CASH OR LOTTERY?
Experimental Evidence on Incentive Design and Crop Residue Burning in Thailand

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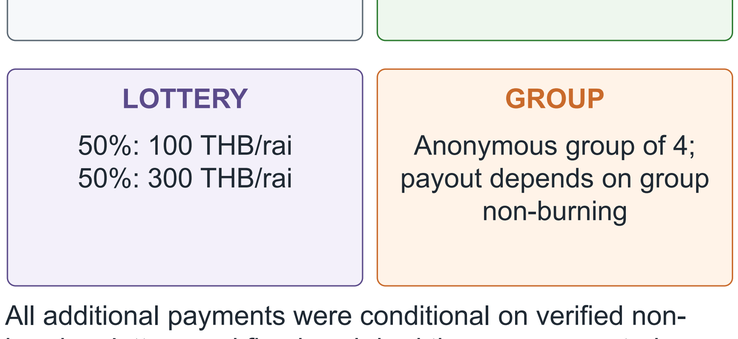
TAKEAWAY: Plot-verified lottery incentives reduced rice residue burning more than guaranteed cash at the same expected payout. Anonymous group payments did not work.

1. MOTIVATION

Crop residue burning is a public-good problem: farmers clear fields quickly, while smoke costs are borne by society.



Rice fields were the largest agricultural hotspot source every year during 2020-2025: 38-50% of crop-related hotspots, and 45.05% in 2025.

Policy gap: bans are hard to monitor; subsidies rarely reward outcomes.

2. FIELD EXPERIMENT

Framed field experiment with 299 rice farmers. Random assignment at the farmer level across four arms.

CONTROL
Participation fee only

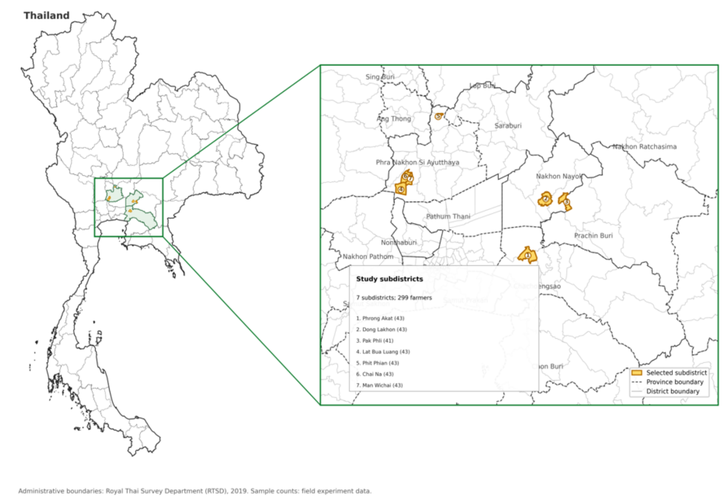
FIXED CASH
200 THB/rai if not burning

LOTTERY
50%: 100 THB/rai
50%: 300 THB/rai

GROUP
Anonymous group of 4; payout depends on group non-burning

All additional payments were conditional on verified non-burning; lottery and fixed cash had the same expected payout.

3. SETTING & TIMELINE



Study sites: 7 subdistricts in Nakhon Nayok, Ayutthaya, and Chachoengsao - high-burning rice areas near Bangkok.

Apr-May 2024
Baseline survey & cost calibration

Dec 2024-Jan 2025
Contracts signed; plots geotagged

Feb 2025
Phone reminders

Apr-May 2025
Satellite + field verification

May 2025
Incentives paid out

Compensation was calibrated from observed costs: burning had an estimated net advantage of about 150 THB/rai; non-burning compensation was set at 200 THB/rai.

4. MEASURING COMPLIANCE

Burning was not self-reported. Each selected plot was geotagged and verified through satellite burn scars and field inspection.

Verification workflow

1. **Geotag plot polygons** ❱
2. **Detect satellite burn scars** ❱
3. **Ground-truth field visits**

Outcome: verified plot-level burning (1 = burned; 0 = not burned).

Credible monitoring makes outcome-based incentives feasible at scale.

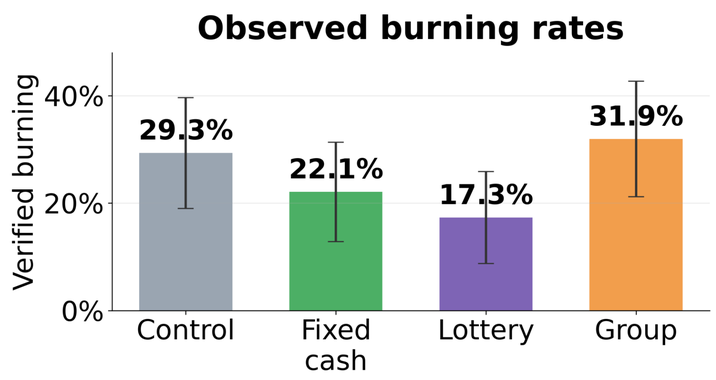
5. IDENTIFICATION

Randomization assignment created comparable treatment groups. Treatment effects are estimated from post-treatment burning, with geographic fixed effects and baseline controls.

Interpretation: differences across arms are attributable to incentive assignment, not pre-existing differences in farmer characteristics.

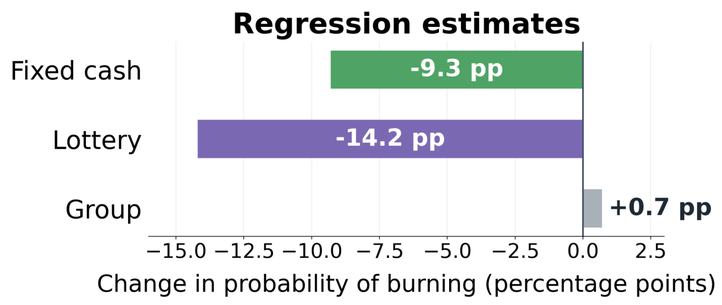
Focus: incentive design, not only incentive size.

6. MAIN RESULT: OBSERVED RATES



Observed burning fell from 29.3% in the control group to 17.3% under the lottery treatment.

7. REGRESSION ESTIMATES



Lottery effects are robust across specifications, including subdistrict fixed effects and baseline controls. Group payment shows no detectable effect.

8. WHY THE LOTTERY WORKED

- Same expected payout as fixed cash
- Higher possible prize made rewards salient
- Government lottery digits made the draw transparent
- Familiar institution increased credibility and engagement

Behavioral lesson: Incentive design can matter as much as incentive magnitude.

Anonymous groups likely diluted individual accountability and weakened motivation.

9. COST-BENEFIT SIMULATION

US$46.3M
Estimated incentive payments

US$220.4M
Estimated avoided air-pollution damages

Benefit-cost ratio

4.76

Every US$1 spent on lottery incentives could generate about US$4.76 in avoided air-pollution damages.

Simulation assumes off-season rice households, 14.2 percentage-point reduction in burning, and conservative PM2.5 damage attribution.

10. POLICY IMPLICATIONS

- Bans and information campaigns alone may be insufficient to eliminate burning; non-burning must be practical and profitable.
- Replace unconditional support with verified non-burning rewards tied to satellite and field verification.
- Design incentives that are salient and locally credible; transparent prize-linked bonuses can strengthen compliance without raising expected fiscal cost.
- Keep individual accountability clear; anonymous group payments are weak without peer visibility or monitoring.
- Pair incentives with straw markets, machinery services, composting options, field audits, and grievance mechanisms.
- Use incentives as a transition strategy while building long-run markets for straw, biomass, compost, and residue-management technologies.

Outcome-based incentives can complement bans and input subsidies during the transition period.

11. SCALING CONDITIONS

- Reliable plot boundaries and farmer registry
- Satellite screening plus targeted field audits
- Clear payment rules and appeal process
- Local residue-management alternatives so farmers can comply

Make non-burning rewarding, verifiable, and practically feasible.

BOTTOM LINE: Incentive design can make environmental compliance cheaper and more effective.

Sources: Attavanich et al. (2026); GISTDA (2025). Acknowledgements: AUS, World Bank CSF, SVITA Foundation, NRCT, GISTDA, and DOAE. Contact: witsanu.a@ku.ac.th