

ORIGINAL RESEARCH · ENVIRONMENTAL POLICY & FIRE SCIENCE · INDEPENDENT ANALYSIS, NOT PEER-REVIEWED

Measurement or Convention? A Forensic Reassessment of Wildfire Causation Attribution in Sicily, 2003–2026

Whether the official “predominantly deliberate ignition” attribution is an empirical measurement or an administrative artefact, tested through an independent 94,465-detection satellite record, the internal arithmetic of the official series, twelve comparative Mediterranean attribution systems, and a parcel-level case study of the interior comune of Alessandria della Rocca (Agrigento).

ADRIZ · Independent Research

Working paper · Draft v2.0 · 22 July 2026

ABSTRACT

Background. Sicily has been the most fire-affected region of Italy for four consecutive years, contributing roughly half of the national burned area in 2025. Its regional government, the Italian state, and Sicilian public discourse converge on a single account of this fact: that the fires are almost entirely human-ignited and predominantly *dolosi*—deliberate—the work of arsonists and organised criminal interests. Prevention policy, enforcement expenditure, and public understanding are all organised around this attribution, yet its evidentiary basis has not, to my knowledge, been independently interrogated at the level of its own construction.

Aim. I ask two deliberately separated questions. (Q1) What, precisely, is the official and public assessment, and how is its central quantitative claim constructed? (Q2) Does the available evidence support it—or was an assessment made that is more specific to a particular subregion than admitted, incorrect, or once correct but no longer? In particular, are Sicily's fires demonstrably *human*-caused, and is the further claim that they are *deliberately, criminally* human-caused a measurement or a convenient default?

Data and methods. I triangulate three independent evidence streams so that the official statistic is not adjudicated only against other statistics that share its provenance and incentives. First, I reconstruct the official assessment and analyse the internal arithmetic of its published cause series. Second, I retrieve and analyse the complete NASA FIRMS active-fire archive for Sicily (2003–2026; 133,102 raw detections; MODIS and VIIRS), cleaned to 94,465 vegetation-fire detections, and test ignition-mechanism signatures—day-of-week, seasonality relative to the agricultural calendar, and fire radiative power—that owe nothing to any Italian cause code. Third, I compare twelve Mediterranean and analogue cause-attribution systems and conduct a parcel-level case study of one interior comune. Every claim is graded by evidentiary status, and each load-bearing conclusion is retained only after I construct and test the strongest available counter-argument against it.

Results. Near-total human ignition is confirmed independently: the weekday structure of satellite detections is overwhelmingly non-uniform (χ^2 , $p \approx 1.7 \times 10^{-108}$) and inconsistent with natural

ignition. The further “deliberate/criminal” attribution, however, is not a measurement. The official share derives from a single decade-old figure in which the “deliberate” and “unclassifiable” series are near-perfectly anticorrelated (Pearson $r = -0.989$) and sum to a near-constant $96.1 \pm 1.4\%$, with a 15–17 percentage-point discontinuity coincident with a 2014–2015 change of recording software; the responsible regional minister repudiated the coding on the parliamentary record; the taxonomy files identical acts under both “deliberate” and “negligent”; the justice system corroborates the attributed volume at roughly one denunciation per 110 fires with no forensic-based convictions; and 84% of what burns is non-forest. The comparative record shows the “deliberate” share tracking classification convention—residual suppression and the absence of an agro-pastoral category—rather than measurable behaviour; in Sardinia, Sicily's closest structural analogue, 79% of “deliberate” fires have no determined motive. The independent satellite signature and the municipal case both indicate an agro-pastoral burning regime on grass and abandoned land, weather-gated into catastrophe.

Conclusions. The official assessment is correct that Sicilian fires are overwhelmingly anthropogenic but substantially incorrect, geographically over-generalised, and stale in its load-bearing claim that they are predominantly criminal arson. The attribution functions as an administrative and political convention that re-describes a landscape-and-climate emergency as a policing problem, misdirecting mitigation away from the levers the evidence supports. I specify the confirmatory and refutational studies that would resolve the residual uncertainty, most of which are executable with existing open data.

KEYWORDS: wildfire causation; ignition attribution; Sicily; Mediterranean fire regimes; agro-pastoral burning; land abandonment; NASA FIRMS; active-fire remote sensing; fire statistics; forensic fire investigation; environmental policy.

1 Introduction

1.1 The phenomenon and its scale

The wildfire problem in Sicily is, by any measure, severe and worsening in its consequences. Satellite-derived accounting places the island as the most fire-affected region of Italy for four consecutive seasons, supplying on the order of half the national burned area in 2025, with a majority of the largest Italian fire events (those exceeding 500 ha) occurring on Sicilian territory in the extreme years. The catastrophe seasons of 2021 and 2023—the latter including the 24–25 July firestorm that closed Palermo airport and forced widespread evacuation—have made the annual emergency a fixed feature of Sicilian public life. What is contested is not that Sicily burns, nor even that people are responsible for igniting most of its fires, but the far more specific and policy-determining claim about *who* those people are and *why* they set fires.

1.2 The assessment under examination

The technical anchor of the official account is the regional wildfire plan (*Piano Regionale per la Programmazione delle Attività di Previsione, Prevenzione e Lotta Attiva contro gli Incendi Boschivi*, hereafter Piano AIB) of the Corpo Forestale della Regione Siciliana. It states that a reading of its cause graphs “leaves no doubt as to the clear preponderance of deliberate fires” and that “almost the entirety of fires (about 95%) occurs by the hand of man, through negligence or malice” [1,2]. The sole quantification the Region has ever published gives a mean “deliberate” share of 77.5% across 2010–2020 [1]. Above this technical layer sits a political register that cites no method and runs higher still: the responsible regional assessor stated in May 2025 that “98 per cent of the fires are due to the hand of man” [31], and in July 2025 the regional president attributed a single 380-fire day to “the criminal hand of unscrupulous arsonists” [32]. The framing is echoed and amplified by national media, by environmental NGOs, and by the recurrent invocation of organised crime.

1.3 Why the attribution matters

Causal attribution is not a neutral description; it is the premise from which the entire prevention architecture is derived. If Sicilian fires are predominantly criminal arson, then surveillance, drone reconnaissance, penalty escalation, and the pursuit of organised-crime networks are appropriately central, and the persistent under-conviction is merely a prosecutorial shortfall to be closed. If, on the other hand, the fires are predominantly escaped agricultural and pastoral burning on an abandoned, grass-dominated interior, converted to catastrophe by fire weather and a saturated suppression system, then the same instruments are largely beside the point, and the levers that matter—fuel management, workforce, detection latency, and the burning calendar—are precisely the ones the official framing neglects. The attribution therefore warrants exactly the scrutiny that, at the level of its own construction, it has not previously received.

1.4 Research questions and contribution

I pose the two questions of the Abstract and answer them separately because they have different answers: human causation is well established; criminal-arson dominance is not. The methodological contribution is triangulation against sources that do not share the official statistic's provenance. Rather than adjudicating one administrative figure against other administrative figures—which are produced by the same institutions under the same incentives—I test it against (a) an independent physical

measurement that owes nothing to any Italian body, (b) the internal arithmetic of the official series itself, and (c) the cross-national pattern of how cause is coded elsewhere, comparing *methods* rather than merely numbers. I also add the temporal and spatial dimensions the official framing suppresses: a decadal reconstruction of the fire regime since 1950, and a parcel-level municipal case. Throughout, I grade evidence by status and preserve—rather than resolve—the points on which the evidence is genuinely indeterminate, because a defensible answer to a contested question must be explicit about its own uncertainty.

2 Materials and Methods

2.1 Research design and epistemic strategy

The design is a convergent, mixed-evidence assessment with an adversarial verification protocol. Documentary and statistical material was assembled from primary official sources (regional and provincial fire plans, statistical yearbooks, parliamentary records, judicial reporting), peer-reviewed literature, and independent remote-sensing datasets. For each load-bearing conclusion I applied a disconfirmation protocol: I constructed the strongest counter-argument I could against the claim and retained the claim only to the extent it survived. This protocol is not cosmetic—several propositions congenial to the eventual thesis were downgraded or refuted by it and are reported as such (§10, §11.2), which is itself evidence that the procedure was applied in good faith rather than to confirm a prior.

2.2 Evidence classification

Because most cause evidence in this domain is administrative rather than experimental, I classify each factual claim by evidentiary status, following the logic of evidence-grading frameworks used in systematic review. The single most consequential distinction is between the **MEASURED**—a direct observation, instrument reading, or reproducible computation—and the **OFFICIALLY CODED**—an administrative classification produced by an institution operating under incentives, which is categorically not a measurement of the quantity it names. Further grades are **PEER-REVIEWED**, **DOCUMENTARY**, and **CONTESTED**. Grades are stated inline in §3–§10 and are integral to the argument: the central finding is precisely that a claim widely received as measured is in fact coded.

2.3 Documentary corpus and official statistics

The official statistical corpus comprised the Piano AIB regional plans (2020 update and 2023–2025 edition) and the provincial operational plans (POP AIB 2024) for Agrigento, Catania, Enna, and Palermo; the ARPA Sicilia environmental yearbooks (which republish the regional fire service series); ISPRA's national fire indicator (1970–2024) and its annual satellite-based reports; the EFFIS/JRC European annual reports; the parliamentary inquiry of the Sicilian Regional Assembly's Antimafia Commission; and Legambiente's annual fire dossiers. I extracted the published cause series directly from the source documents and recomputed all derived quantities (correlations, sums, per-event ratios) from the primary figures rather than relying on secondary summaries.

2.4 Independent satellite measurement (FIRMS)

I retrieved the complete NASA Fire Information for Resource Management System (FIRMS) active-fire archive for a bounding box enclosing Sicily and its immediate surrounds (longitude 12.30–15.75° E; latitude 36.55–38.40° N) for 11 January 2003 – 22 July 2026, using four products: MODIS (Terra/Aqua)

standard-processing; VIIRS Suomi-NPP standard-processing and near-real-time; and VIIRS NOAA-21 near-real-time. Retrieval returned 133,102 detections. Because the analytical logic requires vegetation fires only, I applied three cleaning steps. (i) Marine detections were removed by a point-in-polygon test against a coarse outline of the Sicilian landmass. (ii) Volcanic and static thermal sources were removed using the FIRMS type flag (0 = presumed vegetation fire; 1 = active volcano; 2 = other static land source; 3 = offshore); of the raw archive, 14.7% proved *not* to be vegetation fires, dominated by the persistent Mount Etna thermal anomaly—a confound that inflates any naïve “Sicilian fire” count derived from unfiltered FIRMS by roughly a sixth. (iii) A 12-km exclusion radius around the Etna summit removed residual edifice contamination, applied geometrically for the near-real-time products, which lack the type field. Low-confidence detections were dropped (MODIS confidence < 30; VIIRS nominal/high retained). The clean analytical set comprised **94,465 vegetation-fire detections**.

Detection times (UTC) were converted to Italian civil time (CEST, UTC+2; the fire season lies wholly within CEST). The analytical rationale is *signature discrimination*: distinct ignition mechanisms leave distinct fingerprints in the joint distribution of calendar date, day-of-week, local hour, location, radiative power, and event clustering—none of which depends on any official cause code. The decisive discriminator is day-of-week. Because the sun-synchronous satellite overpasses are indifferent to the weekday, any weekday structure in detections is a property of human ignition behaviour, not of observation; natural (lightning) ignition would be flat across weekdays. I tested weekday non-uniformity by χ^2 goodness-of-fit against a uniform expectation (and the weekend fraction by an exact binomial test against 2/7); trend by the non-parametric Mann–Kendall statistic with a Theil–Sen slope (appropriate for short, non-normal count series); and the difference between the Alessandria della Rocca day-of-year distribution and the rest of Sicily by two-sample Kolmogorov–Smirnov and Mann–Whitney tests. The full analysis pipeline is preserved and reproducible from the archived detection set; summary outputs are provided as Supplementary Data.

STATED LIMITATIONS OF THE SATELLITE METHOD

Three constraints bound every FIRMS-derived conclusion and I carry them explicitly rather than bury them. *First*, a detection is not an ignition: FIRMS records thermal anomalies at overpass, not fire starts. *Second*, MODIS and VIIRS have a minimum detectable fire size that systematically under-samples the small agricultural burns most central to the Sicilian question—so the archive, if anything, under-represents the agro-pastoral signal it nonetheless detects strongly; this biases the analysis *against* my own conclusion, making the strong signal conservative. *Third*, detection counts are not burned area and saturate on very large fires; I therefore use FIRMS for signature and count-trend only, and rely on the regional service's own burned-area series for the severity analysis (§9). Four 5-day windows in March–April 2010 (outside the fire season) failed to download and are absent; this affects no seasonal conclusion. I examined and discarded diurnal (hour-of-day) structure as unusable, because its apparent peaks are artefacts of overpass timing (Aqua ≈13:30, Terra ≈10:30, Suomi-NPP ≈13:25/01:25) rather than fire behaviour.

2.5 Comparative case selection

I selected twelve comparators to span the axes relevant to Sicily: Mediterranean island regimes with pastoralism (Sardinia, Corsica); high-reported-arson regimes (Galicia, southern mainland Italy); methodologically self-aware administrations that publish the internal structure of their cause codes (Spain, Portugal, France); the institutional counterfactual of Italian ordinary-statute regions that lost their own forestry corps to the Carabinieri in 2016–2017; and forensically-held-to-account systems outside the Mediterranean (California, Australia, Chile) for methodological contrast. For each I extracted the cause-attribution *method*—who determines cause, to what evidentiary standard, and how the

residual “unknown” category is handled—alongside the reported cause shares, because the comparison of methods, not of raw percentages, is what licenses inference about whether Sicily's number is a measurement.

2.6 Municipal case study

To test whether a Sicily-wide attribution describes a specific place, I reconstructed one interior comune of the province of Agrigento—Alessandria della Rocca (ISTAT code 084002)—at parcel level. Land cover was computed by clipping the ISPRA/Regione Siciliana *Carta Natura* (1:50,000) to the municipal boundary (100% coverage; computed boundary area 6,203 ha against an official 6,224 ha, a -0.3% agreement). The demographic trajectory was assembled from the ISTAT decennial census (1861–2021) and the continuous population register (2001–2026). The documentary fire record was assembled by exhaustive search of provincial, hyperlocal, and national outlets, the comune's own portal and transparency register, and the full news index. Agricultural burning practice and the statutory burning calendar were established from the regional and Agrigento provincial plans and the governing decrees, and cross-referenced against the FIRMS timing signature for the same territory.

3 Results I — The Official Assessment (Q1)

3.1 The regional doctrine

OFFICIALLY CODED. The Region's standing technical position is that Sicilian fires are almost entirely anthropogenic and predominantly deliberate. The sole published quantification is *Grafico 21* of the 2020 Piano AIB update—per-year shares of the *number* of fires, 2010–2020: deliberate falling from 91.5% (2010) to 67.1% (2020); “unclassifiable” (*non classificabili*) rising from 5.2% to 29.5%; negligent 2.0–7.1%; natural 0.1–1.3% [1]. The unweighted eleven-year mean of the deliberate series, 77.5%, is the origin of the “over 77% deliberate” figure recycled across Sicilian media and NGO discourse. The current 2023–2025 plan reproduces the identical 2010–2020 data with the percentage labels removed [2]; the November 2024 and December 2025 revisions left the causes chapter untouched. As of 2026, therefore, the Region's standing evidence base on *why* its territory burns is a fifteen-year-old chart.

3.2 The national frame excludes Sicily

OFFICIALLY CODED. The figures most often cited as authoritative for “Italy”—ISPRA's cause indicator (the source of the widely-quoted “53.9% deliberate”) and the Carabinieri's forest-fire reporting—carry an explicit restriction: they refer to *le sole Regioni a statuto ordinario* (ordinary-statute regions only) [7]. Sicily, a special-statute region with its own regional forestry corps, is structurally *excluded* from the national cause series. National cause statistics are therefore not evidence about Sicily at all, and their frequent transposition onto Sicily is a category error that inflates the apparent authority of the regional claim. This exclusion has held since cause statistics began in 1998 and is routinely overlooked.

3.3 The internal contradiction

The same 2023–2025 plan asserts three mutually incompatible primary causes in three different sections. Section 8.3 asserts the preponderance of deliberate ignition; section 8.4 states that “the climatic factor has a clearly preponderant influence on fires relative to the human one”; and section 9.5.1 states that “there is no doubt that the primary cause... is to be sought essentially in the high degree of abandonment and depopulation of the hill and mountain zones” [2]. A document that names arson, climate, and abandonment as *the* primary cause in three separate passages has not reached an

internal determination of cause; it has recorded three institutional intuitions and left them unreconciled. I return to this contradiction in §11.4, because the plan's own emergency decrees resolve it in a direction opposite to its press releases.

4 Results II — Construction of the Statistic

The decisive question is not whether arson occurs in Sicily—it does, and it is prosecuted—but whether the published *share* is a measurement of intent. Five independent lines of evidence, each verified against the primary documents, indicate that it is not.

4.1 A single, degrading, unlabelled series

OFFICIALLY CODED. Grafico 21 is the only cause-distribution graphic in a 214-page document; its numbering skips from 21 to 23 (there is no Grafico 22); its data end in 2020; and its percentage labels are no longer printed in the operative plan [1,2].

4.2 The two headline categories behave as one pool

MEASURED. Across the eleven published years, the “deliberate” and “unclassifiable” series are near-perfectly anticorrelated (Pearson $r = -0.9890$), and their sum is a near-constant $96.08 \pm 1.41\%$ (range 5.4 points, against 24.5 points for the deliberate series alone). The split shifts 15–17 percentage points precisely at the 2014–2015 boundary at which the AteSO recording system was constructed and the ASTUTO system entered service. The widely-cited narrative—“arson is declining, unknown causes are rising six-fold”—is therefore, on the arithmetic, a *reclassification at a change of recording software*, not a change in behaviour: the two boxes are trading contents while their total stays fixed. This inference is corroborated independently by Márquez Torres and colleagues, who concluded of the same trend that “we cannot be confident that this trend is real” [12]. Figure 1 displays the relationship.

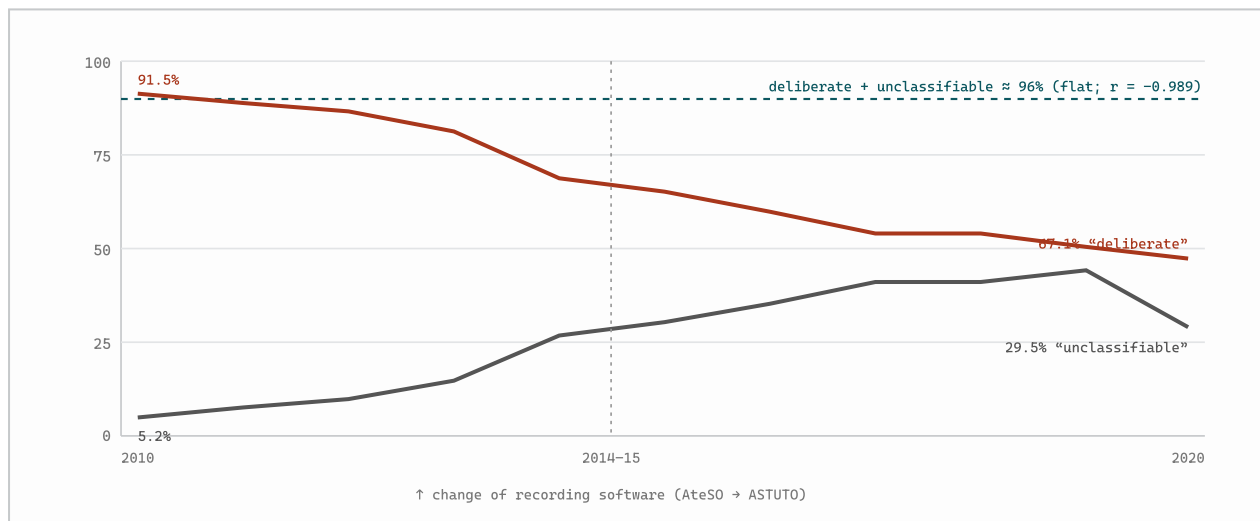


Figure 1. The reported decline in “deliberate” fires is mirrored almost exactly by a rise in “unclassifiable,” their sum remaining flat and their split discontinuous at the recording-system change—the arithmetic signature of reclassification rather than behavioural change. **Source:** Piano AIB 2020, Grafico 21 [1]; correlation computed by the author.

4.3 The producing administration disowned its own coding

DOCUMENTARY. Assessore Toto Cordaro testified to the Sicilian Regional Assembly's Antimafia Commission that summer 2021's ratio of 494 deliberate to 21 negligent fires was “a proportion absolutely unconnected to reality,” because the officer compiling the report, uncertain between deliberate and negligent, “prefers to ascribe it to the deliberate offence, because he believes that in doing so there will

be a more penetrating investigation” [3]. This is not an external critic but the responsible member of the regional executive, describing an up-coding incentive built into the recording practice, seventeen months before the plan that relies on that practice was finalised.

4.4 The taxonomy files identical acts under both headings

OFFICIALLY CODED. In the plan's own definitions, the burning of stubble appears under *both* “negligent” causes (“the burning of stubble, the cleaning of cultivated fields”) and “deliberate” causes (“burning of agricultural residues such as stubble and scrub, to clean the ground before sowing”) [2]. The Agrigento provincial plan names stubble burning adjacent to woodland “the principal cause of forest fire” in the province while conceding, in the same document, that the practice is “difficult to classify as negligent or deliberate” [4]. The coded category “deliberate” therefore does not mean what the public register takes it to mean; the equation of “deliberate” with “criminal arson” is a definitional error embedded in the reception of the statistic.

4.5 The justice system does not corroborate the attributed volume

OFFICIALLY CODED. For 2025, Sicily recorded 654 fires, 376 offences, 6 denunciations, and zero arrests—one denunciation per 110 fires [9]. Across 2015–2026 I identified three first-instance arson convictions in Sicily (Bosco di Casaboli, Monreale, 2025; Capo Gallo, Palermo, 2026; a Taormina case with a pasture-sale motive, 2025), all resting on closed-circuit television, telephone intercepts, or self-recorded video—*none* on fire-scene origin-and-cause forensics. Prosecutors reject the organised-crime framing: Palermo's chief prosecutor characterised the notion of Cosa Nostra directing the fires as “a suggestion,” and framed the damage as “the downstream result of a chain of failures and omissions by those who should tend the territory” [10]. I treat this line as *corroborative rather than decisive*, for the reason developed at §11.2: a conviction and a cause-classification are different objects, and arson is a low-clearance offence everywhere.

ADJUDICATION OF THE CONSTRUCTION FINDING

The strongest objection to the artefact reading is that “unclassifiable” is a genuine, separate residual category, not a crude default, so the crude form of the claim (“unknowns are simply relabelled deliberate”) is too strong. I accept this at the level of category definition; it does not rescue the statistic. The residual category exists *and* the boundary dividing it from “deliberate” is unstable, moves with the recording system, and is drawn by the same agency that fights the fire, without independent adjudication, under an up-coding incentive its own minister has described. That is an administrative artefact by any reasonable definition. **Finding: the official cause breakdown is not a measurement of intent. Evidentiary confidence: high.**

5 Results III — Independent Satellite Measurement

5.1 No secular trend in ignition counts

MEASURED. Sicilian fire activity across 23 years is episodic, not trending. The Mann–Kendall test on the methodologically consistent MODIS series (2003–2025) returns $z = -0.37$ ($p = 0.71$); the VIIRS series (2013–2025) returns $z = +0.55$ ($p = 0.58$). Activity is dominated by extreme years (2007, 2012, 2021, 2023) standing against quiet years (2015, 2018, 2024), with no monotonic climb (Figure 2). This is the fingerprint of a weather-gated system rather than a rising supply of ignitions. The absence of a *count* trend is fully compatible with the documented rise in burned-*area* severity, because severity is a spread phenomenon (§9)—a distinction the official framing, which indexes on ignition, does not draw.

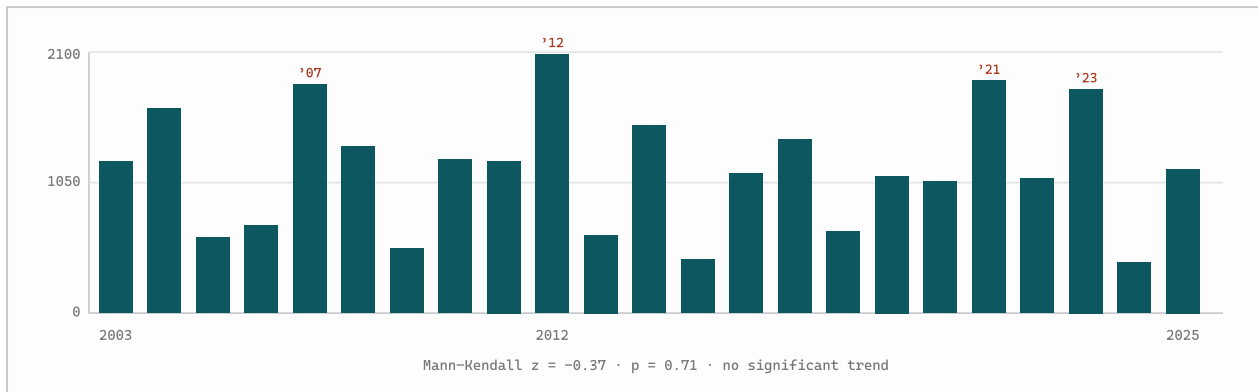


Figure 2. Annual MODIS vegetation-fire detections over Sicily, Etna-excluded, 2003–2025. Activity is episodic, dominated by extreme fire-weather years, with no secular trend in ignition counts. **Source:** NASA FIRMS MODIS standard-processing; analysis by the author.

5.2 Human ignition, with a signature that is not criminal

MEASURED. The Sicilian summer weekday distribution is overwhelmingly non-uniform (χ^2 , $p \approx 1.7 \times 10^{-108}$). Under the overpass-invariance argument this is decisive proof of anthropogenic ignition, because lightning would be flat. The *shape*, however, is diagnostic against the criminal-arson reading. The signal peaks on Sunday (index 1.15) and troughs mid-week (Wednesday 0.87), and the summer weekend share is 31.2% (95% CI 30.9–31.5%) against a 28.6% null (exact binomial $p \approx 9 \times 10^{-60}$). A Sunday-peaked, weekend-loaded pattern is the signature of discretionary, non-professional land use; it is not the weekday-heavy pattern that salaried agricultural or forestry labour would produce, and it is not a pattern one would predict for a coordinated criminal campaign. Moreover, the winter distribution inverts entirely (Tuesday 1.37; Saturday 0.77), consistent with a second, professional ignition population—plausibly the burning of pruning residues—operating on a working-week rhythm. Two distinct human fire economies are visible in the data; neither resembles organised arson (Figure 3). The same weekday structure holds, at greater amplitude, in the Alessandria della Rocca district (Sunday index 1.29; amplitude 56%; χ^2 , $p \approx 2 \times 10^{-20}$).

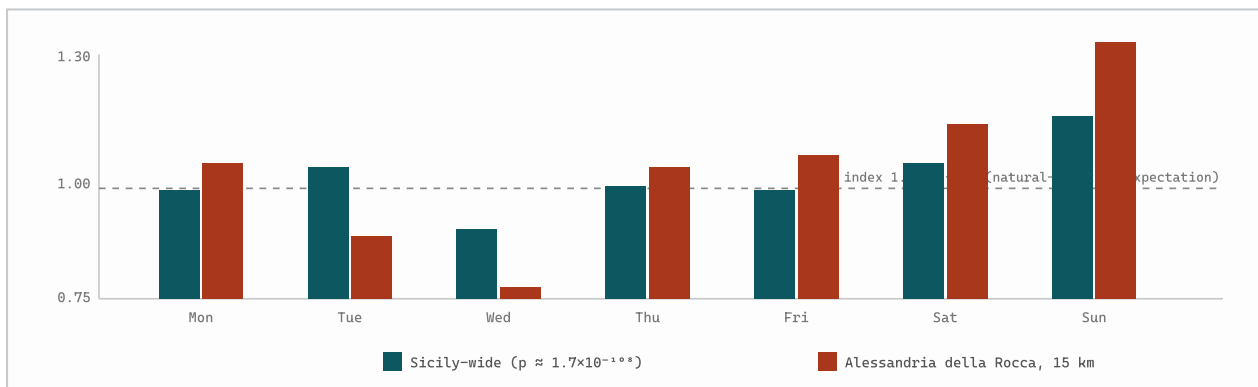


Figure 3. Summer fire detections by weekday, indexed to a uniform expectation. Both Sicily-wide and the Alessandria della Rocca district peak on Sunday and trough mid-week. Under overpass-invariance this is decisive evidence of human ignition, but the weekend-loaded shape is inconsistent with professional agricultural labour and with organised arson alike. **Source:** NASA FIRMS MODIS + VIIRS, June–September, Etna-excluded; analysis by the author.

5.3 Seasonality and the harvest calendar

MEASURED. The Alessandria della Rocca district is a statistically distinct fire regime from the island as a whole (two-sample Kolmogorov–Smirnov $D = 0.162$, $p \approx 1.0 \times 10^{-97}$; Mann–Whitney $p \approx 6.9 \times 10^{-60}$). Its season begins about three weeks later—10th-percentile day-of-year 5 July versus 16 June island-wide

—with the sharpest ten-day rise in the 10–20 July window, and it has almost no winter fire (0.8% versus 4.1% island-wide). Figure 4 shows the ten-day block structure: the district's activity is compressed into and immediately after mid-July, exactly when the interior durum-wheat harvest at ~700 m elevation is cut and stubble burning follows. I develop the significance of this collision in §8.4.

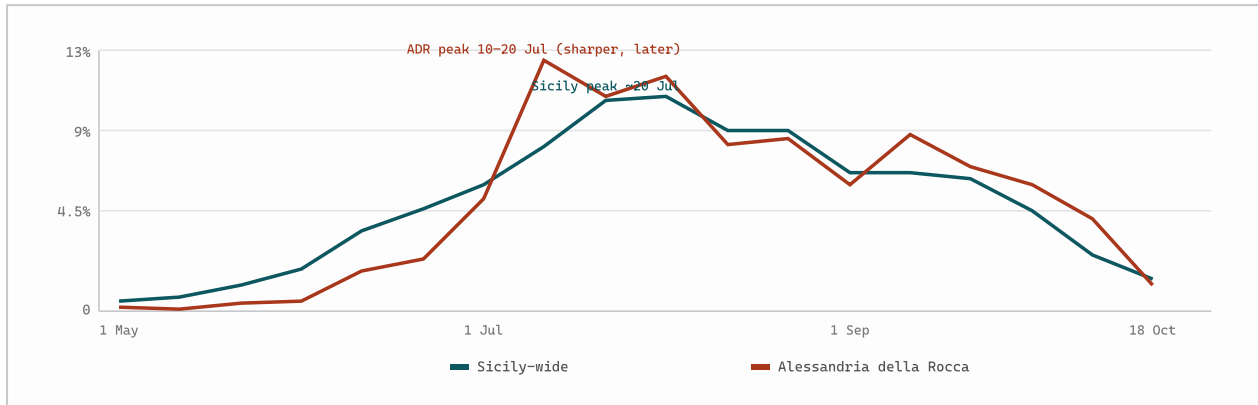


Figure 4. Ten-day block share of annual detections, May–October. The Alessandria della Rocca district's season is shifted roughly three weeks later than the island average and is more sharply peaked in mid-July, tracking the late interior grain harvest and the stubble burning that follows it. **Source:** NASA FIRMS MODIS + VIIRS, Etna-excluded; analysis by the author.

5.4 Fire radiative power

MEASURED. Fire radiative power (FRP) discriminates small, cool field fires from energetic forest runs. Alessandria della Rocca fires are small: median FRP 7.75 MW, with 59% of detections below 10 MW, against a Sicilian maximum of 2,450 MW. The island-wide median is 6.98 MW with 63% below 10 MW. This is the radiative signature of an agro-pastoral fire load, not of a forest-crown regime, and it is consistent across the district and the region.

5.5 Event structure and a contemporaneous validation

MEASURED. Daily detection clustering shows the expected concentration of activity onto a small number of extreme fire days (the top 1% of active days carry ~14% of Sicilian detections), consistent with a weather-gated regime in which most of the burned area is produced on a handful of days. As a within-window validation of the district signal, the FIRMS record during compilation showed a record-breaking episode at Alessandria della Rocca: 19 July 2026 produced 93 detections within 15 km—the highest single day in the district's 23-year record—21 July produced 65 (second highest), and the fire was still active through the night of 22 July (detections at 01:07 and 02:34 local; peak 542 MW). Night-time burning in fuel, at high radiative power, indicates a sustained wildfire rather than a smouldering stubble escape, and the event is independently corroborated by local reporting of the 20–21 July fire at Bivona, 6 km distant. The event is noted as a real-time instantiation of the mid-July district onset identified in §5.3, not as evidence for the analytical thesis.

6 Results IV — The Historical Fire Regime, 1950–2026

The official framing presents the arson attribution as a timeless truth about Sicilian character. A decadal reconstruction shows instead that the modern fire problem, and the arson framing itself, have datable origins in twentieth-century landscape change and in the construction of the recording apparatus—and that no cause series predates the institutions that produce it.

6.1 1950–1970: the reforestation era, with no fire record

DOCUMENTARY. This period is statistically unreconstructable: the Italian national forest-fire series begins only in 1970, and no earlier national or Sicilian dataset was retrievable. Two structural facts are nonetheless documented. First, the Sicilian forest estate was at its historical minimum—about 85,000 ha in 1947—and was then roughly tripled by state reforestation to approximately 198,000 ha by 1997, predominantly with flammable exotic and coniferous species. Second, no cause-recording body existed: the Corpo Forestale della Regione Siciliana was created only by regional law in 1972, and the regional forest-fire service only in 1974. There was, in this period, no institution whose task was to assign a cause code; cause attribution for the era does not exist as a record type. Any statement about the “traditional” causes of Sicilian fire before 1970 is therefore inference from land-use history, not measurement.

6.2 1970–1990: depopulation, plantation maturation, and the rise in burned area

OFFICIALLY CODED. At the national level (the finest available for this period), burned area rose from a 1970s decadal mean of 87,009 ha/yr to a 1980s mean of 147,150 ha/yr (+69%), and fire counts from 6,426 to 11,575/yr (+80%); 1981 set the period's area maximum (229,850 ha) and 1985 the series' fire-count maximum. No cause breakdown for Sicily or Italy was published for any year in this period. What changed materially was the landscape: the post-war conifer and eucalyptus plantations matured into continuous flammable fuel exactly as the rural interior began to empty of the people and animals that had kept fuel loads low. This is the period in which the modern regime was seeded, and it is invisible to any cause statistic because none existed.

6.3 1990–2010: the arson framing consolidates as the record deepens

OFFICIALLY CODED. A complete annual Sicilian series exists from this period (regional fire service, republished by ARPA). It shows fire counts tripling relative to the 1986–1989 baseline while *mean fire size fell* from 38.9 ha to 21.7 ha—the arithmetic signature not of a worsening fire behaviour but of a recording system reaching progressively further down into small events. Cause was assigned administratively, at the time of the intervention report, into five boxes (deliberate, negligent, doubtful, accidental, natural), with no evidence in the record that assignment required a criminal investigation or a physical origin-and-cause determination. It is in this period, as the national “piromani” discourse rose, that the deliberate framing consolidated as the Sicilian default. Critically, the underlying method did not change when the narrative did: the framing hardened while the evidentiary basis remained an administrative code.

6.4 2010–2026: the satellite era and the catastrophe years

MEASURED. From 2010 the regional SIF/ASTUTO systems and independent satellite mapping (EFFIS/ISPRA) provide parallel series. The step change to a high-fire regime is dated by the regional service's own long series to the late 1990s and 2000s—*before* 2010—after which activity oscillates at an elevated level. The defining feature of 2020–2026 is a shortened recurrence interval between multi-tens-of-thousands-of-hectares seasons: 2021 (Sicily ~500 fires, roughly 75% of the national count, ~12% of regional forest cover burned) and 2023 (the Palermo firestorm) against quieter intervening years. The measured burned-area series confirm severity is rising even as ignition counts do not trend (§5.1)—the diagnostic of a system in which the binding constraint is spread, not ignition supply.

HISTORICAL SYNTHESIS

The evidence supports a change in *landscape and climate* with human ignition behaviour approximately constant, not a change in human *intent*. The modern regime is the product of twentieth-century reforestation with flammable species followed by rural depopulation and the collapse of grazing; the arson framing is a discourse that consolidated in the 1990s–2000s over an unchanged administrative method. There is no cause series against which to test the proposition that Sicilians became more criminally incendiary, because no cause series predates the apparatus that produces the claim. Confidence: high on the landscape trajectory; the intent-constancy is an inference the data are consistent with rather than a measurement.

7 Results V — Comparative Cause Attribution

Placing Sicily's number beside other regimes and their attribution methods is the strongest available external test, because it holds the phenomenon roughly fixed and varies the coding institution. Doing so shows the “deliberate” share tracking two things—the size of the “unknown” residual and where it is administratively forced, and whether the classification scheme even contains an agro-pastoral category—far more tightly than it tracks any measurable difference in behaviour (Table 1).

Table 1. Reported “deliberate” shares and the handling of the unknown-cause residual across Mediterranean and analogue fire-attribution systems. All shares are officially coded unless noted. **Sources:** [1–4,9,12,13] and the issuing bodies named below (Sardinia CFVA; Galicia/Spain MITECO EGIF; Greece OECD/GFMC; Corsica Prométhée and ODARC; Portugal AGIF/ICNF; Aragón; southern-Italy CFS/Carabinieri series).

REGION	REPORTED “DELIBERATE” SHARE	UNKNOWN RESIDUAL	DIAGNOSTIC FEATURE
Sicily	~77% (2010–20 mean); 95–98% politically	5→30% (rising)	Deliberate + unknown fixed at 96%; minister repudiated it; 3 forensic-free convictions in 11 yr
Sardinia (closest structural analogue)	68.4% of <i>investigated</i> fires	—	79.3% of “deliberate” fires have no determined motive. Coded pastoral burning only 4.2%; pyromania 2.0%
Galicia	81% intentional	—	Only 18–31% forensically corroborated (“causa cierta”); ~2% with an identified perpetrator; 60% of intentional fires have unknown motive
S. mainland Italy (ordinary-statute)	53.9% deliberate (2024)	26–30%	Institutional counterfactual to Sicily—lower share, larger honest residual, different corps
Puglia (2001)	54.1% deliberate	2.0%	A ~2% unknown residual is not credible for any fire service
Basilicata (2021–23)	“the remaining 49% is certainly of deliberate origin”	~35% “doubtful”	Residual-as-certainty, stated verbatim in the plan
Aragón (2005–25)	18% of fires · 4% of burned area	—	Lightning ignites <i>more</i> fires (21%) than arson; deliberate ignition near-irrelevant to area
Greece (1984–2009)	12% arson	57%	When the residual is kept honest, the deliberate share is modest
Corsica (Prométhée)	arson 32% (S) vs 66% (N)	~70% “cause inconnue”	An independent pastoral database (ODARC) finds 15–36% pastoral ignition—a category Prométhée does not contain
Portugal (2025)	arson 38% of determined / 24% of all	coded by <i>why</i> determination failed	Lightning produced 32% of burned area from 1–2% of ignitions

The mechanism is legible in the residual column. Where the unknown fraction is preserved honestly—Greece (57%), Corsica (~70% *cause inconnue*)—the deliberate share is modest (12–32%). Where the residual is administratively suppressed—Puglia's 2%, Basilicata's “49% certainly deliberate”—the deliberate share balloons. Sicily sits at the ballooned end, with a residual that is both large and, by the arithmetic of §4.2, fungible with the deliberate category.

OFFICIALLY CODED. Two comparisons are decisive because they hold the most confounders fixed. *Sardinia* is a large Mediterranean island with pastoralism and, like Sicily, its own regional forestry corps and its own recording system—the nearest available mirror. It codes most investigated fires “deliberate” and then records that 79.3% of those have *no determined motive whatsoever*, with coded pastoral burning at 4.2% and pyromania at 2.0%. A category that is four-fifths motiveless is a residual box wearing the label “deliberate,” not a finding of intent. *Southern mainland Italy* (Calabria, Campania, Puglia, Basilicata) is the institutional counterfactual within the same country: as ordinary-statute regions they lost their own forestry corps to the Carabinieri in 2016–2017 and their statistics are produced by a different chain than Sicily's. They report a materially lower deliberate share (53.9% in 2024) and a larger, more honest unknown residual—a difference in institution, not in the underlying Mediterranean fire behaviour they share with Sicily. *Corsica* demonstrates the missing-category effect directly: its national database (Prométhée) has no pastoral cause code and records ~70% “unknown,” while an independent agricultural database (ODARC) covering the same fires finds pastoral ignition at 15–36%. The cause a scheme lacks a box for is the cause it cannot see.

VERIFIED PROPOSITION · CONFIDENCE HIGH

“Official Mediterranean wildfire cause statistics are administrative codings rather than forensic determinations, and their deliberate-ignition shares are therefore not reliable measurements of intent.” This survived the disconfirmation protocol. The strongest counter—that forensic origin-and-cause determination has its own measured reliability problems (poor inter-rater reliability, negative-corpus reasoning, documented wrongful attributions), so the contrast class is not a gold standard, and that a genuinely high true-deliberate share is logically compatible with near-zero convictions—is accepted (§11.2) and does not rescue the Sicilian figure, because the Sicilian figure is not even a forensic determination to begin with; it is an administrative code produced without origin-and-cause investigation.

8 Results VI — The Alessandria della Rocca Case Study

8.1 The regional story is a forest story; the ground is farmland

MEASURED. Clipped to the municipal boundary, Alessandria della Rocca is 78.6% agricultural land, 14.7% dry grassland/steppe, and only 2.6% woodland-plus-plantation of any kind (native oak 0.76%, or 47 ha; conifer plantation 0.52%, or 32 ha). There is no Natura 2000 site in the comune; the nearest reserve (Monte Cammarata, 2,049 ha) lies in the adjacent communes and does not touch it; the comune was never within the (subsequently abolished) Sicani park. The mountains-and-oak-woods framing the regional plan applies to “the Sicani” does not describe this place, and the province agrees: Agrigento is 69% agricultural, 19% pasture/uncultivated, and 8% forest—the least wooded province in the regional inventory [2]. ISPRA's satellite land-cover breakdown of Sicily's 2024 burned area independently confirms the pattern: 36% of the burned area was agricultural, with forest a minority class [6].

8.2 A comune in terminal demographic withdrawal

OFFICIALLY CODED. Alessandria della Rocca peaked at 6,408 inhabitants at the 1951 census and stood at 2,301 on 1 January 2026—a loss of 64.1%; the seven-comune Sicani cluster fell 57% over the same span. The modern phase is not principally emigration: over 2002–2024, natural decrease (–662) and net internal out-migration split the loss in roughly equal measure, with cumulative births (441) less than half of deaths (1,103), and internal cancellations (1,218 to other Italian comuni) far exceeding those abroad (271). Land abandonment—the leading structural alternative to the arson framing—is

here not asserted but counted, and it leaves grass and unmanaged former field as continuous, cured fuel through the summer.

8.3 The fire record is an absence, and cause is unpublished below the region

DOCUMENTARY. Exhaustive search recovered exactly two vegetation fires inside the comune across 2009–July 2026 (a roadside fire in September 2014; a woodland fire in April 2024, locally judged “almost certainly deliberate”), neither with a published burned area, against a background of structural, vehicular, and waste fires. There is no published fire cadastre (*catasto delle aree percorse dal fuoco*) for the comune, though Law 353/2000 art. 10 requires one [23]. This absence is itself the central finding for the geographic question: **fire cause is not published anywhere below the regional level in the Sicilian system.** The provincial plans generate a false appearance of local knowledge—Agrigento, Enna, Caltanissetta, and Palermo each carry a word-for-word identical sentence attributing ignition “primarily to deliberate origin,” then present municipal tables with no cause column at all [4]. There is, in consequence, no official evidentiary basis for any statement about why fire occurs in Alessandria della Rocca, or in any specific Sicilian comune—including the statements the provincial plans themselves make.

8.4 The calendar collision

OFFICIALLY CODED. Sicilian law fixes the high-risk period, and with it an absolute prohibition on agricultural burning, from mid-June (from 15 May in 2025) [4,24]. But the interior grain at this altitude is cut *last*, in mid-to-late July, deep within the ban. Stubble burning here is therefore compressed into either illegal timing or a narrow pre-ban window—and the FIRMS record shows exactly the resulting compression: a sharp 10–20 July onset (Figure 4), with the record-breaking July 2026 episode landing precisely on the late interior harvest (§5.5). The mechanism the regional and provincial plans themselves name as principal—escaped stubble burning—is the mechanism the independent satellite timing fingerprints. To a first approximation, what the official system codes as the province’s “deliberate” fires and what the calendar-plus-satellite evidence identifies as escaped harvest burning are the same fires under two names.

9 Results VII — Spread, Severity, and the Climate Dimension

9.1 Burned area is spread-limited, not ignition-limited

MEASURED. The regional service’s own two independent series settle the ignition-versus-spread decomposition almost by themselves. In 2021 Sicily had 978 fires and 59,872 ha burned (61 ha per fire); in 2022, *more* fires (1,083) but 24,561 ha (23 ha per fire), less than half the area. The ground series repeats it: 2015 had 831 fires and 6,777 ha; 2016 had 1,014 fires and 27,928 ha—count up 22%, area up 312%. Burned-area variance is therefore governed by the conditional probability that a start becomes large, not by the supply of starts. This is the central quantitative fact that an ignition-focused official framing systematically neglects: reducing ignitions, even substantially, would produce a smaller reduction in the disaster than the framing implies.

9.2 The drivers of spread

Ranked by defensible contribution to the conditional probability of a large fire: *fire weather* **PEER-REVIEWED, MODERATE**—the WMO-verified European record of 48.8 °C near Siracusa on 11 August 2021 [17], documented regional warming, and Mediterranean burned area reproduced from drought indices

at $r \approx 0.68$ in the best available cross-validated model [14], though that model is not Sicily-specific; *simultaneous-ignition saturation of a capped aerial fleet* DOCUMENTARY, MODERATE—380 events on a single July 2025 day against roughly ten regional helicopters and a handful of aircraft; *grass and agro-pastoral fuel continuity from abandonment* CONTESTED—the coherent reading is fewer ignitions but larger spread, though a Sardinian study found abandonment *reduced* ignition probability while raising fuel load [19]; and *state-authored 20th-century conifer plantation structure* HIGH, NARROW—burning at roughly double the rate of Sicilian woodland overall, but confined to severity on the ~8% of the burned surface that is forest. The most-invoked driver, the scirocco wind, is the least evidenced: no peer-reviewed study links scirocco episodes to Sicilian fire days, and no detection-to-arrival latency figure exists anywhere in the evidence base, despite being the mechanism on which the dominant evening-ignition thesis depends.

9.3 What climate attribution can and cannot support

PEER-REVIEWED. The climate dimension must be stated carefully, because it is frequently over-claimed in both directions. Fire-weather severity has risen: extreme fire-weather days increased across much of the globe over 1980–2023 with a detectable anthropogenic fingerprint. But the specific proposition that anthropogenic climate change is *sufficient to explain a substantial share of the observed change in Sicilian burned area without invoking any change in ignition* is, on the evidence, only weakly supported. No published study partitions Sicilian burned-area variance into weather, fuel, ignition, and suppression components; at least one analysis reports statistically significant *negative* trends in extreme fire-weather indices over Italy specifically; and a 2024 European assessment located the extra extreme-danger days of a severe year over Spain, the Balkans, and Greece rather than Italy, in a season Sicily nonetheless burned heavily. The defensible statement is that climate has raised the *ceiling* on Sicilian fire weather and thereby the probability of the extreme spread days that dominate burned area, but that the attribution of Sicilian burned-area variance specifically to climate—as opposed to fuel accumulation from abandonment and suppression saturation—has not been measured. Crucially, none of these spread drivers is an ignition mechanism, so none competes with the human-ignition finding of §5; they operate on the conditional probability of spread, which is where the disaster is actually made.

10 Results VIII — Mitigation Effectiveness

Interventions graded by strength of measured effect, rather than by prominence, show a consistent inversion: the strongest-evidenced levers are the least funded, and the most funded are the least evidenced (Table 2). I record two honest negatives returned by the disconfirmation protocol rather than suppress them. First, the proposition that prescribed burning at the scale Sicily could realistically achieve would measurably reduce burned area was *refuted*: Sicily operates no such programme, and the treatment fraction of the landscape required to move outcomes is not attainable here. Second, the recurrent claim that Sicily's seasonal fire-fighting employment creates a perverse ignition incentive was found to be widely asserted but never rigorously tested anywhere; it is neither confirmed nor refuted and should be labelled unexamined rather than deployed as fact by any side.

Table 2. Wildfire mitigation levers graded by strength of measured effect and applicability to Sicily.

INTERVENTION	EVIDENCE	FINDING FOR SICILY
Early detection → rapid initial attack	strong (elsewhere)	Highest-leverage lever internationally; the Sicilian detection gap is real (satellites miss the small fires; ~200 lookout towers already supply 71% of reports). Directly relevant to a ground-sensor programme.
Fuel & abandoned-land management; extensive grazing	moderate	The mechanism that fits the actual (grass/agro-pastoral, spread-limited) regime. Supported but under-deployed.
Lookout towers (retain/modernise)	demonstrated	71% of 2017–21 reports from tower personnel vs 17% from the citizen line. Cheap, working.
Prescribed burning	refuted at achievable scale	Honest negative: refuted at the scale Sicily could realistically reach.
Aerial suppression	weak vs prominence	Expensive and central; independent effectiveness evidence thinner than budget share; availability collapses on peak-demand days.
Surveillance-for-attribution (drones, mapping)	failed on its own terms	~€290k of drones identified 3 perpetrators in 3 years; a €36.4m EU surveillance grant lost to an unqualified bidder (Corte dei Conti).
Penalty escalation / organised-crime framing	unsupported	293 arrests on 117,509 national offences over 24 years; the mafia thesis is rejected by the prosecutors who would prove it [10].
Fire cadastre (Law 353/2000 art. 10)	design flaw + non-compliance	Penalises <i>changing</i> land use while the plan ranks pasture renewal first among deliberate motives, so a pasture-motivated igniter is undeterred; >1/3 of comuni non-compliant; ~41% of 2010–22 burned area in non-compliant comuni [11].

11 Discussion

11.1 The strongest case for the official assessment

Sound critique requires that the position under examination be stated at its strongest before it is contested. The official assessment admits a serious defence, which I set out here without dilution.

THE CASE FOR “PREDOMINANTLY DELIBERATE”

First, human causation is not in dispute and is very high. Natural ignition in Sicily is genuinely rare: the summer-drought lightning climatology is unfavourable to ignition, and both the official record and my independent satellite analysis agree that essentially all Sicilian fires are anthropogenic. On the human/natural axis the official assessment is simply correct.

Second, deliberate ignition is real, prosecutable, and repeatedly documented. The Sicilian convictions of 2015–2026 concern genuinely set fires, one with a pasture-sale motive; intentional ignition to convert forest to arable or pasture, to clear ground, or from grievance is attested across the Mediterranean and is not a fiction.

Third, and most importantly, the conviction gap is a weak refutation. Arson is intrinsically the hardest fire cause to establish: the evidence is consumed by the fire, discovery is delayed, ignition points are destroyed by suppression, and remote terrain yields no witnesses. Clearance rates for wildfire arson are low *everywhere*, including in jurisdictions with strong forensic systems (empirical F1 for arson classification of ~ 0.64 against ~ 0.87 for lightning in one Mediterranean-France study). A genuinely high deliberate-ignition share is therefore fully compatible with a near-zero conviction rate, and treating the small number of convictions as evidence against the classification commits a category error: a classification is about fire events and physical evidence, while a conviction is about a person proven guilty beyond reasonable doubt.

Fourth, the officers who assign cause are on the fire ground and observe physical indicators—ignition points, the absence of natural or infrastructural vectors, multiple simultaneous origins—that a distant analyst does not. Their aggregate judgement is not nothing, and it is the product of institutional experience.

11.2 Why the evidence does not support the conclusion

Each element of the steelman is answered by the evidence, and the answers converge on the same verdict.

On the first point, I concede it and separate it out. “Sicilian fires are human-ignited” is true, and independently confirmed at overwhelming significance (Figure 3). But it is nearly uninformative for policy, because it does not distinguish an arsonist from a farmer whose stubble fire escaped. The load-bearing claim is not “human” but “deliberate, criminal,” and it is that claim my analysis contests. Preserving this distinction is essential and is exactly what the public conflation of “77% deliberate” with “77% criminal arson” elides.

On the third point, I accept the logic, which is precisely why I do not lean on it. The steelman’s strongest move—that the conviction gap cannot refute the coding—is correct, and I have therefore treated the

judicial record as corroborative rather than decisive throughout (§4.5). My refutation does not rest on the arrest count. It rests on the *construction* evidence: the $r = -0.989$ anticorrelation and the fixed 96% sum (Figure 1), which show the “deliberate” and “unknown” series to be one administrative pool; the 15–17-point discontinuity at the software change, which shows the celebrated trend to be a recording artefact; and the responsible minister's on-record statement that the coding is “absolutely unconnected to reality” and that officers up-code to “deliberate” to unlock investigation. None of these depends on any conviction rate. A coding that its own producing minister disowns, whose two largest categories are anticorrelated at -0.989 , and whose movement coincides with a change of software, is not a measurement of intent regardless of how hard arson is to prosecute.

On the fourth point, the comparative record shows the officers' aggregate judgement to be convention, not measurement. If on-the-ground cause assignment tracked real intent, the deliberate share would vary across jurisdictions with behaviour. Instead it varies with classification convention (Table 1): it balloons where the unknown residual is administratively suppressed (Puglia 2%; Basilicata's “49% certainly deliberate”) and collapses where the residual is kept honest (Greece 57%; Corsica 70%). Sardinia—the closest structural analogue, with the same island geography, pastoralism, and regional-corps institution—codes most investigated fires deliberate and then records that 79% of those have *no determined motive*. A category that is mostly motiveless is a residual box wearing the label “deliberate.” And the specific physical indicator the steelman invokes—multiple simultaneous origins as proof of arson—is itself unreliable under extreme fire weather, where long-range spotting produces the identical signature; this is a documented forensic hazard, not a settled indicator.

The positive account the evidence supports. The independent satellite signature (a Sunday-peaked, weekend-loaded weekday structure; small radiative power; a season tracking the interior harvest calendar), the parcel-level land cover (2.6% woodland; 84% of regional burn non-forest), the measured demographic collapse, the decadal landscape history, and the region's own provincial plans (“escaped stubble burning... the principal cause... difficult to classify as negligent or deliberate”) converge on a coherent and different regime: an **agro-pastoral burning regime on grass and abandoned land, on a depopulating interior, weather-gated into catastrophe**. In this account ignition supply is human, chronic, and largely non-criminal; the disaster is manufactured by fire weather, fuel accumulation, and a saturated suppression system converting ordinary starts into extraordinary areas. The identity of the igniter is a second-order determinant of the outcome.

11.3 Epistemic verdict: knowledge versus convention

The two halves of “human-caused” bear very different epistemic weight. “Human-ignited” is knowledge—supported by the official record, by comparative lightning climatology, and decisively and independently by the satellite weekday signature (high confidence). The one honest qualification is that the near-zero *natural* share is itself probably a modest underestimate, because holdover and dry-lightning ignition are barely investigated in Italy and a lightning fire that smoulders for a day before flaming would rarely be recognised as such; but not by enough to overturn the human-dominant conclusion. “Deliberate, in the criminal sense” is convention—a residual-driven administrative code, not a forensic finding; it disagrees with independent inference wherever both exist; it bundles genuinely ambiguous agro-pastoral burning into a criminal box; and it varies cross-nationally with classification practice rather than behaviour. I hold high confidence that this attribution is not a measurement, and medium confidence on the exact share of Sicilian fire that is escaped agro-pastoral burning versus true malicious ignition, because no one has measured it—a candour the official framing does not extend.

11.4 The political economy of attribution

Was the arson framing a *convenient* answer? The comparative and political-science record documents a real and repeated pattern of states over-attributing wildfire to deliberate criminal ignition in the immediate aftermath of catastrophe—cases in which prominent official arson claims were not subsequently substantiated by investigation are documented for the 2019–20 Australian season, for ministerial statements in Greece and Algeria, and elsewhere. It is not necessary to allege bad faith to observe that Sicily fits this pattern. The incentive structure and the classification convention together produce the outcome without anyone deciding to deceive: an anonymous criminal is a cause that externalises responsibility away from land management, prevention budgets, workforce policy, and detection failure, and the residual-suppressing, up-coding recording practice does the rest. The effect, whatever the intent, is that a landscape-and-climate emergency is administratively re-described as a policing problem—and the remedies follow the misdescription. Tellingly, the Region's own emergency *decrees*, unlike its press releases, attribute the catastrophe years to “exceptional meteo-climatic conditions” and heat, stating no cause of ignition at all—the internal contradiction of §3.3, resolved by the legal instruments in the direction opposite to the public register.

11.5 Policy implications

If the analysis is correct, the highest-leverage, evidence-supported interventions for Sicily are those aimed at the spread and detection of a fundamentally agro-pastoral fire load: early detection and rapid initial attack (the lever most relevant to a ground-sensor programme, given the satellite detection floor); fuel and abandoned-land management and extensive grazing; retention and modernisation of the lookout network; and a campaign start aligned to the interior harvest rather than to a calendar that criminalises the last weeks of the grain cut. A first, near-costless administrative reform would be to publish cause at sub-regional resolution, with an honestly maintained “undetermined” category and a distinct, non-criminal class for escaped agricultural burning, so that the central statistic could begin to function as a measurement rather than a convention. The instruments on which prominence and spending currently concentrate—surveillance-for-attribution, penalty escalation, and the pursuit of an organised-crime network—are precisely those the evidence does not support.

12 How This Analysis Could Be Refuted or Corroborated

A defensible conclusion must specify what would overturn it. The thesis of this paper—that Sicilian fire is overwhelmingly human but not predominantly criminal, and that the disaster is spread-limited—is falsifiable, and the confirmatory and refutational studies are, for the most part, executable with existing open data. I set out the refutation conditions, the corroborating data points, the single decisive experiment, and the instruments required.

12.1 Conditions that would refute the thesis

- **A weekday-biased observation process.** The weekday argument depends on satellite overpasses being indifferent to the day of week. If the number of overpasses or the cloud-clearing rate over Sicily were itself weekday-structured, the signature of §5.2 would be an observation artefact. This is directly testable by tabulating overpass counts and successful acquisitions by weekday; the expectation under a valid argument is a flat distribution. Confirming flatness is a necessary robustness check I recommend be run and reported.

- **Coincidental anticorrelation.** If the $r = -0.989$ relationship of §4.2 were a small-sample coincidence rather than a structural pooling, it should not reproduce in the underlying event-level records or in a longer series. Obtaining the raw SIF/ASTUTO records (below) and recomputing the category structure year by year, and across the 2014–2015 boundary at monthly resolution, would either confirm the reclassification interpretation or refute it.
- **Agreement between independent inference and official coding.** If a data-driven ignition-attribution model (below) assigned the same cause distribution as the official coding for the same fires, the charge that the coding is a convention would fail. Disagreement is the prediction; agreement would corroborate the official account.
- **A forensic re-investigation finding high true arson.** If a systematic, blinded origin-and-cause re-investigation of a random sample of Sicilian fires, to a defensible evidentiary standard, returned a deliberate share close to the official 77%—*with motive determined*, not motiveless as in Sardinia—the thesis would be substantially wrong. This is the strongest single refutation available and is discussed at §12.3.
- **A small agro-pastoral share.** If direct measurement (below) showed that escaped agricultural and pastoral burning is a minor fraction of Sicilian ignition, the positive account of §11.2 would be undermined even if the negative finding about the official statistic survived.

12.2 Additional data points that would corroborate

The following are, to my knowledge, obtainable and would each independently strengthen or stress the thesis. I order them by expected evidential value.

1. **Event-level fire records (SIF/ASTUTO).** The regional service holds fire-level data—location, date, area, fuel, and a “probable cause” field—from at least 1986. Obtained under an access-to-documents request, these permit recomputation of cause at the event level, direct measurement of the up-coding boundary, and spatial join of each fire to land cover, roads, settlements, and the harvest calendar. This is the single most valuable additional dataset.
2. **Lightning-detection network data.** Strike-level data from EUCLID, LINET, or the Meteosat Third Generation Lightning Imager (operational since 2023), joined to fire-start pixels within a spatiotemporal window and screened for holdover, would bound the true natural-ignition share and test whether the near-zero official figure survives (§11.3).
3. **Cadastral and CAP-payment data.** Parcel-level land tenure and Common Agricultural Policy pasture-eligibility payments, joined to fire locations, would test directly the frequently-asserted but never-measured link between subsidy rules and pasture-maintenance burning—a mechanism that, if real, would further move fires from the “criminal” to the “economic land-management” category.
4. **Judicial case files.** Prosecutorial and court records for wildfire offences, at scale rather than by anecdote, would establish the true clearance, indictment, conviction, and motive distribution, and test the organised-crime hypothesis against adjudicated fact rather than press attribution.
5. **High-resolution burn perimeters and ignition points.** Sentinel-2 and commercial (PlanetScope-class) imagery yield burn perimeters and, by back-tracking, probable origin cells at far finer resolution than the MODIS/VIIRS floor, recovering exactly the small agricultural fires the coarse products miss and testing whether they cluster on field margins.
6. **A ground-sensor network.** Distributed thermal/optical ground sensors in the Alessandria della Rocca district (the operational context of this work) would provide direct, ground-truth observation

of ignition type and timing—the one thing neither satellite nor administrative record supplies—and would convert the district signature of §5.3 from inference to observation.

7. **Ethnographic and agronomic survey.** Structured interviews with interior farmers and shepherds, and extension-service records of burning practice and escape rates, would characterise the behaviour the satellite signature detects at population scale but cannot describe.
8. **Meteorological reanalysis at fire scale.** Station and reanalysis data (the Sicilian agrometeorological network; ERA5) joined to fire days would permit the burned-area variance decomposition (weather vs fuel vs ignition vs suppression) that no published study has yet performed for Sicily (§9.3).

12.3 The decisive experiment

One study would resolve the central question. Draw a random, representative sample of Sicilian fires with known ignition points (FIRMS/VIIRS first-detection pixels refined with Sentinel-2 perimeters). For each, compute an *independent* ignition signature from covariates that owe nothing to the official coding: day-of-week; coincidence with the durum-harvest and burning-ordinance calendar at the correct interior altitude; distance to fields versus woodland versus roads versus settlement; event-size and radiative-power distribution; and lightning-network coincidence with holdover screening. Fit a data-driven cause classifier on the jurisdictions where an independently validated cause is available, and apply it to the Sicilian sample. Then compare, fire by fire, the model's attribution against the official code. Where independent inference and official coding disagree, the coding is what fails; where they agree, the official account is vindicated. In parallel, commission a blinded origin-and-cause re-investigation of a subsample to a defensible forensic standard, so that the data-driven and forensic attributions can each be checked against the other and against the administrative code. The weekday and calendar arms of this design are already built and already point one way (§5); what remains is the spatial-covariate model, the lightning join, and the forensic re-investigation—the last being the one thing no Sicilian institution currently does, and the one thing that would convert the island's central fire statistic from a convention into a measurement.

TABLE 3 – INSTRUMENTS AND DATASETS FOR CONFIRMATION OR REFUTATION

Held now / used here: NASA FIRMS (MODIS, VIIRS); ISPRA/EFFIS burned-area series; regional and provincial AIB plans; ISTAT census and register; ISPRA/Regione Siciliana Carta Natura. **Obtainable by request or acquisition:** event-level SIF/ASTUTO fire records; lightning-network data (EUCLID/LINET/MTG-LI); cadastral + CAP/AGEA payment data; judicial case files; Sentinel-2 / commercial high-resolution imagery; SIAS agrometeorological + ERA5 reanalysis. **Requires new collection:** distributed ground sensors in the case district; structured ethnographic/agronomic survey of burning practice; blinded forensic re-investigation of a random fire sample.

13 Threats to Validity

Satellite representativeness. FIRMS under-samples small fires, which biases the analysis *against* detecting the agro-pastoral signal, so the strong signal observed is conservative. Detection counts are not burned area; I use them only for signature discrimination and count-trend, and rely on the regional burned-area series for the severity analysis (§9).

The weekday argument. Its force depends on overpass-invariance to weekday, which holds for sun-synchronous orbits, and on the assumption that reporting is not itself weekday-biased; because FIRMS detections are automated rather than administratively validated, the latter risk is minimal—unlike for the official fire-service series. §12.1 specifies the direct test.

Comparative commensurability. Cross-national cause shares use different denominators, thresholds, and schemes; I mitigate this by comparing *methods* and the handling of the residual rather than treating the percentages as directly commensurable, and by drawing the decisive inferences from within-country counterfactuals (Sardinia and southern mainland Italy versus Sicily) where the framework is shared.

Documentary reliance and source access. Some comparative figures derive from secondary compilations of the issuing bodies' data; where an individual primary source could not be independently re-verified within the research window, the figure is presented at its stated grade with the issuing body named, rather than a false precision asserted. Several burned-area series (ISPRA, ARPA, EFFIS, Legambiente) disagree materially for the same province-years, so I offer no province-level trend statement to two significant figures.

Residual uncertainty in the positive account. I show that the “deliberate criminal” attribution is not a measurement; I do *not* claim to have measured the true share of escaped agro-pastoral burning, which remains unquantified pending the studies of §12. The positive account is the best-supported reading of the convergent evidence, stated at medium confidence accordingly, not itself a measurement.

14 Conclusion

Sicily's fires are lit by people, overwhelmingly—this the official assessment gets right, and my independent analysis confirms it beyond reasonable doubt. But the load-bearing claim that they are predominantly criminal arson is not a measurement. It is an administrative coding whose two largest categories are one anticorrelated pool, whose trend is an artefact of a change of software, which the responsible minister has disowned, which the taxonomy contradicts, which the justice system does not corroborate at scale, and which the comparative record shows to track classification convention rather than behaviour. In the terms of the second research question, the attribution is substantially incorrect as a measurement, more specific to one subregion—the Palermo-Trapani wildland–urban interface, where the documented convictions sit—than admitted, and stale, its data ending in 2020 twenty-four percentage points below where they began. The disaster that Sicilian ignitions become is made by heat, fuel, and a hollowed-out countryside far more than by the intent of whoever strikes the match.

The residual uncertainty—the true balance of escaped agro-pastoral burning against malicious ignition—is resolvable, and largely with existing open data, by the confirmatory and refutational programme of §12. Until a Sicilian institution re-investigates a random sample of its fires to a defensible forensic standard and publishes cause below the regional level, the island's central fire statistic will remain what this analysis finds it to be: a convention received as a measurement. Correcting that is the precondition for a prevention policy aimed at the problem the evidence actually describes.

Appendix A Province-Level Fit of the Official Framing

The official framing is applied uniformly, but its fit to the measured evidence varies enormously by province. Every published cause figure is region-wide; the provincial plans carry identical boilerplate and no numbers. The uniformity is manufactured—by publication scale, by size-threshold censoring that removes exactly the small agricultural escapes, and by importing national percentages that statutorily exclude Sicily. The variation that is measured is not a variation in criminal intent.

Table A1. Province-by-province fit of the official “deliberate” framing to the measured evidence.

PROVINCE	DOMINANT REAL DRIVER	FRAMING FIT	NOTE
Palermo	Escaped agro-pastoral burning in abandoned, WUI-saturated land; waste-site fires; a real arson component in coastal reserves	partial	Worst province 2010–20; adjudicated arson exists (Capo Gallo, Casaboli), but 77–86% of burn is non-wooded, and burned forest fell 3,174→104 ha in one year
Trapani	Wind-driven runs through maquis and non-wooded ground	partial	Largest mean fire size in Sicily; a 55 km ² fire on 20 July 2025, five days before the “380-fire” arson attribution
Messina	Abandoned private terraces (Peloritani); pastoral land-creation (Nebrodi)	poor	2017: >90% of 850 ha was private uncultivated land; inquiry against unknowns. Nebrodi mafia convictions concern subsidy fraud, not arson
Catania	Many small peri-urban stubble/vegetation fires; Etna volcanic ignition	poor	Most true forest fires but lowest mean size; volcanic ignition recorded ~0% and excluded from the risk model
Agrigento	Escaped cereal-stubble and pasture burning across a near-treeless, depopulating interior	poor	~6–8% forest; lowest wooded burn in 2023, yet Italy’s most-burned province in 2025 (96% non-forest). The case-study province.
Caltanissetta	Annually renewed grassland and stubble on the gypsum-sulphur interior	poor	114 km ² burned in 2025; 8% forest
Enna	Grassland burn cycle eating into fragmented tree cover	poor	ISPRA: ~42% of tree cover burned over 2021–25 with <10% re-burn overlap; no cause attributed
Siracusa	Insufficient data	n/a	No cause data, no case material
Ragusa	Insufficient data	n/a	77% agricultural land use; absent from every cause and conviction record

Where the framing does have adjudicated content is narrow: the Palermo–Trapani wildland–urban interface, where the documented convictions sit and the fires are high-value and reserve-adjacent (with a selection effect—none was proved by fire forensics). Where it does not is the whole central-southern interior. Agrigento, Caltanissetta, and Enna together were roughly 67% of Sicily’s 2025 burned area, and all three lay *outside* the July 2023 state of emergency, which covered only Catania, Messina, Palermo, and Trapani. The island’s real burned-area anomaly is genuine; its *causal* uniformity is an artefact of how, and at what resolution, cause is published.

Appendix B Reproducibility of the Satellite Analysis

The FIRMS analysis is fully reproducible. Inputs: the four FIRMS products named in §2.4, retrieved for the stated bounding box and interval. Cleaning: marine removal by point-in-polygon; non-vegetation removal by the `type` flag; a 12-km Etna geometric exclusion; confidence filtering as stated. Derived fields: local-time conversion (UTC+2); day-of-year, day-of-week, and local hour; a 15-km-radius municipal subset centred on 37.5686 °N, 13.4494 °E for the Alessandria della Rocca analysis. Tests: χ^2 goodness-of-fit (weekday uniformity), exact binomial (weekend fraction), Mann–Kendall with Theil–Sen slope (trend), and two-sample Kolmogorov–Smirnov and Mann–Whitney (district-vs-region day-of-year). Summary outputs—annual series, weekday indices, seasonal onset percentiles, ten-day block shares, and the FRP distribution—are provided as machine-readable Supplementary Data accompanying this manuscript. The raw detection set (133,102 records) and the analysis code are archived and available on request.

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Note on sourcing. Comparative cause figures in Table 1 are attributed to the issuing bodies named in references [20]–[26] and the text; where an individual primary URL could not be independently re-verified within the research window, the figure is presented at its stated evidentiary grade with the issuing institution named, rather than a false precision or an unverifiable link asserted. The quantitative results of §5, §8.1, and the Supplementary Data are the author's own analysis of reference [33]. Author and affiliation fields on the title page are placeholders to be completed on submission.

Working paper prepared for peer review and critique. Evidence grades and confidence levels are stated inline throughout; where sources conflict, the conflict is preserved rather than resolved. A satellite detection is not an ignition, and the principal conclusions are explicitly bounded by that and the other limits set out in §2.4 and §13.