

AISRE Annual Conference 2026
Session SO.04 – Impact Evaluation for Innovation and Sustainability

26 June 2026

**EFFECTS OF INCENTIVES FOR CONVERSION TO ORGANIC FARMING:
An Evaluation of Causal Pathways and Long-Term Outcomes**

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26 June 2026

From quantitative success to the evaluation question

□ THE QUANTITATIVE RESULT

Organic UAA (Tuscany): 2024: 37% — Italy ~18%; EU avg ~9%

EU 2030 target: 25%

GROWTH 2014–2024

2014: 100,000 hectares → 2024: 210,000 hectares (+110%)

□ THE CRITICAL QUESTION

How much of this quantitative growth is attributable to public incentives?

And for which farms did the incentives actually work?

What do we know from the literature on organic conversion incentives?

□ WHAT DO STUDIES FIND?

⚠️ DESCRIPTIVE/CORRELATIONAL STUDIES

- Beneficiaries vs non-beneficiaries comparison
- Problem: self-selection, no counterfactual
- They find: positive correlations between subsidies and efficiency, but not causal
- Examples: Casolani et al. 2021, Madau 2007, Łuczka et al. 2021

□ CAUSAL STUDIES (few!)

- DiD, PSM, synthetic control
- **Credible effect identification**
- They find: *positive effects on the environment and efficiency (+10%), but **only average effects***
- Examples: *Cisilino 2019, Raimondo 2021, Rees 2023*

□ GAPS IN THE LITERATURE

1 NO HETEROGENEITY

Even causal studies: **only average ATT/ATE**
Who benefits? Who is harmed?
Which characteristics *ex ante* identify the profiles?

2 SHORT HORIZON + TRUNCATION

In the long term (e.g. 9 years): farm exit introduces endogenous selection.
Outcome "truncated by death" makes counterfactual analysis challenging, but creates important learning opportunities

□ CONTRIBUTION OF THIS STUDY

1. HANDLES TRUNCATION: identifies 9-year causal effects by distinguishing strata for which the outcome is defined (survivors) from those for which it is undefined (exiters) → latent mechanisms of response to treatment
2. CAUSAL AND HETEROGENEOUS: Bayesian principal stratification identifies four latent profiles with profile-specific effects, without assuming homogeneity
3. OPERATIONAL: observable ex ante characteristics (UAA, age, legal form) enable differentiated targeting

An innovative approach to complex questions

THE CHALLENGE □

□ Count organic farms today

□ Understand for whom the incentive was decisive

How can we separate the incentive effect from what would have happened anyway?

THE METHOD □

COMPLETE DATA

- 28,153 farms
- 9-year observation window
- Complete administrative records

PRINCIPAL STRATIFICATION

Reconstructs hidden response pathways

☑ Like a CT scan rather than an X-ray: we see not only whether there is an effect, but also the pathways through which it is produced

QUALITATIVE SURVEY

- 187 interviews (surviving farm sample)
- Motivations
- Perceived profitability

THE TEAM □

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□ Not a standard evaluation, but the identification of differentiated causal mechanisms

The analysed sample

STUDY AT A GLANCE

28,153
total eligible farms

712 treated (2015 call) 27,441 controls

9-YEAR SURVIVAL

83.7%
596 treated

73.6%
20,194 controls

The difference is NOT an effect (raw selection)

ORGANIC FARMS (among survivors)

93%
treated

12%
controls

TIME HORIZON

2015 → 2024 (9 years)

DATA SOURCES

Ranking lists + Farm Register +
Crop plans + 187 interviews

□ The study estimates 9-year causal effects on organic farming persistence and farm survival, distinguishing four latent response profiles

Beneficiary profile: who are the treated farms?

Pre-conversion data, 2015

SIZE AND STRUCTURE

- Average UAA: 48 ha
(vs 21 ha population)
- 27% non-individual legal forms
(vs 14% population)
- 41% under 10 years
(vs 29% population)

LOCATION

- 61% between Siena and Grosseto
- 18% in mountain areas

MARKET ORIENTATION

- 83% market-oriented (self-consumption <50%)
 - 17% mainly self-consumption (>50%)
- 38% members of consortia/POs

CROP SPECIALISATION

- 40% arable crops
- 33% mixed systems
- 14% viticulture
- 14% olive growing

→ Average profile: structured farms, larger than average, market-oriented

Not all farms respond in the same way

THE FOUR POSSIBLE PATHWAYS

RESILIENT

Survive anyway
Solid, structured farms
The incentive/conversion does not affect survival, but it may strengthen the organic choice

PROTECTED

Survive only thanks to the incentive
Small, fragile farms
The incentive/conversion saves them

VULNERABLE

Exit anyway
Too fragile
The incentive/conversion cannot save them

HARMED

Exit because of the incentive
The incentive/conversion introduces unsustainable constraints

⚡ The **PRINCIPAL STRATIFICATION** method identifies these hidden pathways

The Four Latent Strata

Stratum	Survive <i>WITHOUT</i> incentive?	Survive <i>WITH</i> incentive?	Organic outcome 9 yrs <i>WITHOUT</i> incentive	Organic outcome 9 yrs <i>WITH</i> incentive
 RESILIENT	Yes	Yes	 Defined (observable /imputable)	 Defined (observable /imputable)
 PROTECTED	No	Yes	 Undefined	 Defined (observable /imputable)
 HARMED	Yes	No	 Defined (observable /imputable)	 Undefined
 VULNERABLE	No	No	 Undefined	 Undefined

“Defined” = we can observe or infer the outcome; “Undefined” = logically impossible outcome (neither observable nor inferable)

Why it matters

Only for Resilient farms can we compute the causal effect of the incentive on organic adoption at 9 years. For other strata, at least one of the two potential outcomes does not logically exist.

Observed Data Contain Mixtures of Latent Strata

Observed	T = 0 (<i>untreated</i>)	T = 1 (<i>treated</i>)
S = 1 (<i>survivors</i>)	☐ Resilient + ☐ Harmed	☐ Resilient + ☐ Protected
S = 0 (<i>exited</i>)	☐ Vulnerable + ☐ Protected	☐ Vulnerable + ☐ Harmed

⚠ Directly comparing treated vs untreated survivors is biased and incorrect

- Among **treated survivors** survivors: also **Protected** (surviving only thanks to the incentive).
- Among **untreated survivors** survivors: also **Harmed** (that would exit with the incentive).

The “naive” organic % gap reflects not only the incentive effect but also a different latent composition

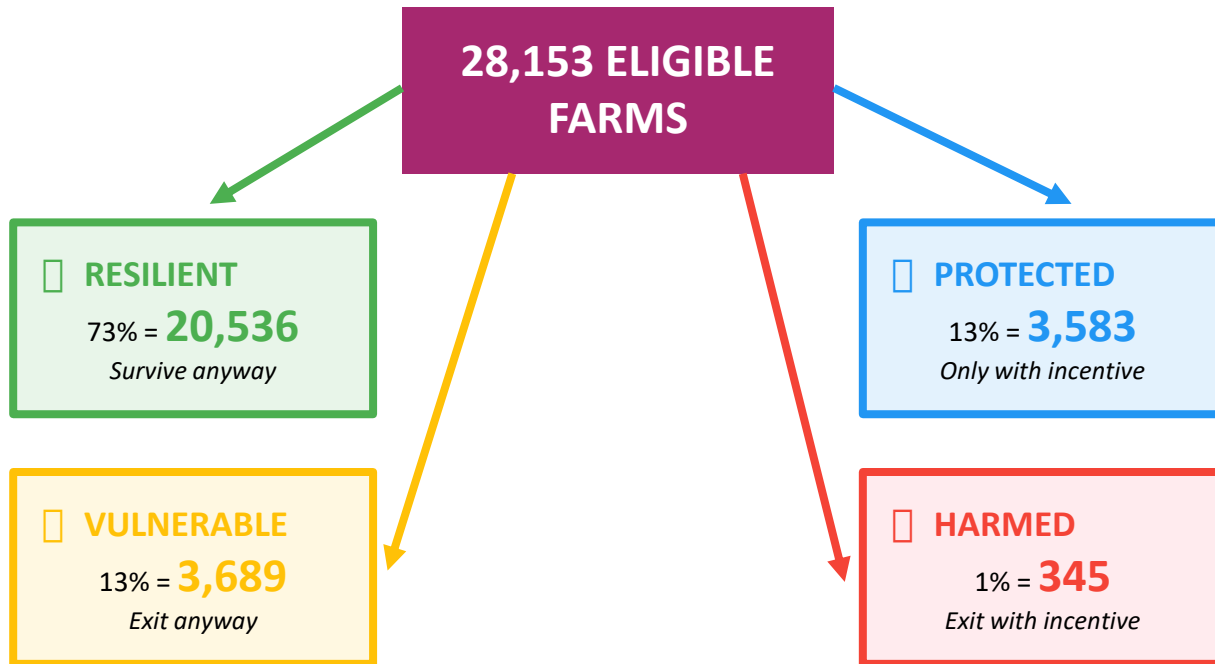
Goals of principal stratification:

- ☐ **Decompose** observed groups, **assigning** each farm to a latent stratum. Then ...
- ☐ **Impute**/observe outcomes only where logically defined
- ☐ **Compare** outcomes with/without incentive only where meaningful: ☐ Resilient

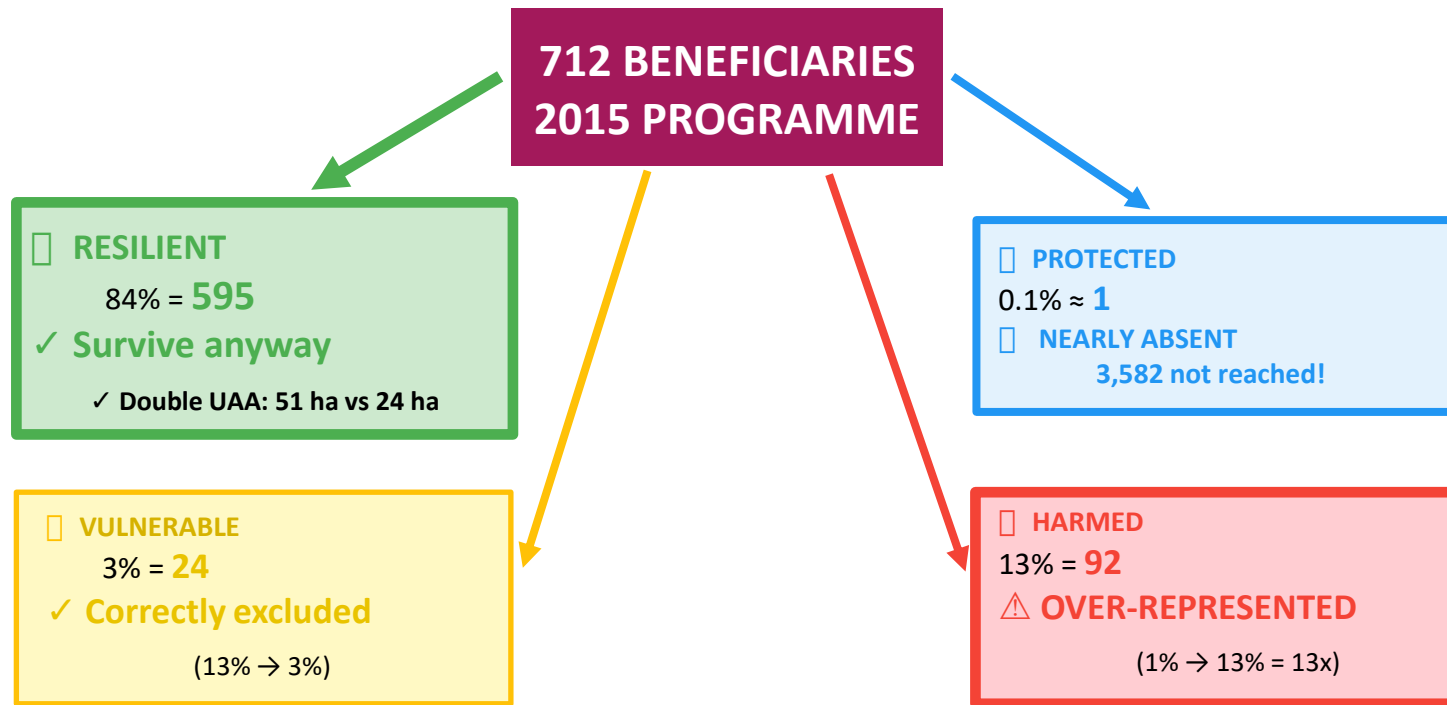
Identification rests on conditional ignorability +

Flexible Bayesian parametric models for latent strata membership and counterfactual potential outcomes

How are the 28,153 eligible farms distributed?



How are the 712 programme beneficiaries distributed?



Strata composition: population vs beneficiaries

STRATUM	GENERAL POPULATION	UAA mean	BENEFICIARIES	UAA mean
 RESILIENT (survive anyway)	73%	24 ha	84%	51 ha
 PROTECTED (only with incentive)	13%	14 ha	0.1%	25 ha
 VULNERABLE (exit anyway)	13%	14 ha	3%	30 ha
 HARMED (exit with incentive)	1%	34 ha	13%	33 ha

⚠ **KEY TAKEAWAY:** the programme predominantly reached farms that would have survived anyway (Resilient, 73% → 84%), almost entirely missing those that would have most benefited from survival support (Protected, 13% → 0.1%).

Potential vs actual targeting

RESILIENT (73% → 84%)

GENERAL POPULATION

- Avg UAA: 24 ha
- 69% mature (>10 years)
- 17% non-individual legal forms
- Balanced territorial distribution

AMONG TREATED

- UAA doubled: 51 ha
- 30% non-individual legal forms
- Concentrated GR+SI (60%)

PROTECTED (13% → 0.1%)

GENERAL POPULATION

- Small UAA: 14 ha
- Mature (71% >10 years)
- 92% individual operators
- Similar to Vulnerable, but recoverable

ALMOST ABSENT AMONG TREATED

- The few reached: larger (25 ha), younger, less often individual operators

HARMED (1% → 13%)

GENERAL POPULATION

- Large UAA: 35 ha
- Younger (52% <10 years)
- 28% non-individual legal forms
- More viticulture (18%)
- Concentrated SI+GR (60%)

AMONG TREATED

- More mature, more often individual operators
- Similar UAA (33 ha)

VULNERABLE (13% → 3%)

GENERAL POPULATION

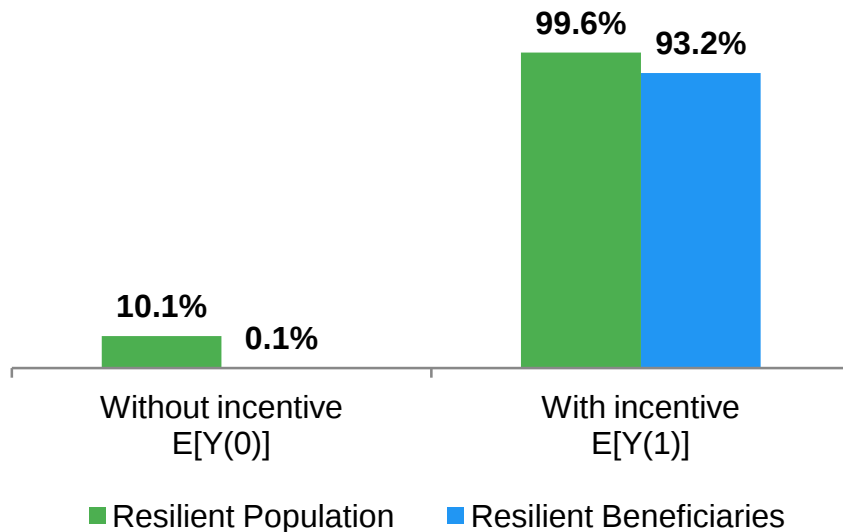
- Small UAA: 14 ha
- Very mature (72% >10 years)
- 92% individual operators
- Similar profile to Protected

ALMOST EXCLUDED (correctly)

- The few reached: larger (30 ha), younger, more concentrated in GR+SI

The causal effect on Resilient farms: long-term organic persistence

CAUSAL EFFECT AT 9 YEARS FROM POLICY CALL



RESILIENT POPULATION (SACE)

$E[Y(0)]$ without incentive: 10.1%

$E[Y(1)]$ with incentive: 99.6%

$EFFECT = E[Y(1)] - E[Y(0)]$ | Convertible Resilients
+89.4 pp probability of remaining organic
(95% CrI: 87.5 – 92.7)

TREATED RESILIENT FARMS (SACE_{T=1})

$E[Y(0)]$ without incentive: 0.1%

$E[Y(1)]$ with incentive: 93.2%

$EFFECT = E[Y(1)] - E[Y(0)]$ | Converted Resilients
+93.1 pp probability of remaining organic
(95% CrI: 92.6–93.8)

□ Why is SACE_{T=1} larger? Targeting selected Resilient farms with a very low counterfactual propensity $E[Y(0)]$ (0.1% vs 10.1%), making the treatment-control gap wider (+93.1 pp vs +89.5 pp).

Qualitative Interviews: Whom We Surveyed and Why

□ THE MECHANISM: WHY DO WE ONLY HEAR FROM RESILIENT FARMS?

1. STARTING POINT (2015)

712 programme beneficiaries



2. AFTER 9 YEARS (2024)

596 survivors (116 exits)



3. COMPOSITION OF SURVIVORS

Reachable: 595 Resilient (99.9%) • 1 Protected (0.1%)

Not reachable: Harmed/Vulnerable because they exited

□ WHAT WE DID

187 in-depth interviews
with 596 treated survivors

□ WHOM THE RESULTS REFER TO

- We apply weights $\text{Pr}(\text{Resilient})/\text{Pr}(\text{Response})$
- Inference refers to the 595 treated Resilient survivors

□ The qualitative results (next slide) refer exclusively to the Resilient stratum, which accounts for almost all programme beneficiaries (84%) and virtually all treated survivors.

Beyond the numbers: what Resilient farms tell us

BEFORE CONVERSION (2015)

□ PROFILE

- 14% agricultural diploma/degree
- 83% market-oriented (self-consumption <50%)
- Average turnover: **84k €**
- **72% low margins**

□ MOTIVATIONS (scale 1–5)

- Intrinsic motivation: **4.09** (*values*)
- Future orientation: **3.87** (*long term*)
- Risk propensity: **2.96** (*moderate*)

□ *"I chose organic out of environmental conviction"*

AFTER 9 YEARS (2024)

□ TURNOVER

€124k (+48%), but 74% still report low margins △

□ ORGANIC SALES

- **39% sell ALL organic** • 15% more than half
- 22% less than half • 27% none

□ ACTIVITY DIVERSIFICATION

- Agritourism **23%→32% (+39%)** • Energy **14%→26% (+86%!)** • Processing **21%→26%**

□ SUSTAINABLE PRACTICES

- Minimum tillage **34%→51% (+50%!)** • Rotation **63%→68%** • Overseeding **20%→28%**

□ DISTRIBUTION CHANNELS

- Direct sales: **15% → 20% (+33% - premium!)**
- Delivery to producer organisations: **34% → 39% (+17%)**
- Agricultural B2B sales: **10% → 14% (+44%)** large-scale retail stable

△ THE POINT: organic consolidated (93%) + turnover up (+48%) + active diversification, but profitability is unchanged (74% low margins). Policies should help farms valorise organic production, not just compensate for its costs.

Policy Implications: Resilient farms (73% of convertible farms)

□ EX ANTE SIGNALS (observable ex ante characteristics)

UAA >20 ha • Non-individual legal form • Farm age >10 years

DIAGNOSIS (from data + interviews)

□ Incentive works (+89pp) ⚠ BUT critical profitability: 74% report low margins

□ RECOMMENDATION

Evolve support: from area compensation → product valorisation

THE RATIONALE

Organic production is consolidated (93%), but margins remain tight. Farms need to EARN FROM organic, not just COMPENSATE for its costs.

CONCRETE ACTIONS

- ✓ Support collective organisations (POs, consortia) → stronger bargaining power
- ✓ Strengthen commercial channels (direct sales) → capture premium price
- ✓ Invest in on-farm processing → retain added value

Policy Implications: Other Strata at a Glance

□ PROTECTED

13% of convertible farms | 0.1% of beneficiaries

Who: small, mature, individual farms

Issue: almost entirely missed by the programme

Policy: actively target + reduce entry barriers.

- Dedicated training and technical advice
- Free specialist consulting
- Demonstration farms (early adopters)
- Simplified calls for small farms
- Certification costs covered

□ HARMED

1% of population | 13% of beneficiaries

Who: younger, larger, more specialised farms

Issue: risk strongly over-represented among treated farms

Policy: ex ante sustainability test + case-by-case screening

□ VULNERABLE

13% of population | 3% of beneficiaries

Who: very small, old, individual farms

Issue: conversion incentives are unlikely to be enough

Policy: redirect to renewal or social-support instruments

Main message: target Protected, screen Harmed, redirect Vulnerable.