*Neg_Emot*) and on the declared ability to maintain the implementation despite the presence of barriers (*M_Self_Eff*). This suggest that older farmers, may consider the adoption of regenerative agriculture practices too demanding.

Gender registered a multifaceted impact on Serbian farmers' behavioural factors. Female farmers were associated to a negative effect on the intention to adopt the practice (*Behaviour1*), reflecting perceived barriers to the adoption of regenerative practices. However, gender had a positive effect on reflective self-efficacy (*R_Self_Eff*), indicating that female farmers, despite lower stated intention, may still feel capable of overcoming potential barriers when deciding to adopt regenerative agriculture practices.

Education level was positively associated with the perceived moral relevance of the practice (*Attitude2*) and the perception of a support of peers in adopting the practice (*Soc_Norm*). This suggest that more educated farmers were both morally engaged and socially aligned with the activity promoted by the nudging message.

Income showed a positive impact on the perceived advantage of adopting regenerative agriculture practice (*Attitude1*), reinforcing the idea that farmers with more financial resources may associate regenerative agriculture with economic or strategic benefits. Additionally, income positively influenced the perceived positive environmental impact of the practice (*Pos_Emot*).

Finally, membership in a farmer's union was also positively associated with *Pos_Emot*, indicating that unionized farmers were more likely to associate the nudged practice with a positive emotion due to the reduction of their environmental impact.

5.3 Case Study 3: Switzerland - Biodiversity Promotion Using Locally Adapted Practices

5.3.1 Context and target behaviour

This case study explores the promotion of biodiversity-friendly agricultural practices in Switzerland, focusing on a pilot project in the canton of Zurich (ZiBiF). The project involves farms of various types testing a new approach to biodiversity promotion, which moves away from prescriptive measures towards a goal-oriented system. Instead of

following predefined actions, farmers are encouraged to develop site-adapted solutions, granting them greater flexibility while also increasing their responsibility for biodiversity outcomes. Given the complexity of biodiversity management, education, knowledge dissemination, and technical support are considered crucial to ensure that farmers have the necessary skills to implement effective measures.

The project is situated in the Swiss midlands, within the Alpine North region, covering pre-Alpine and Jura landscapes. The agricultural sector in the region is diverse, encompassing intensive vegetable, arable, and cattle farming in the lowlands, while the uplands are characterized by extensive livestock farming. The canton also features valuable natural ecosystems, including lakes, peatlands, and mountain formations, which play a critical role in supporting biodiversity.

Despite these natural advantages, biodiversity promotion in Swiss agriculture faces several challenges. Current regulations are often perceived as rigid, applying a one-size-fits-all approach that does not always align with the needs of different farms. Bureaucratic complexity adds further barriers, discouraging participation in biodiversity schemes. Additionally, public perception plays a role in shaping farmer behaviour, with concerns that biodiversity-promoting areas may be perceived as messy or unkempt, potentially impacting the reputation of participating farmers. Frequent changes in agricultural policies create uncertainty, complicating long-term planning and investment in biodiversity measures.

The case study seeks to scale up locally adapted biodiversity promotion practices, shifting from process-oriented to result-oriented biodiversity management. By allowing farmers to set their own biodiversity goals and select appropriate measures, the intervention is expected to enhance effectiveness, motivation, and engagement. However, risks remain, particularly the possibility that farmers may not significantly change their practices or that funding may not be continued at the cantonal or federal level. Ensuring transparent communication and realistic expectations among all stakeholders is therefore crucial. The project also aims to evaluate whether result-oriented biodiversity measures are a more effective approach and whether they could be expanded as a model for national biodiversity policies.

5.3.2 Nudge intervention design

To support farmers in engaging more actively with biodiversity promotion, the intervention was designed using a combination of informational and social norm-based nudging approaches. A scoping literature review was conducted to identify evidence-based messages that could be integrated into the nudge. The analysis focused on two key areas: economic incentives associated with biodiversity-friendly practices and the role of peer influence in shaping adoption behaviours.

Research suggests that enhancing biodiversity can mitigate the negative environmental impacts of conventional intensification, such as biodiversity loss and disruptions to ecosystem services (Tschumi et al., 2015). Additionally, in both Switzerland and the EU, biodiversity-promoting measures, such as flower strips, are supported by direct payments, helping to compensate farmers for land opportunity costs and additional management efforts (Reforming Agricultural Subsidies, 2017). The literature also highlights that enhanced biodiversity can improve crop yields through natural pest control mechanisms, ultimately reducing reliance on chemical pesticides and lowering production costs (Tschumi et al., 2015).

While financial incentives are important, research also indicates that social perceptions and reputational concerns influence farmers' decision-making. Farmers who have not yet adopted biodiversity-friendly practices fear negative judgements from their peers, particularly regarding agroforestry and other visible environmental interventions (Sereke et al., 2016). In Switzerland, non-adopters of agroforestry report being more concerned about the opinions of fellow farmers than those of environmental groups or the general public. They also express concerns about increasing environmental regulations, viewing them as potential constraints on their autonomy (Sereke et al., 2016).

To address these issues, the nudge intervention was structured to highlight the financial benefits of biodiversity-friendly practices, including direct payments, cost savings on pesticides, and improved ecosystem services. The intervention also emphasised peer participation and knowledge-sharing, leveraging local advisory networks and community-based biodiversity promotion initiatives. Additionally, it encouraged engagement through accessible learning opportunities, reinforcing that many farmers in the region are already actively involved in biodiversity promotion projects.

By integrating these elements, the intervention aimed to reduce uncertainty, enhance the perceived benefits of biodiversity-friendly practices, and encourage a shift in social norms within farming communities.

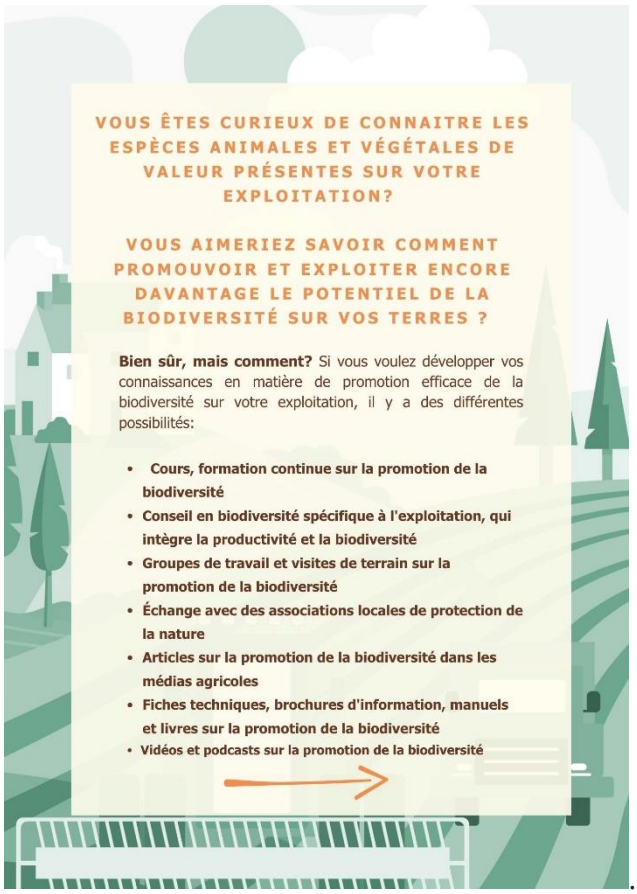
5.3.3 Final validated nudge message

The final nudge message, validated by Case Study Coordinators (CSCs), was formulated as follows:

> *"Are you interested in enhancing biodiversity on your farm? Would you like to learn how to unlock the full potential of your land to support biodiversity?*
>
> *Yes, but how? If you want to expand your knowledge on biodiversity promotion, there are several options available to you:*
>
> - *Courses and training on biodiversity-friendly farming*
> - *Farm advisory services that integrate production and biodiversity goals*
> - *Working groups, field inspections, and on-site demonstrations on biodiversity promotion*
> - *Exchanges with local nature conservation organizations*
> - *Agricultural media featuring articles on biodiversity promotion*
> - *Brochures, informational materials, manuals, and books on biodiversity management*
> - *Videos and podcasts on biodiversity-friendly farming*
>
> *Did you know that some farmers in the Canton of Zurich are currently receiving biodiversity-specific advice as part of a pilot project? This consultation helps them set site-specific biodiversity objectives. Together, they develop tailored measures to achieve their biodiversity goals."*

This message was structured to ensure that farmers feel empowered with practical knowledge and peer support, reducing perceived risks and social barriers to biodiversity adoption. Following validation by the Case Study Coordinators (CSCs), the nudge was translated into German, French, and Italian and formatted into a graphical document, ensuring clarity and accessibility for the target audience. The final version of the nudge, as presented in its visual format, is shown in the following image.

Figure 6: final version of the nudge in different languages



5.3.4 Impact of nudge on famers' behavioural factors related to the adoption of SFSs

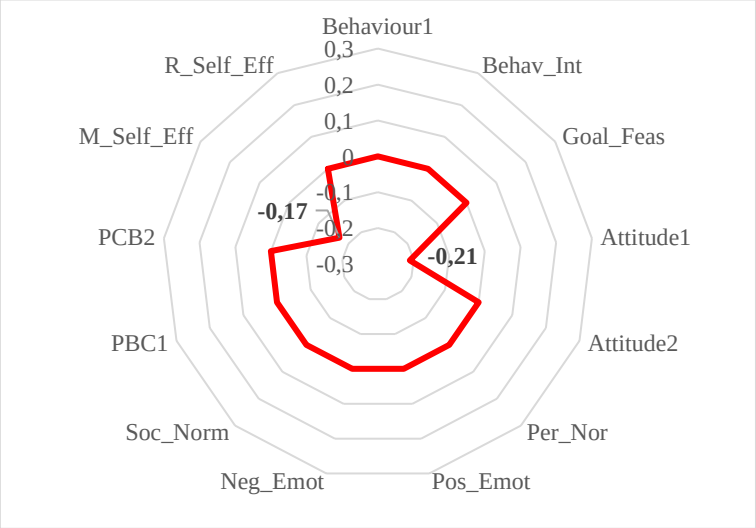
Table 7 and Figure 7 summarize the results of the estimations of the Difference-in-Differences models for the considered outcome variables. The models estimated for this case study do not include risk aversion as covariate. This choice was made due to the higher level of fit registered for this version of the DiD estimation.

Table 7: impacts of the nudge, socio-demographic variables, and risk aversion on farmers' behavioural factors for CS 3:

	Impact of Nudge	Age	Gender	Education Level	Income	Member of Farmers Union	R^2
Behaviour1	-0.02	-0.10	-0.32*	0.09*	-0.01	-0.12	0.09
Behav_Int	0.00	0.06	-0.20	0.07	0.01	0.06	0.11
Goal_Feas	0.09	-0.08	-0.37**	0.13**	0.06**	-0.33**	0.13
Attitude1	-0.21**	-0.08	-0.14	0.08	0.02	-0.12	0.03
Attitude2	0.02	-0.14*	-0.28	0.01	0.03	-0.07	0.07
Per_Nor	-0.07	0.05	-0.25	0.09*	0.04*	-0.05	0.09
Soc_Norm	0.02	-0.06	-0.37*	0.01	-0.04	0.12	0.07
Pos_Emot	0.00	-0.17**	-0.21	0.08	0.01	0.27*	0.07
Neg_Emot	-0.01	0.10	0.11	0.11*	0.00	-0.16	0.05
PBC1	-0.09	0.03	-0.29*	-0.05	0.04*	-0.35**	0.04
PBC2	0.14	-0.01	0.29	-0.14**	-0.03	-0.02	0.06
M_Self_Eff	-0.17*	0.00	0.09	0.06	0.02	-0.30	0.04
R_Self_Eff	0.02	-0.11	0.02	-0.02	0.03	-0.24	0.08

Note: ***= significant at 1% level; **= significant at 5% level; *= significant at 10% level

Figure 7: impact of nudge on farmers' behavioural factors for CS 3



The impact of the nudging intervention in Case Study 3 appears to be predominantly negative. The nudge had a negative effect on farmers' perceived advantage of participate to activities to promote biodiversity (*Attitude1*) and their perceived autonomy in the adoption of the practice (*PBC2*), suggesting reluctance to adopt the practice both in terms of its perceived value and independence of action.

Concerning the impact of socio-demographic variables on behavioural factors related to the adoption of SFS, Age negatively influenced the moral relevance attributed to its adoption of the practice (*Attitude2*) and the perceived positive motion related to the environmental impact of practice adoption (*Pos_Emot*). This suggests that older farmers were less influenced by nudge concerning motivational, attitudinal, and emotional dimensions.

Gender registered a negative impact on the intention to adopt the practice (*Behaviour1*), perceived feasibility (Goal_Feas), perceived social support (*Soc_Norm*), and perceived ease of implementation (*PBC1*). This suggest that female farmers were generally less receptive to the nudge in motivational, normative, and perceived control.

Education level showed a positive effect on the intention to adopt (*Behaviour1*), perceived feasibility (*Goal_Feas*), personal moral norms (*Per_Nor*), and with perceived stress (*Neg_Emot*). This indicates that more educated farmers were both more aligned with the practice, but potentially more aware of the potential barriers and challenges. On the opposite, education was negatively associated with perceived autonomy (*PBC2*)

Income had a positive impact on perceived feasibility (*Goal_Feas*), personal motivation to participate to biodiversity promotion programs (*Per_Nor*), and perceived ease of adoption (*PBC1*). These findings suggest that financial stability may have an indirect impact on the intention to join the programs promoted through the nudge.

Finally, membership in a farmer's union had a negative impact on perceived feasibility (*Goal_Feas*), perceived ease of implementation (*PBC1*), and perceived positive environmental impacts (*Pos_Emot*). So, unionized farmers may perceive the participation to biodiversity promotion programs as not too effective.

5.4 Case Study 4: France - Promoting Protein Autonomy in French Livestock Farms

5.4.1 Context and target behaviour

This case study focuses on encouraging protein self-sufficiency in French dairy farms, aiming to reduce reliance on imported soybean meal by promoting the adoption of locally sourced protein-rich forages and improved grassland management. The targeted behaviour involves increasing the uptake of practices such as the use of legumes, clover, alfalfa, and diversified grass-legume mixtures, alongside strategies to extend grazing periods and enhance the autonomy of feed production at farm level.

The case study is situated in the Atlantic pedo-climatic zone, encompassing a range of dairy basins across western, northern, and central-eastern France (Franche-Comté and Auvergne). These areas present diverse farming conditions, from lowlands to mountainous terrains, and include both conventional and organic dairy farms. With around 54,000 dairy farms in the country, averaging 118 hectares and 68 cows per farm, the French dairy sector is robust but currently heavily dependent on imported soybean meal, with 44% destined to dairy cattle feed.

This dependency presents environmental and economic risks, including contributions to deforestation, greenhouse gas emissions, price volatility, and loss of food system resilience. Additional barriers include weak legume supply chains, limited knowledge on sustainable protein alternatives, and the influence of large buyers within the feed and dairy industries. Despite this, there is a growing interest in improving protein autonomy through agroecological practices, supported by emerging quality schemes and regional innovation projects.

A scoping literature review was conducted to identify evidence-based messages that could inform the nudge intervention. The review focused on two dimensions: (1) the economic and agronomic benefits of locally produced protein sources, and (2) the role of peer influence and societal expectations in encouraging behavioural change.

The literature emphasises the importance of educating farmers on the availability and effectiveness of protein-rich forage crops, such as legumes and alfalfa, which can replace soybean meal without compromising yield or quality (IDELÉ, 2022). Beyond direct feed substitution, crop diversification offers benefits including nitrogen fixation, improved soil health, and reduced input costs (CAP Protéines, 2021-2024). Furthermore, highlighting consumer preferences for sustainable production, and the potential for added market value, reinforces the relevance of these practices (AFPF, 2022).

Social factors also play a critical role. Farmers are more likely to adopt new approaches when they observe their peers succeeding with them. Community-level examples of increased milk yield, forage quality, and profitability act as strong motivators (CAP Protéines, 2021-2024). Additionally, aligning with broader environmental expectations, such as reducing deforestation associated with soy imports, could help strengthen farmers' reputational incentives and sense of purpose. These elements shaped the core of the nudge intervention.

5.4.2 Nudge intervention design

The intervention combined informational inputs and social norm mechanisms to support the transition toward protein self-sufficiency in dairy farming.

The informational component focused on economic and agronomic benefits. Farmers were informed about how shifting to protein-rich forages like legumes, clover, and alfalfa can enhance feed autonomy, reduce costs linked to synthetic fertilisers and imported soy, and improve resilience to market fluctuations. The message also highlighted research findings showing that diversified forage systems can improve milk yields and contribute to long-term soil fertility (IDELÉ, 2022).

The social norm component drew on peer influence and collective engagement. The intervention presented real-life experiences of French farmers who had successfully adopted protein self-sufficiency practices, reinforcing the perception that such changes are both viable and beneficial. Furthermore, it aligned with growing societal expectations regarding sustainable agriculture and reduced environmental impact (CAP Protéines, 2021-2024). By portraying these changes as increasingly common within the farming community, the intervention sought to normalise the transition and motivate broader uptake.

Together, these components were designed to make the shift toward protein autonomy appear financially attractive, socially supported, and technically feasible.

5.4.3 Final validated nudge message

The final nudge message, validated by the Case Study Coordinators (CSCs), was formulated as follows:

> *"Join the movement toward sustainable dairy farming!*

Many farmers have shifted to protein self-sufficiency, reducing reliance on imported soybean meal and embracing locally produced forage.

Did you know France imports 3.5 million tonnes of soybean meal annually, with 44% for dairy cows? Soybean cultivation is often linked to monoculture and thus deforestation, causing significant environmental impacts.

By shifting to protein-rich forages like legumes, clover, and alfalfa, you can not only reduce environmental impact but also enhance farm profitability and independence from volatile market fluctuations.

Transitioning may seem daunting, but you're not alone. Farmers' successful experiences offer valuable insights: they report these practices increase milk yields, forage quality, and profitability.

Take the first step towards a more resilient and profitable dairy farming practice!"

This message was structured to ensure clarity, relevance, and motivational appeal. It highlights both the environmental rationale and the economic case for change, while leveraging the influence of peer experiences to reduce perceived risks. Following validation, the message was translated into French and formatted into a visual template to maximise engagement and accessibility for the target audience. The final version of the nudge is presented in its graphic format.

Figure 8: final version translated in French

5.4.4 Impact of nudge on famers' behavioural factors related to the adoption of SFSs

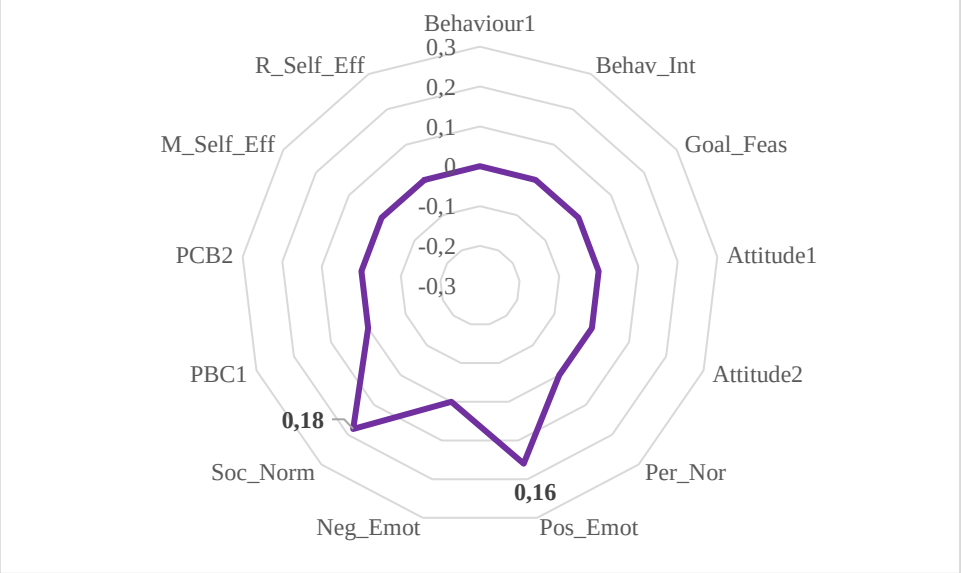
Table 8 and Figure 9 summarize the results of the estimations of the Difference-in-Differences models for the considered outcome variables.

Table 8: impacts of the nudge, socio-demographic variables, and risk aversion on farmers' behavioural factors for CS 4:

	Impact of Nudge	Age	Gender	Education Level	Income	Member of Farmers Union	Risk aversion	R^2
Behaviour1	0.13	0.10*	0.20	0.01*	0.04**	0.13	0.21*	0.07
Behav_Int	0.00	-0.03	0.52***	0.07	0.04	-0.27*	0.06	0.13
Goal_Feas	0.09	0.03	0.05	0.02	0.05*	-0.19	0.11	0.14
Attitude1	0.01	-0.01	0.18	0.03	-0.03	-0.12	0.18**	0.09
Attitude2	0.17	-0.05	0.23	0.02	0.04	-0.23	0.13	0.05
Per_Nor	-0.03	-0.11	0.30*	0.11**	0.07**	0.33	0.24	0.15
Soc_Norm	0.18*	0.11*	0.65	0.19**	0.00	-0.14	0.15*	0.23
Pos_Emot	0.16*	-0.11*	0.34	0.04**	0.10**	-0.07	0.23*	0.19
Neg_Emot	0.16	0.02**	0.03	0.03*	0.01*	-0.36	0.25*	0.10
PBC1	0.00	-0.01	0.19	0.08*	0.03	-0.14	0.27***	0.07
PBC2	-0.04	-0.04	0.21	0.07	-0.01	-0.08	0.31***	0.11
M_Self_Eff	-0.10	-0.11**	0.24*	0.06	0.03	0.15	0.20**	0.15
R_Self_Eff	-0.06	-0.04	0.06	0.00	0.01	-0.29*	0.37	0.13

Note: ***= significant at 1% level; **= significant at 5% level; *= significant at 10% level

Figure 9: impact of nudge on farmers' behavioural factors for CS 4



The impact of the nudging intervention in Case Study 4 appears to be positive. The nudge positively influenced farmers' perception of social encouragement to adopt the practice (Soc_Norm) and their emotional engagement with its environmental relevance (*Pos_Emot*).

Age had a positive impact on the intention to adopt the practice (*Behaviour1*), the perception of peer pressure (*Soc_Norm*), and the perceived stress related to the adoption of the nudged practice (*Neg_Emot*). However, it also had a negative effect on the perceived positive environmental impact related to the implementation of the practices (*Pos_Emot*) and on farmers' declared confidence in maintaining the practice despite barriers. (*M_Self_Eff*).

Gender had positive impact on 3-years adoption plans (*Behav_Int*), personal norms (*Per_Nor*), and perceived self-efficacy (*M_Self_Eff*), indicating that female farmers were more propense to adopt practices for the autonomy in protein production and more confident in their ability to implement them.

Education level was positively associated with intention to adopt the practice (*Behaviour1*), personal norms (*Per_Nor*), perceived peer pressure (*Soc_Norm*), perceived positive environmental impacts (*Pos_Emot*), potential stress (*Neg_Emot*), and perceived ease of adoption (*PBC1*). These results suggest that education responsiveness to the nudge, while raising awareness about potential barriers.

Income showed a positive impact on several outcomes: intention to adopt (*Behaviour1*), perceived feasibility (*Goal_Feas*), peer pressure (*Per_Nor*), perceived positive environmental impacts (*Pos_Emot*), and potential stress (*Neg_Emot*), suggesting that wealthier farmers could be engaged in the adoption of SFS, but may perceive higher pressure.

Farmers union membership was associated with negative effects on short-term adoption plans (*Behav_Int*) and reflective self-efficacy (*R_Self_Eff*), indicating that unionized farmers may face constraints that limit their responsiveness to the nudge.

Finally, risk aversion emerged as a positive moderator of the nudge's effects, enhancing intention to adopt (*Behaviour1*), perceived advantage of the practice (*Attitude1*), perceived peer pressure to implement the practice (*Soc_Norm)*, and perceived reduction of environmental impacts (*Pos_Emot*). Also, risk aversion was positively associated with both dimensions of perceived behavioural control, ease of implementation (*PBC1*) and autonomy (*PBC2*), as well as with maintenance self-efficacy (*M_Self_Eff*). These findings suggest that risk-averse farmers, when properly nudged, may be responsive to the adoption of practices to promote autonomy in protein production.

5.5 Case Study 5: Germany - Creating Regional Production-Consumption Cycles/Sustainable pig farming

5.5.1 Context and target behaviour

This case study focuses on promoting higher levels of animal welfare and environmental standards in pig farming systems in the Brandenburg region of Germany. The objective is to establish regional production-consumption cycles for pig meat that enhance sustainability through guaranteed remuneration for farmers via regional value chains and supportive policy instruments.

Brandenburg's agricultural sector is characterised by a relatively low pig population and a dominance of large-scale farms operating under legacy systems inherited from the GDR period. Pig farming remains highly specialised and reliant on imported feed, with minimal integration into regional food systems. Challenges include outdated stabling systems, environmental concerns linked to intensive production, and declining pig numbers due to factors such as African Swine Fever (ASF) and market volatility.

A scoping literature review was conducted to identify evidence-based content for the nudge intervention, focusing on two key areas: (1) economic incentives related to the adoption of higher welfare and environmental standards, and (2) social influence mechanisms that can reinforce behaviour change within farming communities.

Findings from the literature highlight that consumers express a strong willingness to pay for animal-friendly, locally produced meat (Napolitano et al., 2010; Maynard et al., 2003; Profeta & Hamm, 2019). This demand has supported the expansion of EU regulations on farm animal welfare, with farmers increasingly recognising a link between animal health, meat quality, and market differentiation (Gocsik et al., 2015; Derstappen & Christoph-Schulz, 2021). Additionally, improving animal housing and promoting natural behaviours is associated with reduced aggression, better growth rates, and overall farm efficiency (Uehleke et al., 2021; Luo et al., 2020; Brandt et al., 2020).

From a social perspective, peer influence and societal expectations play a significant role in driving the adoption of higher welfare standards. Farmers involved in organic or welfare-certified schemes often cite both ideological motivations and premium pricing as key reasons for participating (Vanhonacker & Verbeke, 2014). Moreover, widespread agreement exists among farmers on the benefits of practices such as group housing for sows, straw

bedding, and outdoor access. Such measures are increasingly perceived not only as ethical improvements but as contributing to better productivity and farm reputation (Weible et al., 2016).

These insights shaped the intervention strategy by emphasising both the financial and social benefits of transitioning to more sustainable pig farming systems.

5.5.2 Nudge intervention design

The intervention was structured to combine clear informational inputs with social norm mechanisms to support the adoption of higher animal welfare and environmental standards in conventional pig farming.

The informational component focused on communicating the economic and technical benefits of improved animal welfare. Farmers were presented with evidence that enhancing environmental enrichment, enabling natural behaviours, and transitioning away from practices such as tail docking can reduce disease incidence, improve product quality, and lower costs associated with stress-related health issues (Uehleke et al., 2021). Furthermore, the message highlighted growing consumer preferences for meat that is locally sourced and produced with high welfare standards, which offers market advantages and price premiums (Napolitano et al., 2010; Profeta & Hamm, 2019).

The social norm component leveraged peer experiences and sector-wide shifts. Farmers were informed about the increasing uptake of improved welfare practices within their community, such as banning tail docking and implementing group housing for sow. Testimonies from farmers in top assurance schemes underscored how these changes have enhanced both animal well-being and farm profitability (Derstappen & Christoph-Schulz, 2021). By aligning the message with the broader momentum towards animal-friendly production systems, the intervention aimed to foster a sense of collective transition and normalise the adoption of improved practices.

5.5.3 Final validated nudge message

The final nudge message, validated by Case Study Coordinators (CSCs), was formulated as follows:

> *"Adopting higher animal welfare and environmental standards brings multiple benefits!*
>
> *Improved animal welfare enhances animal health, increasing growth rates and product quality while reducing adverse behaviours like aggression.*
>
> *Consumers are increasingly willing to pay more for locally sourced, animal-friendly meat, leading to higher-quality products and better prices for farmers. In fact, a study conducted in Germany shows that 74% of respondents choose a high-welfare pork cutlet over one produced under minimum standards.*
>
> *The demand for higher animal welfare standards is growing, fuelled by voluntary labelling schemes and evolving regulations.*
>
> *Colleagues are already implementing higher standards, from banning tail docking to providing group housing for sows—boosting both animal welfare and income. Ready to join the movement towards better practices?"*

The message was designed to highlight both tangible benefits (e.g., improved growth and product quality) and reputational advantages, while reinforcing positive peer influence. After validation, the nudge was translated into German and formatted in a visually engaging document tailored for local distribution. The final version of the nudge is presented in its graphic format.

Figure 10: final version translated in German

5.5.4 Impact of nudge on famers' behavioural factors related to the adoption of SFSs

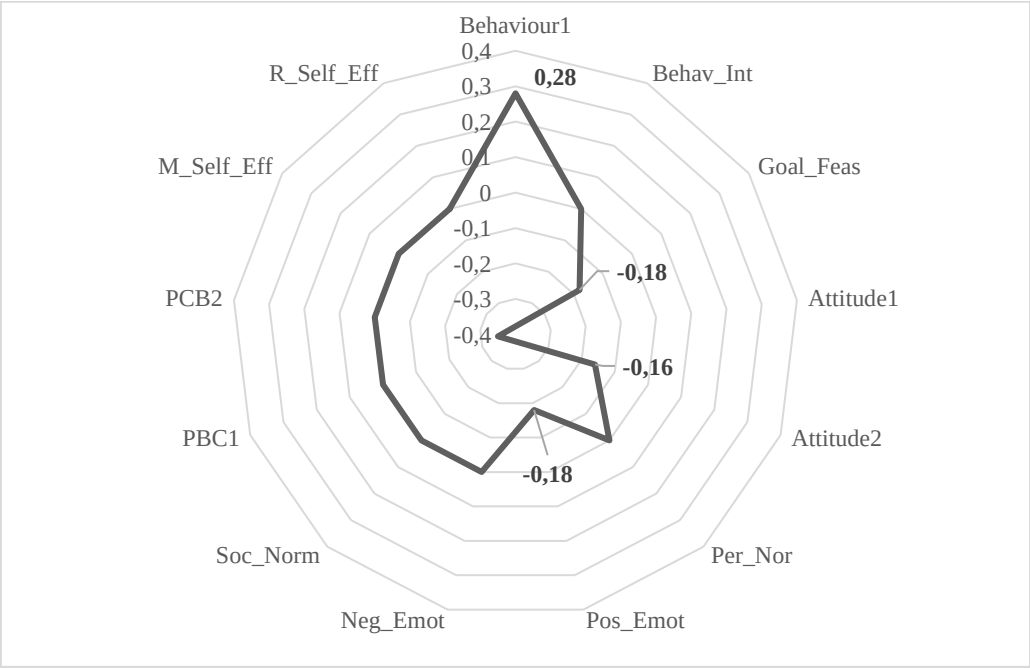
Table 9 and Figure 1111 summarize the results of the estimations of the Difference-in-Differences models for the considered outcome variables. The models estimated for this case study do not include risk aversion as covariate. This choice was made due to the higher level of fit registered for this version of the DiD estimation.

Table 9: impacts of the nudge and socio-demographic variables on farmers' behavioural factors for CS 5:

	Effect of Nudge	Age	Gender	Education Level	Income	Member of Farmers Union	R^2
Behaviour1	0.28**	-0.04	-0.02	0.13**	-0.05	0.04	0.06
Behav_Int	-0.01	0.07	-0.14	-0.06	0.02	-0.08	0.09
Goal_Feas	-0.18*	-0.05	-0.13	0.12**	-0.06*	-0.30**	0.11
Attitude1	-0.01	0.07	-0.14	-0.06	0.02	-0.08	0.09
Attitude2	-0.45**	-0.05	0.00	0.07	-0.05	0.04	0.11
Per_Nor	0.12	-0.16**	-0.19	0.09*	0.00	-0.03	0.08
Soc_Norm	0.04	0.14**	-0.18	-0.04*	0.03	-0.19	0.04
Pos_Emot	-0.18**	-0.05	-0.23	0.06	0.03	-0.05	0.05
Neg_Emot	-0.06	0.15	0.15	0.06	0.04	-0.34**	0.07
PBC1	0.00	0.17**	-0.30**	0.00	-0.06	0.07	0.08
PBC2	-0.10	-0.03	0.17	0.00	-0.11***	-0.09	0.07
M_Self_Eff	0.17	0.01	-0.24	0.05	-0.01	-0.11	0.04
R_Self_Eff	0.30**	0.00	0.00	0.15**	-0.12***	0.02	0.14

Note: ***= significant at 1% level; **= significant at 5% level; *= significant at 10% level

Figure 11: impact of nudge on farmers' behavioural factors for CS 5



The impact of the nudging intervention in Case Study 5 appears to be mixed. While the nudge positively influenced farmers' intention to adopt the practice (*Behaviour1*) and their confidence in successfully adopting it despite potential barriers (*R_Self_Eff*), it also had negative effects on perceived feasibility (*Goal_Feas*), the moral importance attributed to the practice (*Attitude2*), and positive emotional engagement (*Pos_Emot*).

Concerning the impact of socio-demographic variables on behavioural factors related to the adoption of SFS, Age was positively associated with the perception of peer pressure to adopt measures to increase animal welfare (*Soc_Norm*) and with perceived ease of adopting those practices (*PBC1*). However, it had a negative impact on personal moral norms (*Per_Nor*), suggesting that older farmers could be more exposed to external pressures, while being less convinced of the utility of implementing animal welfare standards.

Gender was negatively associated with perceived ease of adoption (*PBC1*), indicating that female farmers may perceive greater barriers in implementing the nudged practices.

Education level showed a multifaceted impact: it was positively associated with intention to adopt higher animal welfare standards (*Behaviour1*), with perceived feasibility (*Goal_Feas*), and personal moral norms (*Per_Nor*), suggesting a generally stronger cognitive and motivational alignment. However, it had a negative impact on *Soc_Norm*, potentially reflecting a lower impact of peer pressure among more educated farmers.

Income had a negative impact on perceived feasibility (*Goal_Feas*), perceived autonomy (*PBC2*), and confidence in successful adoption in presence of barriers (*R_Self_Eff*). This may suggest that wealthier farmers are more skeptical regarding the implementation of higher animal welfare standards.

Finally, farmers union membership negatively influenced both perceived feasibility (*Goal_Feas*) and perceived stress related to the adoption of the promoted practice (*Neg_Emot*), indicating that unionized farmers may experience lower interest in the adoption of the intervention, while not perceiving an increase in the potential stress that this could generate.

5.6 Case Study 6: Greece - Shifting to Sustainable Practices Across the EU Through Consumer Brands

5.6.1 Context and target behaviour

This case study addresses the transition to sustainable agricultural practices within the European Union, with a particular focus on the influence of consumer brands. The initiative is active in regions such as West Macedonia in Greece and Vojvodina in Serbia, and is coordinated by GAIA, in collaboration with stakeholders like "Poios Einai to Afentiko" in Greece and "C'est Qui le Patron" in France. These partnerships aim to foster sustainable practices among small to medium-sized family-owned farms, especially in the orchard, vegetable, and livestock sectors.

The core challenge lies in enabling farmers to meet consumer expectations for quality, nutritional value, and environmental impact while complying with national and EU regulations and sustaining or increasing their income. Farmers face difficulties in selecting and implementing the most efficient and feasible agricultural practices, especially when competing against products originating from more conventional systems. In addition, the adoption of transparent procedures along the agri-food value chain is critical to build consumer trust and market differentiation.

In West Macedonia, which has a continental-Mediterranean microclimate, farming faces environmental and agronomic challenges such as high rainfall variability, frost, and summer droughts. The average farm size is 12.2 hectares, with approximately 187,780 hectares of agricultural land under cultivation. Farming in these areas is typically small-scale and diversified, yet challenged by nitrogen deposition, biodiversity loss, pesticide dependency, and market pressures.

The behaviour targeted by this case study is the adoption of smart farming practices that have a positive environmental and economic impact. These include the application of precision agriculture tools, digital technologies, and data-driven decision-making processes to optimise the use of water, fertilizers, and pesticides. Smart farming practices are designed to improve productivity and sustainability simultaneously by reducing input waste, increasing resilience to climate change, and enhancing the traceability and quality of agricultural products. The introduction of such technologies also supports compliance with evolving EU sustainability standards and helps small and medium farmers remain competitive in modern agri-food markets.

Key ambitions also involve the shortening of supply chains, the use of eco-friendly packaging, and a broader engagement of producers, cooperatives, consumers, and markets to support widespread behavioural change.

5.6.2 Nudge intervention design

The intervention design combines informational, technological, and behavioural components. It promotes understanding of sustainable agriculture and its benefits by bridging scientific knowledge and on-farm practices (Ingram, 2018). Educational activities target both farmers and advisors, focusing on resource efficiency, reduced use of agrochemicals, and protection of soil health and biodiversity (Godfray et al., 2010).

Training sessions aim to enhance digital skills among farmers, supporting the use of precision agriculture tools and smart technologies. These innovations help optimise input use and increase efficiency, making sustainability both achievable and profitable (Klerkx & Rose, 2020). The intervention also includes the organisation of farm visits and demonstration activities to inspire adoption through exposure to good practices and innovation. Similar actions are directed at consumers, to increase awareness and align perceptions with the realities of sustainable farming.

Economic incentives are introduced as a key lever, such as financial rewards for measurable outcomes like reduced pesticide or water use. Agricultural advisors play a crucial role in this process, acting as trusted intermediaries who provide technical guidance and build confidence in sustainable practices (Rose et al., 2016).

Lastly, the intervention seeks to influence consumer perceptions, highlighting the environmental impact of agriculture and the value of sustainably produced goods. Through storytelling, transparency, and branding, the project reinforces the link between production practices and consumer choices, encouraging market demand for sustainable products (FAO, 2019).

5.6.3 Final validated nudge message

The final nudge message, validated by Case Study Coordinators (CSCs), was formulated as follows:

> *"Ever wonder if you're using too much water, pesticides, or fertilizers? Let's talk about smart farming practices!*
>
> *Technology can be a game-changer: tailored tools and apps can make farming a whole lot more efficient, easy and eco-friendly. Precision techniques optimize pesticide and fertilizer application, minimizing waste and environmental impact. Embracing these innovations isn't just about efficiency; it's about cultivating a greener future where sustainability and productivity coexist.*
>
> *And let's not forget about consumers: demonstrating eco-friendly practices can boost consumer interest and demand, benefiting both farmers and the environment.*
>
> *Remember, as more farms adopt these practices, the collective impact grows stronger. To fully benefit from precision agriculture, farmers should collaborate to share resources, cut costs, and boost technology effectiveness.*
>
> *Be a leader in your community and join the movement towards sustainable agriculture."*

The nudge message was translated into Greek and formatted in a visually accessible format, distributed through local advisory services, producer cooperatives, and public awareness campaigns. On-site demonstrations, workshops, and training programs were conducted to reinforce learning and support adoption. The effects of the intervention will be evaluated through changes in farmer behaviour, input usage data, and consumer engagement metrics.

Figure 12: final version translated in German

5.6.4 Impact of nudge on famers' behavioural factors related to the adoption of SFSs

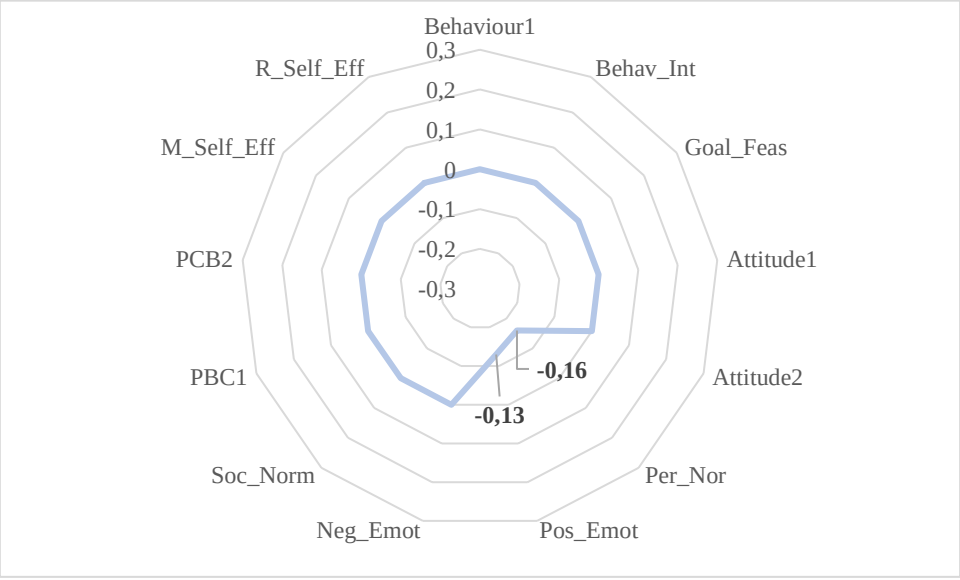
Table 10 and Figure 13 summarize the results of the estimations of the Difference-in-Differences models for the considered outcome variables. The models estimated for this case study do not include risk aversion as covariate. This choice was made due to the higher level of fit registered for this version of the DiD estimation.

Table 10: impacts of the nudge and socio-demographic variables on farmers' behavioural factors for CS 6:

	Effect of Nudge	Age	Gender	Education Level	Income	Member of Farmers Union	R^2
Behaviour1	-0.01	0.11	0.05	0.12**	0.01	-0.09	0.09
Behav_Int	0.01	0.02	-0.03	-0.07	-0.01	-0.37**	0.08
Goal_Feas	-0.07	0.03	-0.18	0.06	0.02	-0.11	0.04
Attitude1	-0.09	0.05	-0.03	0.02	0.05*	-0.35***	0.02
Attitude2	0.04	0.03	0.43***	0.03	0.05**	-0.17	0.04
Per_Nor	-0.15**	0.03	-0.08	-0.01	-0.02	-0.08	0.001
Soc_Norm	0.05	0.13*	0.17	0.15***	-0.04	-0.23*	0.06
Pos_Emot	-0.13*	0.05	0.46***	0.04**	0.09**	-0.14	0.12
Neg_Emot	0.11	-0.01	0.13	0.11*	-0.06**	-0.01	0.06
PBC1	0.00	-0.04	0.07	0.09	-0.04*	-0.16	0.08
PBC2	0.04	0.21***	-0.38***	-0.04	-0.03	-0.10	0.10
M_Self_Eff	-0.07	0.13*	-0.25	0.06	0.00	-0.31*	0.03
R_Self_Eff	0.06	0.16***	0.17	0.12***	-0.02	-0.21	0.07

Note: ***= significant at 1% level; **= significant at 5% level; *= significant at 10% level

Figure 13: impact of nudge on farmers' behavioural factors for CS 6



The findings for Case Study 6 indicate that the nudging intervention had limited or even adverse effects on some behavioural dimensions. Specifically, the intervention negatively affected farmers' internalised moral norms (*Per_Nor*) and their positive emotional engagement (*Pos_Emot*), potentially indicating a lack of resonance between the message and the values or expectations of the targeted population.

Looking at socio-demographic effects, age emerged as a significant positive factor across several dimensions: older farmers reported stronger perceptions of social support (*Soc_Norm*), higher confidence in maintaining the practice in the face of obstacles *(R_Self_Eff*), and greater feelings of autonomy (*PBC2*). This suggests that, in this context, older

farmers may be more anchored in local networks or more experienced in integrating innovation within their management routines.

Gender was positively associated with affective and ethical responses: female farmers reported stronger alignment with the moral rationale behind the promoted practice (*Attitude2*) and greater positive emotional engagement. However, they also reported lower perceived autonomy (*PBC2*), which may indicate structural or contextual barriers that limit their decision-making freedom, despite a strong intrinsic motivation.

Education level played a multifaceted largely positive role. More educated farmers showed higher scores on intention to adopt (*Behaviour1*), felt stronger peer pressure (*Soc_Norm*), and experienced more positive emotions (*Pos_Emot*). At the same time, they also reported increased stress levels (*Neg_Emot*), possibly reflecting a heightened awareness of the practical challenges and trade-offs involved in adopting new practices. Education also enhanced perceived efficacy in dealing with potential implementation challenges (*R_Self_Eff*).

Income showed a dual effect: on one hand, wealthier farmers expressed more favourable instrumental and moral attitudes (*Attitude1* and *Attitude2*), as well as more positive emotional responses. On the other, they tended to perceive the adoption of smart farming practices as less straightforward (*lower PBC1*) and felt less stressed (*lower Neg_Emot*), possibly due to greater access to alternative resources or strategies.

Lastly, membership in a farmers' union was negatively associated with several variables. Unionised farmers were less inclined to plan adoption in the short term (*Behav_Int*), reported lower instrumental motivation (*Attitude1*), perceived weaker social norms (*Soc_Norm*), and expressed lower confidence in maintaining adoption over time (*M_Self_Eff)*. This pattern may reflect a mismatch between the collective culture of unions and the more individualised framing of the nudging intervention.

Overall, the Greek case highlights the importance of tailoring nudging strategies not only to specific behaviours, but also to the socio-cultural dynamics of the farming population. Emotional and normative alignment appear to be crucial factors influencing how messages are received and internalised.

5.7 Case Study 7: Slovenia - Boosting Direct Selling in Slovenia

5.7.1 Context and target behaviour

This case study addresses the adoption and scaling of direct selling practices among small and medium-sized farms in Slovenia. Direct selling, defined as the sale of agricultural products directly from producer to consumer, offers the opportunity to enhance farm profitability by bypassing intermediaries and securing a larger share of revenue. The initiative aligns with a broader EU objective to strengthen short food supply chains (SFSCs) as a path toward more sustainable and resilient food systems.

In Slovenia, the agricultural sector is characterised by small-scale, family-run farms, with an average size of 7 hectares and approximately 6 livestock units per holding. Many of these farms already engage in direct selling, especially organic producers, yet challenges remain regarding the workload associated with these activities and the stability of resulting incomes. Research conducted by CEJA in collaboration with the Young Farmers of Slovenia has identified workload intensity and uncertain profitability as major barriers to the broader adoption of direct selling.

The Panonian pedo-climatic zone, which dominates Slovenian agriculture, is marked by diverse soil types, including Chromic Cambisol, Dystric Cambisol, and Eutric Cambisol, and is highly vulnerable to climate change impacts such as floods, droughts, and temperature extremes. These environmental stressors, coupled with labour shortages, limited ICT infrastructure, and historical issues of trust among producers, further complicate the long-term viability of small farms and their engagement in SFSCs.

A scoping literature review was conducted to identify relevant behavioural levers for crafting the nudge intervention, with a specific focus on economic incentives and social dynamics supporting direct selling.

Key findings highlighted that direct selling enables farmers to increase gross income by eliminating distribution costs, thereby reducing dependency on low-value long supply chains (Paciarotti & Torregiani, 2021; Rocchi et al., 2019). It also contributes to farm resilience by lowering risk exposure, optimising the use of family labour, and

improving product customisation based on consumer preferences. From an environmental perspective, direct selling reduces the carbon footprint associated with conventional distribution logistics.

Furthermore, social innovation and peer influence emerged as important motivators. Farmers embedded in local networks with shared values are more likely to adopt direct selling practices when encouraged by successful examples from their peers and trusted community actors (Rocchi et al., 2019). Engagement in SFSCs is also linked to a desire to contribute to local economic development and reinforce social cohesion, especially in rural areas.

These insights were used to craft the nudge message, integrating economic arguments and leveraging the power of localised social norms.

5.7.2 Nudge intervention design

The intervention was designed to communicate both the financial opportunities and the social relevance of direct selling for small and medium-sized farmers in Slovenia.

The informational component emphasised the profit potential of direct selling by underlining the benefits of eliminating intermediaries, which enables farmers to retain a greater share of the product's final value. Evidence shows that this model increases income, reduces farm management risks, and allows greater flexibility in product differentiation and pricing, particularly in organic and niche markets (Gerritsen, 1970; Rocchi et al., 2019). Additionally, the intervention pointed to the role of the Chamber of Agriculture of Slovenia, which provides technical advisory services to support the development of direct selling strategies and infrastructure.

The social norm component focused on fostering a sense of community and mutual support among farmers engaged in SFSCs. Farmers were encouraged to view direct selling not only as a business opportunity but also as a way to contribute to local economic resilience, foster producer cooperation, and strengthen ties with consumers. This framing sought to tap into existing social networks where trust and knowledge exchange facilitate innovation and behavioural diffusion (Paciarotti & Torregiani, 2021).

By combining financial and social arguments, the intervention aimed to normalise direct selling as an accessible and desirable strategy, especially for young and medium-scale farmers seeking greater autonomy and sustainability.

5.7.3 Final validated nudge message

The final nudge message, validated by the Case Study Coordinators (CSCs), was formulated as follows:

> *"Are you seeking a pathway to increased transparency and community engagement? Direct selling could be the transformative solution you've been looking for.*
>
> *Here's why: It empowers you to bypass intermediaries, ensuring that more of your hard-earned revenue stays in your hands. By eliminating additional distribution costs, you can significantly boost your profit margins and bolster the financial health of your farm.*
>
> *Direct selling isn't just about maximizing profits; it's about building a resilient and sustainable agricultural enterprise. By forging direct connections with consumers, you can enhance your farm's income and mitigate risks in farm management.*
>
> *Did you know that the Chamber of Agriculture of Slovenia provides advisory services to support these initiatives?*
>
> *Tap into the power of community support. Direct selling is more than just a business model—it's a collaborative movement driven by shared values and aspirations.*
>
> *By engaging in direct selling, you contribute to the vitality of local economies, promote cooperation among producers, and strengthen ties between farmers and consumers.*
>
> *Embrace the opportunity to make a tangible difference in your community."*

The message was crafted to ensure clarity and resonance with the Slovenian farming context, balancing economic rationale with community engagement. Following validation by CSCs, the nudge was translated into the local language and formatted into a visually accessible document. The final version of the nudge is presented in its graphical format.

Figure 14: final version translated in Slovenian

5.7.4 Impact of nudge on famers' behavioural factors related to the adoption of SFSs

Table 11 and Figure 15 summarize the results of the estimations of the Difference-in-Differences models for the considered outcome variables.

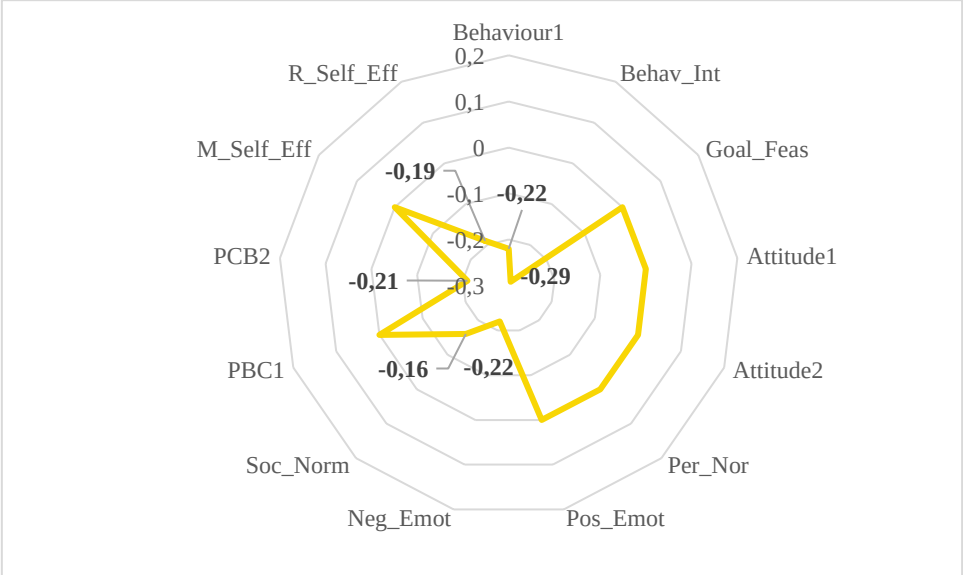
Table 11: impacts of the nudge, socio-demographic variables, and risk aversion on farmers' behavioural factors for CS 7

	Effect of Nudge	Age	Gender	Education Level	Income	Member of Farmers Union	Risk aversion	R^2
Behaviour1	-0.22**	0.05	0.09	0.10	-0.03	0.23	-0.03	0.09
Behav_Int	-0.30***	-0.16**	-0.09	0.05	0.00	0.06	0.06	0.08
Goal_Feas	-0.17	-0.05	0.00	0.08	-0.01	0.13	0.12	0.06
Attitude1	-0.06	-0.17**	-0.27	-0.02	-0.02	0.24	0.14	0.11
Attitude2	-0.13	-0.14**	-0.19	-0.01	0.01	0.21	0.04	0.06
Per_Nor	-0.15	-0.10	-0.06	0.03	0.00	0.29*	-0.08	0.04
Soc_Norm	-0.10	-0.04	-0.15	-0.01	0.01	0.27*	0.00	0.04
Pos_Emot	-0.16*	0.11*	0.43***	-0.07	-0.01	0.19***	0.35	0.17
Neg_Emot	-0.22***	-0.07	-0.22	0.11	-0.01	-0.14	0.10	0.07
PBC1	-0.01	-0.16**	-0.38**	0.05	-0.01	-0.23	0.18**	0.12

	Effect of Nudge	Age	Gender	Education Level	Income	Member of Farmers Union	Risk aversion	R^2
PBC2	-0.21**	-0.22***	-0.32*	0.03	0.00	-0.19***	0.18	0.14
M_Self_Eff	-0.06	-0.08	-0.19	-0.06	0.01	0.05	0.26***	0.11
R_Self_Eff	-0.19	0.01	-0.10	0.02	-0.04	0.06	0.12	0.07

Note: ***= significant at 1% level; **= significant at 5% level; *= significant at 10% level

Figure 15: impact of nudge on farmers' behavioural factors for CS 7



The findings for Case Study 7 suggest that the nudging intervention had limited or even negative effects on several key behavioural outcomes. Specifically, the intervention negatively affected farmers' intention to adopt the practice (*Behaviour1*), their short-term adoption planning (*Behav_Int*), and their positive emotional engagement (*Pos_Emot*), while also increasing stress or discomfort (*Neg_Emot*). In addition, the intervention was associated with a lower sense of autonomy (*PBC2*) and reduced confidence in overcoming potential challenges (*R_Self_Eff*). These patterns may reflect a disconnect between the nudging message and the expectations or perceived capacities of the target population.

Looking at socio-demographic effects, age was negatively associated with short-term planning (*Behav_Int*), instrumental attitudes (*Attitude1*), internalised moral motivation (*Attitude2*), and perceived control (*PBC1* and *PBC2*). This suggests that older farmers may be more sceptical about the feasibility or relevance of the promoted behaviour. However, age was positively associated with emotional engagement (*Pos_Emot*), indicating that, despite reservations, older farmers may still feel aligned with the broader narrative or goals of the intervention.

Gender showed a dual pattern. Female farmers reported stronger emotional engagement (*Pos_Emot*), but also lower perceived control (*PBC1*) and autonomy (*PBC2*). This could point to a motivational alignment paired with structural or contextual limitations, potentially linked to gendered roles or access to resources within the sector.

Membership in a farmers' union had mixed effects. Union-affiliated farmers were more likely to report strong internalised moral norms (*Per_Nor*), felt greater peer pressure to adopt the practice (*Soc_Norm*), and experienced greater emotional resonance with the intervention (*Pos_Emot*). At the same time, they perceived lower autonomy (*PBC2*), which may reflect institutional constraints or the influence of collective organisational norms.

Finally, risk aversion was positively associated with perceived ease of adoption (*PBC1*) and the ability to maintain adoption over time (*M_Self_Eff*), suggesting that more cautious farmers, when nudged appropriately, may respond with structured planning and self-efficacy, particularly when interventions are framed to address uncertainties.

Overall, the Slovenian case underlines the importance of tailoring nudging strategies not only to target behaviours but also to the socio-demographic and institutional contexts of the farming population. Emotional engagement and perceived agency emerge as key mediators of behavioural response.

5.8 Case Study 8: Italy - Reducing Pesticides in Small and Medium horticultural farms in Emilia-Romagna

5.8.1 Context and target behaviour

This case study examines the transition towards a more sustainable vegetable production model among small and medium-sized farms in Emilia-Romagna, Italy. The objective is to encourage farmers adopting both conventional and integrated production methods to reduce their reliance on synthetic pesticides and herbicides, while simultaneously improving profitability and sustainability.

Emilia-Romagna is geographically divided between the Po Valley and the Apennines, presenting a variety of soil types from gravel-rich permeable upper plains to silt and clay-heavy lower plains. The region's prevailing temperate subcontinental climate varies from oceanic in the Apennines to sub-Mediterranean along the coast, with annual precipitation ranging from 650 mm in the lowlands to over 2000 mm in mountain areas zones. Emilia-Romagna is a major producer of vegetables and fruit in Italy, leading in the production of salads, tomatoes, lettuce, carrots, potatoes, and many other horticultural crops. However, intensive agricultural practices, particularly the heavy use of synthetic pesticides, pose challenges to environmental sustainability and long-term soil health.

A scoping literature review was conducted to identify evidence-based messages to be included in the nudge. The focus was on highlighting both the economic and ecological benefits of reducing pesticide use, as well as the influence of peer practices and knowledge-sharing networks. The review found that joining cooperatives or consortia provides farmers with opportunities to access technical support and sustainable innovations (Cervantes, 2023). Peer interactions, such as farm visits and testimonials, help reduce uncertainty and increase confidence in transitioning practices (Johnson et al., 2016; Thomas et al., 2019). Reducing pesticide use can lead to economic benefits, such as lower input costs and access to more profitable markets, without compromising yields (Klinnert, 2023; Lechenet et al., 2017). Moreover, the social component plays a role in facilitating behaviour change by promoting shared values and collective action among farmers (Swart et al., 2023).

These insights were used to design the nudge, aiming to emphasise practical, context-specific solutions that are financially beneficial and socially supported.

5.8.2 Nudge intervention design

The intervention combined informational content with social norm mechanisms to promote reduced pesticide use among horticultural farmers.

The informational component focused on communicating the financial advantages of reducing synthetic pesticide use, including cost savings, improved soil health, and access to premium markets for sustainably grown products. Farmers were encouraged to join consortia dedicated to sustainable farming, where they could access research findings, technological innovations, and training events on alternative pest control methods. Evidence shows that participation in such networks improves both economic outcomes and adoption of sustainable practices (Klinnert, 2023; Lechenet et al., 2017).

The social norm component leveraged community-based strategies. Testimonials and peer-led farm visits were used to demonstrate the success of other farmers who had adopted sustainable practices. Digital and local informational events promoted practical, locally adaptable alternatives to synthetic pesticides. These initiatives aimed to foster a sense of collective commitment and reduce perceived risks by highlighting the positive experiences of similar agricultural businesses (Thomas et al., 2019; Swart et al., 2023).

By integrating these components, the intervention addressed economic concerns and facilitated behavioural change through social reinforcement and access to concrete support mechanisms.

5.8.3 Final validated nudge message

The final nudge message, validated by the Case Study Coordinators (CSCs), was formulated as follows:

> *"Are you ready to transform your vegetable farm and increase your profitability? Reducing the use of synthetic pesticides and herbicides will not only improve sustainability but also enhance your profits. With the EU target to reach 25% of land cultivated with organic standards by 2030, now is the perfect time to make the transition.*
>
> *And if you are wondering how, it's easier than you think!*
>
> *Have you ever considered joining a consortium dedicated to reducing pesticide use in vegetable farming?*
>
> *Being part of a consortium could provide you with access to the latest research, best practices, and technological innovations aimed at minimising synthetic pesticide use.*
>
> *Through collective efforts, the transition becomes more manageable and efficient, allowing you to tap into more profitable markets for sustainably grown products.*
>
> *Explore the possibilities around you! Join initiatives shaping a sustainable and prosperous future for our farms and communities!"*

This message was structured to ensure clarity, credibility, and engagement. It highlighted economic benefits, reinforced social norms, and provided concrete next steps to encourage adoption. Following validation, the message was translated into Italian and formatted into a graphical document suitable for dissemination.

Figure 16: final version translated in Italian

5.8.4 Impact of nudge on famers' behavioural factors related to the adoption of SFSs

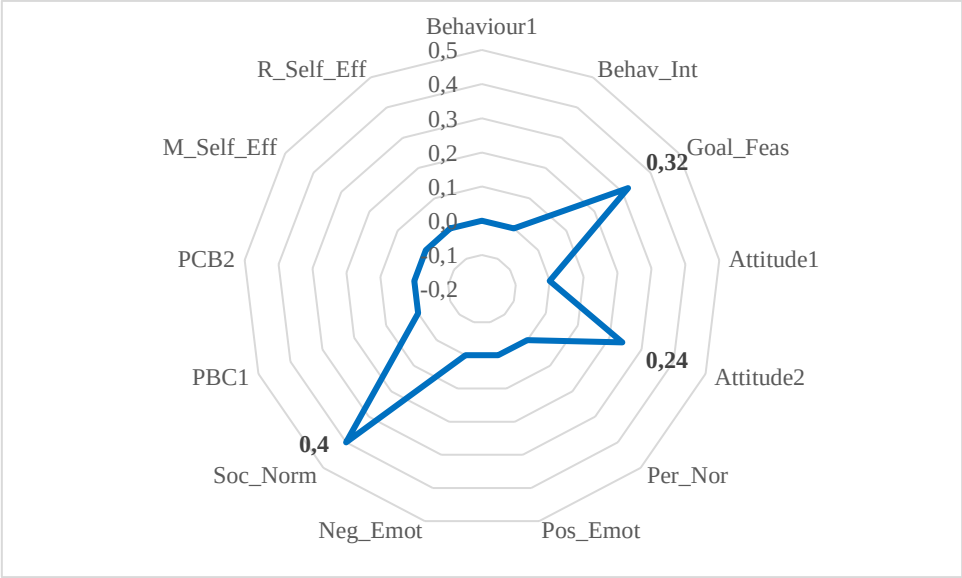
Table 12 and Figure 17 summarize the results of the estimations of the Difference-in-Differences models for the considered outcome variables.

Table 12: impacts of the nudge, socio-demographic variables, and risk aversion on farmers' behavioural factors for CS 8

	Effect of Nudge	Age	Gender	Education Level	Income	Member of Farmers Union	Risk aversion	R^2
Behaviour1	0.06	0.15**	0.24	-0.02	-0.01	-0.06	-0.17**	0.10
Behav_Int	-0.06	0.07	-0.03	0.07	-0.06	-0.28***	0.09	0.08
Goal_Feas	0.32**	0.14	0.32	0.00	-0.01	0.01	0.03	0.11
Attitude1	-0.02	0.06	0.23	-0.06	-0.02	-0.05	0.18**	0.09
Attitude2	0.24*	0.12***	0.11	0.05	0.02	-0.29**	0.14**	0.23
Per_Nor	0.08	-0.02	0.27*	0.00	-0.02	0.10	0.06	0.04
Soc_Norm	0.40***	-0.04	0.33**	-0.04	0.00	0.17	0.04	0.14
Pos_Emot	0.17	0.01	0.16	0.02	0.02	0.14	0.19***	0.08
Neg_Emot	-0.13	0.09	-0.04	-0.07	-0.01	0.08	0.23**	0.07
PBC1	0.12	0.09*	-0.01	-0.02	-0.04*	-0.07	0.10	0.10
PBC2	0.13	0.05	0.38**	-0.03	0.01	0.04	0.02	0.09
M_Self_Eff	0.03	0.05	0.32**	-0.04	0.03	0.02	-0.02	0.07
R_Self_Eff	0.18	0.09	0.00	0.00	0.05**	-0.12	0.14**	0.13

Note: ***= significant at 1% level; **= significant at 5% level; *= significant at 10% level

Figure 17: impact of nudge on farmers' behavioural factors for CS 8



The findings for Case Study 8 indicate a generally positive reception of the nudging intervention. Farmers exposed to the message reported a stronger perception that adopting the promoted practice, reducing the use of synthetic pesticides, was feasible in the short-to-medium term (*Goal_Feas*). The intervention also positively influenced the moral importance they assigned to the practice (*Attitude2*) and reinforced their sense of social encouragement (*Soc_Norm*), suggesting that the message resonated both ethically and socially.

Looking at socio-demographic effects, age emerged as a significant factor supporting behavioural change. Older farmers were more likely to express the intention to reduce the use of pesticides (*Behaviour1*), to perceive the practice as achievable (*Goal_Feas*), and to feel morally aligned with it (*Attitude2*). They also reported greater confidence in

the practical implementation of the behaviour (*PBC1*), indicating a combination of motivation and capability in response to the intervention.

Gender also played a meaningful role. Female farmers reported stronger internalised moral norms (*Per_Nor*), greater perceived social support (*Soc_Norm*), and higher levels of both perceived autonomy (*PBC2*) and self-efficacy in sustaining the behaviour (*M_Self_Eff*). These results point to a high degree of ethical alignment and perceived agency among women in the sample, elements likely to enhance the long-term impact of the intervention.

The role of income was more nuanced. Farmers with higher income levels were less likely to find the promoted practice easy to implement (*PBC1*), possibly due to more complex farm operations or higher internal standards. Nonetheless, they expressed strong confidence in their capacity to manage the transition effectively (*R_Self_Eff*), suggesting that economic resources may buffer implementation challenges even when perceived complexity is higher.

Membership in a farmers' union appeared to reduce both short-term behavioural planning (*Behav_Int*) and the moral importance attributed to the practice (*Attitude2*). This may reflect a degree of misalignment between institutional discourse and the ethical framing of the intervention, or a greater need for collective validation in shaping individual behavioural change.

Finally, risk aversion revealed a complex behavioural pattern. Risk-averse farmers showed higher intention to adopt the practice (*Behaviour1*), more favourable instrumental and moral attitudes (*Attitude1* and *Attitude2*), and greater emotional resonance, both positive (*Pos_Emot*) and negative (*Neg_Emot*). They also reported strong confidence in their ability to sustain the behaviour (*R_Self_Eff*). However, a contradictory negative association was also found for *Behaviour1*, possibly indicating heterogeneity within this group, where some risk-averse individuals may engage cautiously, while others may hesitate due to perceived uncertainties.

Overall, the Italian case highlights the importance of emotional, ethical, and social alignment in nudging strategies aimed at reducing pesticide use. Trust, perceived feasibility, and individual confidence emerge as key drivers for supporting sustainable practice adoption.

5.9 Case Study 9: Ireland - Growing the Organic Livestock Farming Sector

5.9.1 Context and target behaviour

This case study examines the expansion of the organic livestock farming sector in Ireland, a strategic initiative aligned with the Irish government's Climate Action Plan, which aims for 10% of agricultural land to be farmed organically by 2030. Since the introduction of increased financial support for organic farming, payments under the Organic Farming Scheme have risen by 500%, leading to a tripling of the land farmed according to organic principles. This rapid expansion makes organic farming the fastest-growing agricultural sector in Ireland.

The case study is led by TEAGASC, the Agriculture and Food Development Authority of Ireland, in collaboration with organic farm advisors, educational institutions, and organic certification bodies. The initiative seeks to facilitate the transition of conventional livestock farms to organic systems, thereby improving environmental sustainability, enhancing animal welfare, and ensuring economic viability for farmers. The Irish Organic Strategy sets a target of increasing organic production from 2% to 7.5% of the utilisable agricultural area by 2027, yet significant challenges remain. For example, the organic dairy sector currently represents less than 1% of the national milk volume, despite the favourable conditions of Ireland’s Atlantic climatic zone, which supports grass-based farming systems with an abundance of clover and multi-species sward crops.

Several factors have contributed to the slow expansion of organic dairy farming. The high profitability of conventional dairy farming has historically reduced the economic incentives for conversion, while limited market infrastructure, insufficient processing facilities, and a lack of clear market pathways for organic dairy products have added further barriers. The transition to organic farming also requires significant changes in farm management, which can be perceived as a risk by farmers unfamiliar with organic systems. Understanding the behavioural and economic

factors that influence farmers' decisions is essential for identifying effective interventions that can facilitate the growth of this sector.

5.9.2 Nudge intervention design

To encourage greater participation in organic livestock farming, the intervention was designed using a combination of informational inputs and social norm mechanisms. A scoping literature review was conducted to identify key messages that could be incorporated into the nudge, ensuring that both economic incentives and peer influence were addressed in a way that would be meaningful to Irish farmers.

Findings from the literature highlight that farmers who adopt organic practices experience improvements in soil health and fertility over time. Organic farming can also reduce reliance on synthetic pesticides and fertilisers, lowering input costs while enhancing long-term sustainability (Murphy et al., 2014). Participation in agri-environmental schemes such as the Rural Environment Protection Scheme (REPS) has historically provided financial stability, particularly in times of market uncertainty or external shocks, as demonstrated during the foot-and-mouth disease outbreak (Murphy et al., 2014). These schemes not only offer direct financial incentives but also help farmers mitigate risks associated with the transition to organic production.

Beyond financial incentives, organic farming is increasingly aligned with evolving consumer preferences. The growing demand for organic products presents farmers with an opportunity to access premium markets, where certified organic dairy products command higher prices (Surucu-Balci and Tuna, 2021). Organic farms also tend to exhibit greater biodiversity and environmental resilience, creating additional advantages for farmers interested in adopting sustainable practices (Power et al., 2013). Research further indicates that organic farmers are more likely to engage in result-based agri-environmental schemes, as the lower opportunity costs of their farming systems make participation more economically viable (Schaub et al., 2023).

Social norms and peer influence also play a critical role in farmers' decisions to adopt organic practices. Farmers who relate to other organic producers are more likely to convert, as social networks provide practical knowledge, reduce uncertainty, and help normalise organic farming within the broader agricultural community (Sapbamrer and Thammachai, 2021). However, concerns about reputation and scepticism towards environmental regulation can act as barriers, particularly among farmers who are deeply embedded in conventional systems (Power et al., 2013). Engaging farmers in multi-stakeholder discussions and promoting knowledge-sharing through advisory services can help reduce these concerns and foster a more supportive environment for organic conversion.

The intervention was structured to emphasise the financial benefits of organic farming, including increased payments under the Organic Farming Scheme, reduced input costs, and greater access to premium markets. The message also highlighted the growing momentum of organic farming in Ireland, reinforcing the idea that organic farming is no longer a niche sector but a rapidly expanding industry with strong government backing and market potential. By integrating these elements, the nudge aimed to address economic concerns, reduce perceived risks, and create a sense of social validation for farmers considering the transition.

5.9.3 Final validated nudge message

The final nudge message, validated by Case Study Coordinators (CSCs), was formulated as follows:

> *"Join the fastest growing farming sector in Ireland, which has tripled in size since 2020.*
>
> *Embracing organic practices doesn't just transform farms; it unlocks a world of benefits for you and the environment.*
>
> *By reducing synthetic pesticides and fertilizers, you not only protect both health and ecosystems but also lower production costs.*
>
> *Benefit from an increase in payment of up to 54% by joining Organic Farming Schemes.*

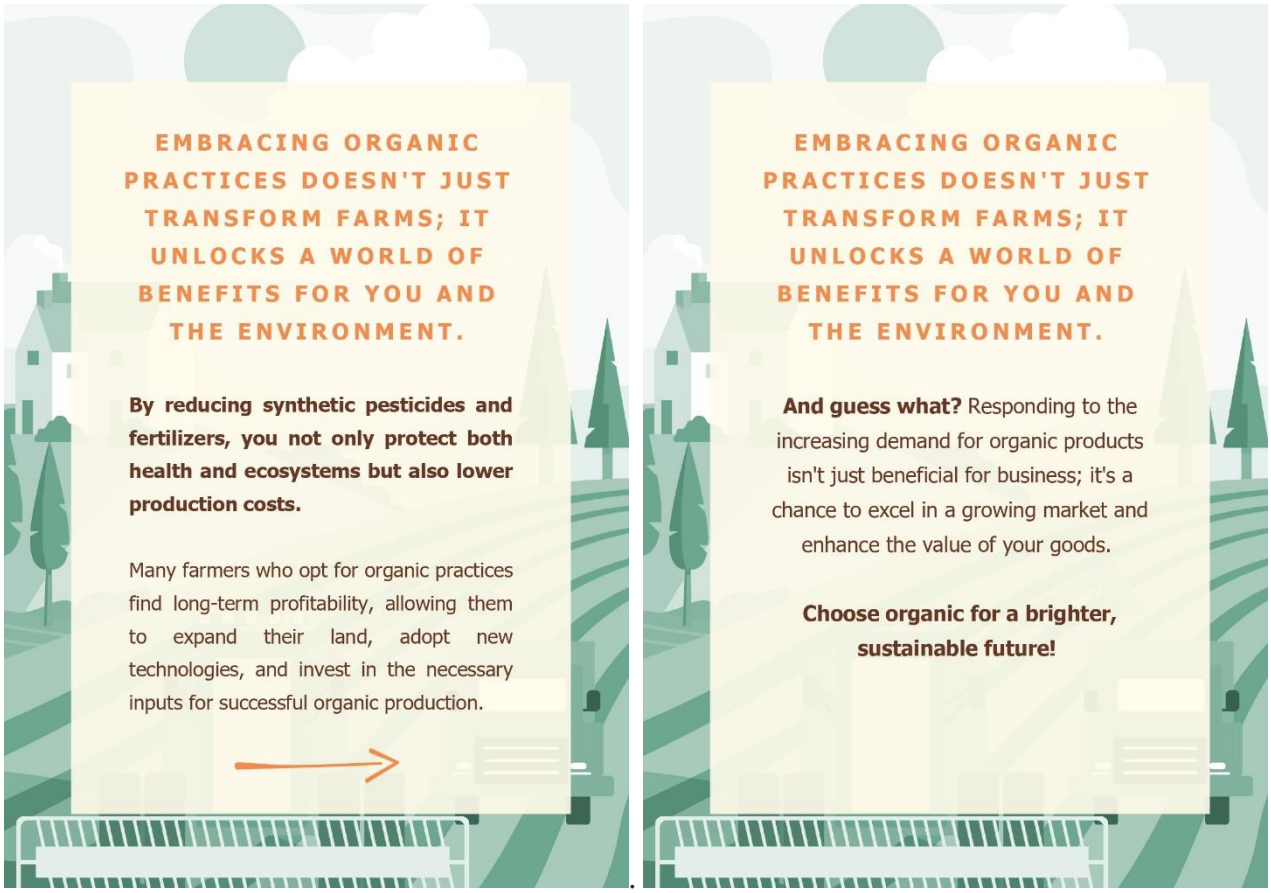
Many farmers who opt for organic practices find long-term profitability, allowing them to expand their land, adopt new technologies, and invest in the necessary inputs for successful organic production.

And guess what? Responding to the increasing demand for organic products isn't just beneficial for business; it's a chance to excel in a growing market and enhance the value of your goods.

Choose organic for a brighter, sustainable future!"

This message was structured to highlight the financial and environmental benefits of organic farming while leveraging peer influence to increase adoption rates. Following validation by the Case Study Coordinators (CSCs), the nudge was formatted into a graphical document, ensuring clarity and accessibility for the target audience. As the nudge was developed in English, no translation was required. The final version, as presented in its visual format, is shown in the following image.

Figure 18: final version in English



Impact of nudge on famers' behavioural factors related to the adoption of SFSs

Table 13 and Figure 19 summarize the results of the estimations of the Difference-in-Differences models for the considered outcome variables.

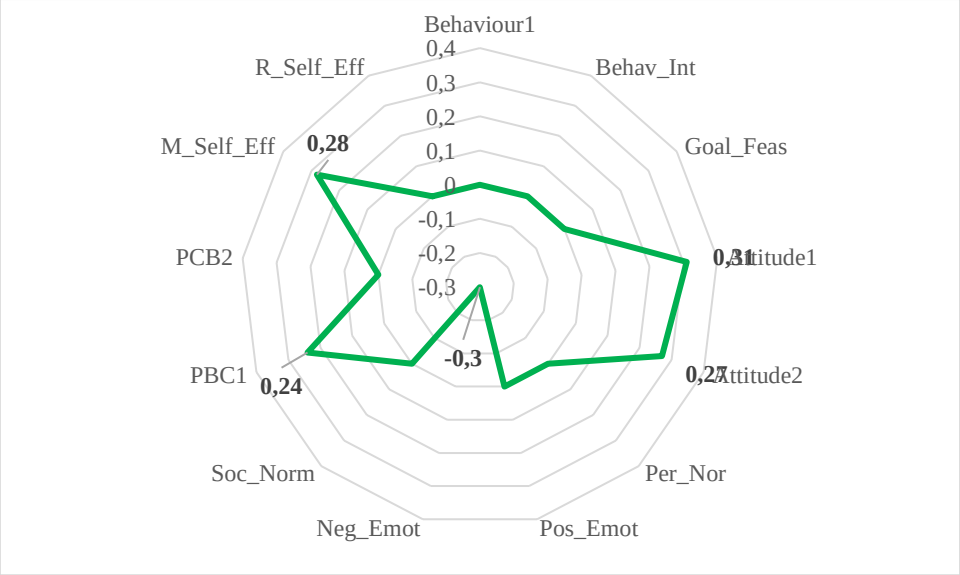
Table 13: impacts of the nudge, socio-demographic variables, and risk aversion on farmers' behavioural factors for CS 9

	Impact of Nudge	*Age*	*Gender*	*Education Level*	*Income*	*Member of Farmers Union*	*Risk aversion*	R^2
Behaviour1	0.01	0.16**	-0.24	-0.12**	0.05	0.12	0.06	0.12
Behav_Int	0.06	0.05	-0.04	0.04	0.05*	-0.14	0.14*	0.07

	Impact of Nudge	*Age*	*Gender*	*Education Level*	*Income*	*Member of Farmers Union*	*Risk aversion*	*R^2*
Goal_Feas	0.17	-0.04	0.18	-0.07	0.09**	0.03	0.02	0.08
Attitude1	0.31**	0.07	0.03	0.04	0.03	-0.04	-0.03	0.09
Attitude2	0.27**	0.09	-0.37	0.01	-0.03	0.12	0.07	0.11
Per_Nor	-0.04	0.07	-0.08	0.05	-0.08**	-0.20	-0.16**	0.11
Soc_Norm	0.10	0.03	0.13	0.01	-0.11***	0.02	-0.20***	0.16
Pos_Emot	0.23	0.18**	-0.10	0.21***	-0.09	0.25*	-0.05	0.20
Neg_Emot	-0.30*	0.14**	0.48***	0.13**	-0.11**	0.22	0.03	0.21
PBC1	0.24*	-0.11	-0.28	-0.01	-0.03	-0.15	0.13	0.10
PBC2	-0.18	0.01	-0.50**	-0.03	-0.07	0.01	-0.17**	0.14
M_Self_Eff	0.28*	0.17***	0.07	0.06	-0.06	0.08	0.01	0.10
R_Self_Eff	0.12	0.03	0.10	0.05	-0.04	-0.04	-0.03	0.07

Note: ***= significant at 1% level; **= significant at 5% level; *= significant at 10% level

Figure 19: impact of nudge on farmers' behavioural factors for CS 9



The findings for Case Study 9 indicate that the nudging intervention was generally effective in enhancing farmers' behavioural readiness for adopting organic practices. The message succeeded in strengthening farmers' belief that the practice was worthwhile and beneficial (Attitude1), while also reinforcing its perceived moral importance (Attitude2). At the same time, it reduced emotional stress linked to the adoption decision (*Neg_Emot*) and improved both the perceived ease of implementation (PBC1) and confidence in maintaining the new behaviour over time (*M_Self_Eff*).

Socio-demographic factors further shaped the response to the intervention. Age emerged as a multifaceted driver: older farmers reported higher intention to adopt organic practices (*Behaviour1*), greater emotional connection to the message (*Pos_Emot*), and higher confidence in sustaining the behaviour (*M_Self_Eff*). However, they also experienced more stress or emotional tension related to the decision (*Neg_Emot*), suggesting that while they were engaged and motivated, the transition was perceived as emotionally demanding.

Gender had more nuanced effects. Female farmers tended to attribute less moral importance to the practice (*Attitude2*) and felt less autonomous in adopting it (*PBC2*). They also reported higher emotional strain (*Neg_Emot*), possibly reflecting a heightened emotional sensitivity or a perception of reduced control in responding to the nudging message.

Education level was negatively associated with the intention to adopt (*Behaviour1*) yet positively linked to both positive and negative emotional responses (*Pos_Emot* and *Neg_Emot*). This pattern may reflect greater emotional

activation among more educated farmers, combined with a more critical or cautious assessment of the feasibility of adopting organic systems.

The role of income was twofold. On one hand, wealthier farmers were more inclined to engage in short-term planning (*Behav_Int*) and perceived the practice as more feasible (*Goal_Feas*). On the other, they were less likely to express personal moral obligation (*Per_Nor*), feel influenced by peers (*Soc_Norm*), or report emotional resonance with the message (*Pos_Emot*). These findings suggest that while financially equipped to implement the change, some wealthier farmers may feel less ethically or socially aligned with the underlying narrative of the intervention.

Membership in a farmers' union was positively associated with emotional engagement (*Pos_Emot*), suggesting that unionized farmers were more affectively receptive to the nudging message, perhaps due to shared discourses or collective identity around sustainability.

Lastly, risk aversion presented contrasting effects. It was positively associated with short-term behavioural planning (*Behav_Int*), suggesting a cautious but structured readiness to act. However, risk-averse farmers reported lower personal moral alignment (*Per_Nor*), less perceived peer support (*Soc_Norm*), and reduced feelings of autonomy (*PBC2*), indicating that internal hesitations and social uncertainties may temper their behavioural response.

Overall, the Irish case reveals that emotional alignment, moral resonance, and practical confidence are key dimensions for effective behavioural interventions, especially when promoting system-level transitions such as conversion to organic farming.

6 Conclusions: a cross-case analysis of the impact of nudges

The analysis of the impact of the nudging interventions allowed to identify statistically significant results for all the investigated behavioural factors influencing the adoption of SFS in all the 9 ENFASYS considered case studies.

Considering the whole picture of the 9 ENFASYS case studies, the impact of nudging intervention has been mixed, as summarized in Table 14

Table 14: impacts of nudging intervention in the 9 ENFASYS Case Studies

	CS1	CS2	CS3	CS4	CS5	CS6	CS7	CS8	CS9
Behaviour1					Pos		Neg		
Behav_Int							Neg		
Goal_Feas	Pos				Neg			Pos	
Attitude1	Neg		Neg						Pos
Attitude2					Neg			Pos	Pos
Per_Nor						Neg			
Soc_Norm				Pos				Pos	
Pos_Emot				Pos	Neg	Neg	Neg		
Neg_Emot							Neg		Neg
PBC1									Pos
PBC2		Pos					Neg		
M_Self_Eff	Neg		Neg						Pos
R_Self_Eff		Pos			Pos		Neg		
Overall Impact	Mix	Pos	Neg	Pos	Mix	Neg	Neg	Pos	Pos

Note: pos=positive impact; Neg=negative impact; Mix=mixed impact

Case Study 1 registered a mixed impact of the nudge. The intervention improved perceived feasibility (*Goal_Feas*) but had a negative influence on perceived advantages of the practice (*Attitude1*) and the ability to maintain its implementation (*M_Self_Eff*). This suggests ambivalence between perceived possibility to adopt eco-schemes and its sustainability over time.

In Case Study 2 the nudge had a positive impact, increasing perceived autonomy (*PBC2*) and reflective self-efficacy (*R_Self_Eff*), strengthening farmers' confidence in their ability to adopt regenerative agriculture practices.

On the opposite, Case Study 3 registered a negative impact of the intervention. The nudge decreased the perceived advantages of participating to programs for the promotion of biodiversity (*Attitude1*) and the perceived ability to maintain the implementation of this practice in presence of barriers (*M_Self_Eff*).

Case Study 4 registered a positive impact of the nudging intervention. Farmers reported improved perceptions of peer pressure for the adoption of practices to increase the autonomy in production of proteins (*Soc_Norm*) and of the perceived positive environmental impact related to the implementation of these practices (*Pos_Emot*), suggesting that the nudge effectively activated a pathway for behavioural change.

Case Study 5 presented a mixed impact. The intervention stimulated intention to adopt higher standards for animal welfare (*Behaviour1*) and increased the reflective self-efficacy related to the adoption of this practice (*R_Self_Eff*), However, negative impacts were found for perceived feasibility of the implementation (*Goal_Feas*), moral importance given to the practice (*Attitude2*), and positive emotions related to the reduction of environmental impact due to the implementation of higher animal welfare standards (*Pos_Emot*). The results highlighted a potential readiness of farmers in implementing the practice, countered by a reluctance related to the actual feasibility and advantages of its implementation.

Negative impacts of the nudging interventions were found also in Case Study 6 and Case Study 7. In Case Study 6 the nudge had a negative impact on farmers' personal norms (*Per_Nor*) and perceived reduction of environmental

impact due to the implementation of the practices (*Pos_Emot*). In Case Study 7 Several outcome variables were negatively affected by the nudge: behavioural intention to adopt direct selling (*Behaviour1*), short-term planning (*Behav_Int*), positive emotions related to the reduction of environmental impacts (*Pos_Emot*). Also perceived stress related to the adoption of direct selling increased (*Neg_Emot*), and preceived autonomy (*PBC2*) and self-efficacy (*R_Self_Eff*) decreased.

In the end, Case Study 8 and 9 registered positive impact due to the nudging intervention. In Case Study 8 positive impacts emerged for perceived feasibility of reduction of pesticides (*Goal_Feas*), perceived importance of the practice (Attitude2), and peer pressure to adopt it (*Soc_Norm*). In Case Study 9 the nudge increased the perception of advantages connected to the adoption of organic practices in farming (Attitude1), the perceived moral relevance of the practice (Attitude2), while presenting an increase of perceived stress connected to the adoption of organic practices. Also, perceived ease of implementation (*PBC1*), and long-term self-efficacy (*M_Self_Eff*), of the practice increased.

To conclude, the intervention showed positive impacts in Case Studies 2, 4, 8, and 9. Mixed results in Case Studies 1 and 5 highlight partial effectiveness, while case Studies 3, 6, and 7 presented negative patterns, highlighting the need to adapt the practices to be adopted and the strategies to promote them to the characteristics of the target contexts and populations.

Particular attention should be paid to the perceived familiarity of the SFS that are promoted. According to the results of nudging interventions, practices that were perceived as less familiar or more hypothetical were more likely to be associated with negative impacts of the nudges, while positive impacts were more observed when the promoted practices were perceived as more familiar or feasible given the characteristics of the contexts in which farmers are operating.

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