

# Curtailing Land-Clearing Fires in Indonesia

FALL 2020

## Using Conditional Cash Payments to Prevent Fires: Cautionary Findings from Indonesia

### Problem

Land-clearing fires in Indonesia are a major source of private and social losses. Virtually all of these fires are deliberately set, and are often the consequence of smallholders seeking to expand farm size. The widespread societal costs arise from greenhouse gas emissions, habitat destruction, deforestation, compromised public health, and strained international relations. Policy approaches to fire prevention have typically been regulatory in character, and have been largely ineffective. A growing, but unresolved, policy question in Indonesia and elsewhere is whether fiscal incentive schemes can

be effective in curtailing fire amidst imperfect property rights, land-use flux, and chronic underdevelopment.

### Experiment

To provide a more analytic basis for using economic incentives as part of Indonesian fire policy, scholars from Stanford University, Australia National University, and the National Team for the Acceleration of Poverty Reduction (TNP2K) undertook a large-scale randomized controlled trial in West Kalimantan that also included three rounds of field-based surveys. The specific objective was to test whether a community-level



### About the Stanford Center on Food Security and the Environment

The Center on Food Security and the Environment addresses critical global issues of hunger, poverty and environmental degradation by generating vital knowledge

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conditional cash transfer approach could reduce harmful land clearing with fire. The study covered about 90,000 households within four districts in West Kalimantan. This project is among the first to test whether conditional cash payments to villages can be successful in curtailing land-clearing fires.

The study estimated the effects of conditional cash transfers by offering contracts to village governments. Two-hundred and seventy-five villages were chosen randomly (Figure 1), of which 75 were again randomly chosen from for the program (treatment). The remaining 200 villages were assigned to a comparison group. Fire outcomes (hotspots) were monitored from space with remotely sensed satellite data.

The intervention had three components: (a) village information and instructions on fire prevention; (b) an up-front Rp 10 million (approximately \$750) capital grant at the start of the experiment to ease liquidity constraints and help with fire prevention efforts; and (c) an ex-post conditional payment of Rp 150 million (approximately \$10,800, equal to around 15% of the average village budget) at the end of the fire season (December 31, 2018) if villages were successful in eliminating fires. The sample of villages was restricted to the eight most fire-prone sub-districts in each district,

and to villages that had hotspots in at least two of the last three years. Small traditional fires, especially important in Dayak communities for upland rice production, were excluded from the fire counts. To receive their ex-post payment, villages were required not to set fires from July–December and to extinguish natural fires promptly.

### Results

**Out of 75 treatment villages, 21 (28%) managed to go fire-free for the entire 2018 dry season. While initially this percentage appears impressive, 29% of the control group villages also had no fires.** Statistically, the probability and extent of fires were not distinguishable across the treatment and control groups. The distributions of hotspot detections were remarkably similar and there was no discernible impacts on tree cover loss. We reluctantly concluded that there was no evidence that the pay-for-performance program had reduced fire beyond what would have been expected in the absence of the program. These results underscore the importance of having control groups in measuring policy effectiveness.

**The program caused villages to increase their fire prevention behaviors and resources allocated to fire prevention activity.** Treatment villages were 20% more

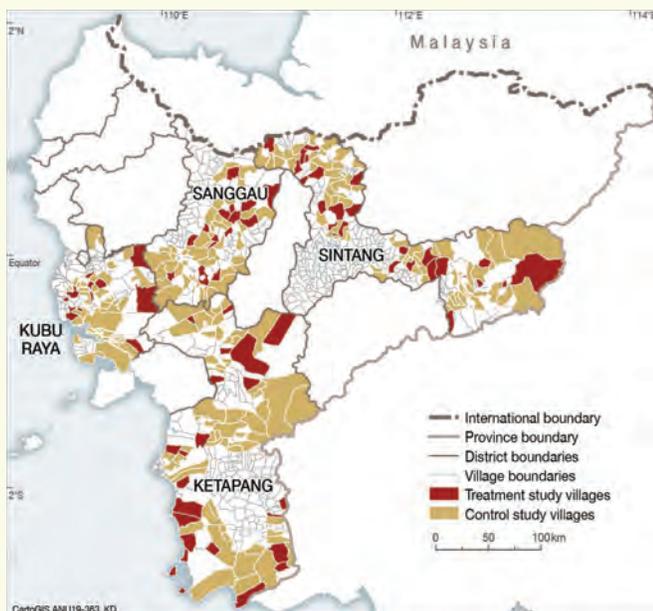


Figure 1.



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likely to have fire prevention task forces, most of which were formed after village facilitations. There were also large increases in the number of task force groups within villages, the number of villagers participating in fire patrols, and the frequency with which forest patrols were undertaken. However, there was no increase in the probability that the fire department outside the village (*Manggala Agni*) was contacted.

**The program had no major impacts on fire outcomes primarily because of (a) the low cost of fire clearing and the high value (net present value) of the land being cleared, and (b) a collective action failure.** Our field visits and survey data suggested that understanding and interest in the program was generally high. Up-front capital grants were used to buy minor firefighting equipment and to hire more fire-monitoring brigades. However, there were large differences between the best and worst performing villages with respect to commitment to the program. Differences were observed in the leadership role of the village head and other prominent figures, as well as in community mobilization.

**Nine out of ten villages in our separate in-depth study indicated that fire was the only way in which land was cleared, and that availability of land was the most important determinant of land clearing by fire.** Fire was the most practical and cheapest method of land

clearing and a number of villagers said that land clearing would only stop when land (forest margin) was no longer available, irrespective of other sources of income. Both smallholders and companies used burning to convert forest into cultivated land for oil palm, rubber, and other crops. Fire was also used over peat land that had been intentionally drained to grow crops. Fire is thought by many in the region to reduce the land's acidity and to generate useful plant nutrients—a plausible conclusion for mineral soils, but not peat soils.

**Village poverty appeared not to be a prime determinant of fires (though there was little variation in average income levels across sample villages); however, size of village and cohesiveness were significant.** Non-fire villages were on average only one-third as large in terms of population as villages with fires (1,600 people versus 4,400 people). There was also considerable variation in knowledge about the experiment. Since the training process was virtually identical in all treatment villages, the information-transfer process proved inadequate in some communities. Smaller villages were seemingly more cohesive and better informed than larger ones.

**A moderate El Nino event occurred in 2018, and the resulting dryness in sample villages was nearly comparable to the epic fire year of 2015.** If the experiment had taken place instead in 2016, half as many



hot spots would have observed. After the 2015 major fire year, villages had been ordered to allocate resources for fire prevention activities, but they had stopped doing so after facing a much milder dry season in 2016. Since the cost of preventing fires is much cheaper than mitigating disasters, the concept of fire prevention seems not to have been appreciated by many communities.

**An affordable alternative to land clearing is key to reducing the use of fire in land clearing.** The net present value (NPV) of cleared land is dependent on the type of soil, clearing costs, expected prices for oil palm fruit bunches, and discount rates. Various estimates thus put the range of NPVs per hectare anywhere between US\$ 3,000 and US\$ 20,000. Meanwhile, the costs of clearing land using mechanical methods ranged between US\$ 150 to US\$ 180 per hectare, while clearing land by burning cost between US\$ 3 and US\$ 5 per hectare. Government programs, including the latest rice field extension program (*cetak sawah*), have not been able to offer an equal economic alternative to burning. Unless a village has access to land-clearing machinery from a plantation or public agency, fire will likely remain as the dominant land-clearing method.

**The number of hotspots in our sample, which averaged about four per village, was distressingly high. Yet villages on average contained about 400 households, implying that 1% or fewer households were engaged in “rogue” fire setting.** The common perception that most villagers are casually setting fire appears to be a misperception. This small-numbers phenomenon raises the broader question of carrots versus sticks in policy design. Can broad-based conditional incentive schemes be effective at the village level for dealing with 1% of the households who set fires, or will peer (villager) pressure and penalties to specific wrongdoers be necessary for effective fire curtailment?

## About The Researchers

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This brief is based on findings from TNP2K Working Papers “**Fight fire with finance: a randomized field experiment to curtail land-clearing fire in Indonesia**” (Edwards, R.B., Falcon, W.P., Hadiwidjaja, G., Higgins, M.M., Naylor, R.L., and Sumarto, S. (2020)) and “**Using Conditional Cash Payments to Curtail Land-Clearing Fires: Cautionary Evidence from Indonesia**” (Hadiwidjaja, G., Falcon, W.P., Edwards, R.B., Higgins, M.M., Naylor, R.L., and Sumarto, S. (2020)).



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