

Supporting Documents and Materials

Background, Research Questions, Hypotheses, and Transparency Commitment

Background

Livestock-heavy food systems create major climate and biodiversity pressures, and shifting production toward plant food production likely requires ambitious policy change (Fesenfeld et al., 2023). Policies, however, do not just respond to public preferences; they can also reshape what target groups believe, want, and support (Mettler & Soss, 2004; Pierson, 1993). Policy feedback theory predicts this occurs through two channels: by altering material incentives, and by conveying meanings, information, and norms about government and citizenship (L. R. Jacobs & Mettler, 2018; Pierson, 1993; Wang & Zhang, 2025).

Farmers are a particularly apt population for testing this theory. They experience policy through direct contact with subsidies, advisory services, and compliance requirements — though policy measures also differ in whether they target producers directly, intermediaries, or consumers (Irek et al., 2025) — making farm-level program participation a concrete, observable test of policy feedback (Canessa et al., 2024; Mack et al., 2021; Sander et al., 2024). Farmers also matter politically as an organized interest group with substantial mobilization potential, particularly in rural areas — meaning feedback effects here are not confined to individual attitudes but can plausibly extend to political behaviour more broadly (Anzia et al., 2022; Mettler & Soss, 2004; Simonovits et al., 2021).

Despite this, policy feedback research remains dominated by social policy and US cases, with little comparative or agriculture-specific farm-level evidence (Anzia et al., 2022; Béland & Schlager, 2019). Farmers as a distinct social and interest group remain underresearched in this literature — most feedback studies treat beneficiaries as individual citizens or program recipients, not as members of an organized, politically consequential occupational group (Anzia et al., 2022; Mettler & Soss, 2004). European agri-environment research explains participation and incremental practice uptake well, but rarely asks whether that participation changes later policy preferences (Canessa et al., 2024; Sander et al., 2024; Wensing et al., 2019). Existing agricultural feedback evidence suggests effects can be self-reinforcing or self-undermining, but there is little causal evidence on which channel — material or interpretive — drives policy acceptance, and we lack experimental studies that identify their causal contribution (Béland & Schlager, 2019; Busemeyer et al., 2021; A. M. Jacobs & Weaver, 2015) (Béland & Schlager, 2019; Busemeyer et al., 2021; Jacobs & Weaver, 2015).

This paper asks whether — and through which channel — participation in a transition intervention changes farmers' support for the policy instruments enabling structural production-type switching, in a European high-income farming context.

Research Questions

- **RQ1:** How do agricultural advisory and financial interventions reshape farmers' policy preferences for different types of agri-food policies—varying by policy instrument (financial, regulatory, informational), direction (incentive, disincentive), and point of intervention (producer, intermediary, consumer)?
- **RQ2:** Through which mechanisms do these effects operate: material or interpretive belief change and does the relative contribution of the material versus interpretive channel vary by point of intervention (e.g., material channel dominant for producer-targeted measures, interpretive channel dominant for consumer- or intermediary-targeted measures)?
- *RQ3 (exploratory): Do the two treatment types (advisory support and advisory plus experimental budget) reshape farmers' policy preferences differently?*

Hypotheses

H1: Farmers in either treatment arm show greater increases in support for policy instruments promoting plant food production than control farms.

Rationale: Policy feedback theory predicts that individuals who benefit from a policy intervention become more supportive of policies of the same kind (Mettler & Soss, 2004; Pierson, 1993). Since both treatments have positive material and interpretive effects on plant food production, farmers who experience them are expected to extend this support to state policy instruments pursuing the same goal.

H2: Farmers in either treatment arm do not show increased support for policy instruments promoting a reduction of animal food production, relative to control farms.

Rationale: Over the two-year study horizon, treated farms are expected to expand plant food production alongside, not instead of, their existing animal production, so neither treatment is expected to create material self-interest in reducing animal production specifically. Both treatments may plausibly generate a weak interpretive effect by demonstrating viable plant production alternatives, which could soften farmers' perceived costs of an eventual reduction in animal production; however, we expect this effect, if present, to be too small to produce a detectable shift in support for policy instruments specifically targeting animal production reduction.

Pre-Registration and Transparency

We commit to reporting results for all pre-specified hypotheses and outcomes regardless of statistical significance or consistency with our predictions. Deviations from this pre-analysis plan will be clearly documented and justified in any resulting publications.

Analysis Plan

Primary analysis: ANCOVA with baseline controls for intention-to-treat estimates, and panel regression with fixed effects to assess both intention-to-treat (ITT) and treated-to-treat (LATE/TOT) effects across waves.

Pooled/treatment specification (primary test of H1 and H2, full sample):

$$(\text{ANCOVA, ITT}) Y_i = \beta_0 + \beta_1 \text{pooledTreatment}_i + \beta_2 Y_{i,\text{baseline}} + \varepsilon_i$$

$$(\text{Panel FE, ITT}) Y_{it} = \beta_1 (\text{pooledTreatment}_i \times \text{Post}_t) + u_i + \gamma_t + \varepsilon_{it}$$

where $\text{pooledTreatment}_i = 1$ for farms receiving either the advisory service alone or the combined advisory service and budget (Arm 1 and Arm 2, pooled) and 0 for control farms (Arm 3 and Arm 4); $\text{Post}_t = 1$ for post-treatment survey waves and 0 for baseline; $Y_{i,\text{baseline}}$ is the farm's baseline outcome value; u_i are farm fixed effects; γ_t are wave fixed effects. Y is the general plant-policy-support item for H1, and the animal-production-reduction-support item for H2.

Farmers' policy attitudes may shift over the study period for reasons unrelated to treatment (e.g., broader political or media developments affecting agricultural policy debates generally). The wave fixed effects (γ_t) absorb such common time trends across all farms; the Panel FE design therefore isolates the treatment effect through the *difference* in change between treated and control farms, rather than assuming control farms' attitudes remain static.

β_1 is the pooled treatment effect. H1 is supported if $\beta_1 > 0$; H2 is supported if β_1 is not significantly positive. As an exploratory analysis, the same specification is re-estimated with Y as the mean policy-support score within each instrument Type/Direction category, to examine whether treatment effects differ by instrument type (incentive vs. disincentive; financial vs. regulatory vs. information-based); this is not a confirmatory test of a pre-registered hypothesis.

Arm comparison specification (full sample, arm-specific effects each versus control, tests RQ3):

$$(\text{ANCOVA, ITT}) Y_i = \delta_0 + \delta_1 \text{Arm1}_i + \delta_2 \text{Arm2}_i + \delta_3 Y_{i,\text{baseline}} + \varepsilon_i$$

$$(\text{Panel FE, ITT}) Y_{it} = \delta_1 (\text{Arm1}_i \times \text{Post}_t) + \delta_2 (\text{Arm2}_i \times \text{Post}_t) + u_i + \gamma_t + \varepsilon_{it}$$

where Arm1_i and Arm2_i are separate indicators for Arm 1 and Arm 2, each estimated on the same full sample, with control (Arm 3 and Arm 4) as the reference category. The Arm 1-versus-Arm 2 contrast is obtained via a linear hypothesis test on $(\delta_2 - \delta_1)$. This specification is reported alongside the pooled/treatment specification above, not as a replacement for it.

Robustness Checks

- Both specifications are re-estimated including time-variant control variables (e.g., direct-payment programme changes affecting the wider policy environment during the study period) to assess sensitivity of treatment estimates to time-varying confounders.

- The pooled/treatment specification is re-estimated restricted to subgroups of farms differentially exposed to time-variant policy changes (e.g., livestock-focused farms for policy changes specific to animal production), to assess whether treatment estimates are sensitive to confounding shocks affecting only part of the sample. Given the smaller subgroup sample size, this check is likely to be under-powered relative to the full-sample specification and is interpreted accordingly
- H1 is re-estimated restricted to the subset of producer-targeted policy-instrument items (see Primary Outcomes table), to assess whether the pooled treatment effect is more robust for measures intervening directly on producers than for the full battery including intermediary- and consumer-targeted items.

To assess treated-to-treat (LATE/TOT) effects, accounting for imperfect compliance with assigned treatment, actual take-up (D_i , e.g., advisory sessions attended, budget drawn) is instrumented by treatment assignment, using the same pooled and arm-by-arm structure.

Randomization inference considering rerandomization: Because treatment assignment within Canton Lucerne (Arms 1–3) follows a rerandomization procedure, we will account for this restricted randomization when conducting inference for β_1 , δ_1 , and δ_2 wherever the comparison is among Arms 1–3. Specifically, under the sharp null of no treatment effect, we will re-estimate each treatment-effect statistic for every acceptable allocation obtained during the final stage of the rerandomization procedure, holding observed outcomes fixed, to construct a randomization distribution. The p-value is the share of acceptable allocations yielding a statistic at least as extreme as the one observed under the actual allocation. Since Arm 4 is assigned directly and is not part of the rerandomization procedure, no randomization distribution exists for comparisons involving Arm 4; standard asymptotic inference (e.g., robust or clustered standard errors) is used for any specification involving Arm 4 instead.

Covariate balance: For Arms 1–3, covariate balance on the pre-specified tiered covariates is expected by design; rather than testing for balance among these arms, we will present the achieved balance statistics for transparency. We may additionally consider covariate adjustment to further increase precision. For Arm 4, balance relative to Arms 1–3 will be formally tested on the same pre-specified covariates. Where sample size in Arm 4 is sufficient, we will additionally consider adjustment methods (e.g., matching or weighting) to improve comparability if imbalance is detected; any such adjustment will be incorporated into the specifications above as an added covariate or weighting term, and reported as a robustness check alongside the unadjusted estimates.

Attrition and withdrawal rates will be reported by arm. For Arms 1–3, achieved balance will be re-presented among farms remaining at each wave; for Arm 4, balance will be re-tested among farms remaining at each wave. Where attrition is concentrated in specific arms, ex-post matching will be applied to restore comparability.

Exploratory causal mediation analysis (RQ2): We estimate the proportion of the treatment effect on policy support mediated through a material channel (risk perception, income share/value creation, and the risk/effort attitude item pair) versus an interpretive channel (TPB subjective norm, perceived behavioural control, the disadvantageous/discouraging attitude item pair, felt appreciation as a farmer, institutional legitimacy), fitted in parallel. The two institutional legitimacy items (general democratic satisfaction, agricultural/food policy satisfaction specifically) are examined both jointly, as a combined interpretive-channel indicator, and separately, given their differing level of specificity to the treatments. This analysis is exploratory and not confirmatory for H1, H2, or RQ3.

Secondary and exploratory analyses (moderation by occupational identity, treated in a separate paper; network spillovers, treated in a separate paper) are reported separately and are not confirmatory for this pre-registration.

PRIMARY OUTCOMES (Table)

Primary Outcomes (end points)

Survey-based indicators (baseline, Year 1, Year 2):

- Policy-instrument battery, introduced with: "Would you support or reject the following state measures? Assume all other support programs and framework conditions remain unchanged." 7-point scale (fully reject → fully support):

Policy measure	Target	Type	Direction	Point of Intervention
Farm-specific advisory and training services from public bodies (e.g., Agridea, cantons) to promote plant food production (excluding feed)	Plant	Information	Incentive	Producer
State-funded experimental budget of CHF 10,000 to promote plant food production (excluding feed)	Plant	Financial	Incentive	Producer
Simplification of spatial planning procedures for plant food production (excluding feed), e.g. structural investments for specialty crops (greenhouses, hail protection) or post-harvest infrastructure for arable crops (drying, dehulling)	Plant	Regulatory	Incentive	Producer
Stronger state-subsidized crop insurance for plant	Plant	Financial	Incentive	Producer

crops to protect against yield losses				
Higher border protection for plant crops (excluding feed) that are currently only slightly or not at all protected (e.g., protein crops)	Plant	Regulatory	Incentive	Producer
Increase in per-crop subsidies (Einzelkulturbeiträge) for plant crops (excluding feed crops) that are currently only slightly or not at all supported (e.g., protein crops)	Plant	Financial	Incentive	Producer
Stronger state financial support for marketing and innovation along the value chain for plant foods (e.g., regional processing infrastructure, pilot and demonstration projects)	Plant	Financial	Incentive	Intermediary
An exit premium for livestock farms (e.g., pig breeders) in Switzerland	Animal	Financial	Incentive	Producer
Voluntary reduction targets for livestock numbers in Swiss agriculture	Animal	Regulatory	Disincentive	Producer
A reduction of VAT on plant foods	Plant	Financial	Incentive	Consumer
An increase of VAT on animal foods	Animal	Financial	Disincentive	Consumer
A mandatory minimum share of plant foods in institutional catering (e.g., canteens, hospitals, schools)	Plant	Regulatory	Incentive	Intermediary

Sponsors and Partners

This study is conducted as part of the Plant4Value project at ETH Zurich, funded by Stiftung Mercator Schweiz, Seedling Foundation, Minerva Stiftung, and Fourfold Stiftung — four independent philanthropic foundations. All funds are channelled through the ETH Foundation, and the four philanthropic foundations have no influence on the research design, conduct, or publication decisions. No public research funding bodies, government agencies, or industry sponsors are involved. Three institutional partners support the study through administrative and operational collaboration: the cantonal agricultural

authority of Canton Lucerne (LAWA), which administers disbursement of the experimental budget; the Berufsbildungszentrum Natur & Ernährung Luzern (BBZN), which leads farm acquisition and delivers the initial advisory session; and the Decisions Science Laboratory (DeSciLab) at ETH Zurich, which handles participant contact and communication. No partner holds a commercial interest in the study outcomes, and no conflicts of interest have been identified among the research team or project partners.

Reference List

- Anzia, S. F., Jares, J. A., & Malhotra, N. (2022). Does Receiving Government Assistance Shape Political Attitudes? Evidence from Agricultural Producers. *American Political Science Review*, 116(4), 1389–1406.
<https://doi.org/10.1017/S0003055422000314>
- Béland, D., & Schlager, E. (2019). Varieties of Policy Feedback Research: Looking Backward, Moving Forward. *Policy Studies Journal*, 47(2), 184–205.
<https://doi.org/10.1111/psj.12340>
- Bussemeyer, M. R., Abrassart, A., & Nezi, R. (2021). Beyond Positive and Negative: New Perspectives on Feedback Effects in Public Opinion on the Welfare State. *British Journal of Political Science*, 51(1), 137–162.
<https://doi.org/10.1017/S0007123418000534>
- Canessa, C., Ait-Sidhoum, A., Wunder, S., & Sauer, J. (2024). What matters most in determining European farmers' participation in agri-environmental measures? A systematic review of the quantitative literature. *Land Use Policy*, 140, 107094.
<https://doi.org/10.1016/j.landusepol.2024.107094>
- Fesenfeld, L., Mann, S., Meier, M., Nemecek, T., Scharrer, B., Bornemann, B., Brombach, C., Beretta, C., Bürgi, E., Grabs, J., Ingold, K., Jeanneret, P., Kislig, S., Lieberherr, E., Müller, A., Pfister, S., Schader, C., Schönberg, S., Sonneveld, M., ... Zähringer, J. (2023). *Wege in die Ernährungszukunft der Schweiz—Leitfaden zu den grössten Hebeln und politischen Pfaden für ein nachhaltiges Ernährungssystem*. Zenodo. <https://doi.org/10.5281/zenodo.7543576>
- Irek, J., Finger, R., Ammann, J., Arbenz, A., Mack, G., & El Benni, N. (2025). Shared responsibility: Understanding the role of governments, farmers, retailers, and

consumers in food system policies. *Q Open*, 5(2), qoaf025.
<https://doi.org/10.1093/qopen/qoaf025>

Jacobs, A. M., & Weaver, R. K. (2015). When Policies Undo Themselves: Self-Undermining Feedback as a Source of Policy Change. *Governance*, 28(4), 441–457.
<https://doi.org/10.1111/gove.12101>

Jacobs, L. R., & Mettler, S. (2018). When and How New Policy Creates New Politics: Examining the Feedback Effects of the Affordable Care Act on Public Opinion. *Perspectives on Politics*, 16(2), 345–363.
<https://doi.org/10.1017/S1537592717004182>

Mack, G., Ritzel, C., Heitkämper, K., & El Benni, N. (2021). The Effect of Administrative Burden on Farmers' Perceptions of Cross-Compliance-Based Direct Payment Policy. *Public Administration Review*, 81(4), 664–675.
<https://doi.org/10.1111/puar.13335>

Mettler, S., & Soss, J. (2004). The Consequences of Public Policy for Democratic Citizenship: Bridging Policy Studies and Mass Politics. *Perspectives on Politics*, 2(1), 55–73. <https://doi.org/10.1017/S1537592704000623>

Pierson, P. (1993). When Effect Becomes Cause: Policy Feedback and Political Change. *World Politics*, 45(4), 595–628. <https://doi.org/10.2307/2950710>

Sander, A., Ghazoul, J., Finger, R., & Schaub, S. (2024). Participation in individual and collective agri-environmental schemes: A synthesis using the Theory of Planned Behaviour. *Journal of Rural Studies*, 107, 103255.
<https://doi.org/10.1016/j.jrurstud.2024.103255>

- Simonovits, G., Malhotra, N., Lee, R. Y., & Healy, A. (2021). The Effect of Distributive Politics on Electoral Participation: Evidence from 70 Million Agricultural Payments. *Political Behavior*, 43(2), 737–750. <https://doi.org/10.1007/s11109-019-09572-7>
- Wang, P., & Zhang, Y. (2025). Cross-domain policy feedback effects on mass publics. *Governance*, 38(2), e12905. <https://doi.org/10.1111/gove.12905>
- Wensing, J., Carraresi, L., & Bröring, S. (2019). Do pro-environmental values, beliefs and norms drive farmers' interest in novel practices fostering the Bioeconomy? *Journal of Environmental Management*, 232, 858–867. <https://doi.org/10.1016/j.jenvman.2018.11.114>