Conservation decisions rely on balancing incentives with unpredictable variables

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If you own land, as long as it's not bound up in a legal restriction, you've got options. You might decide to convert it into farm land. You might develop it. You could decide to wait and see if the land increases in value. Or you could accept a temporary contract that sets it aside for conservation, or a more permanent one that binds you to never develop it. University of Illinois environmental economists examined some of the aspects of this conundrum.

"Developing land for intensive agriculture is in all practicality an irreversible decision. To convert, say, a palm oil plantation in Indonesia back to being a national forest, would be so costly that it is functionally irreversible," says Amy Ando.

In a recent study, Ando's then student Payal Shah, models two such potentially irreversible decisions. In one scenario, a landowner gets a permanent lump-sum payment to never develop the land. In the other, the landowner receives a temporary lump-sum payment and agrees not to develop it for a while. At the end of that time, the landowner can choose to develop or re-contract. Shah, who is now a research scientist at Okinawa Institute of Science and Technology Graduate University, and Ando look at how large a payment is necessary under those two conditions to induce a landowner to accept a contract.

"We find that the permanent lump-sum needs to be much higher for the land owner to agree. It's more than just about the money. It's what we call the 'loss of option value.' Having that flexibility to make the best

choice tomorrow has real value," Ando says.

Interestingly, the option value is higher the more uncertainty there is about the future. So, the more that returns fluctuate up and down, the more people want to wait and see before deciding what to do with their land.

"We model a world in which you get carbon payments if your land is not developed or you can get profit from farming if you develop it," Ando explains. "Both of those choices are uncertain in the future. You don't know what the market for carbon payments will be like. If you don't develop it, you don't know what profits would be like for the palm oil plantation. The more uncertainty there is, the more increasingly reluctant a landowner is to make any permanent decision about what to do with the land. They just want to wait and see."

Ando says if the carbon payments for not developing land are linked to something, like the profits a landowner gets after developing the land, this creates a positive correlation between those two and reduces the overall uncertainty. "This makes people less hesitant to make a permanent decision."

The case study in Indonesia is simulated, but based on real data on the profits on palm oil plantations and real data on carbon payments. The outcome from the study is formulas to help those who design conservation policies to estimate how much money is needed to pay landowners to be willing to accept a conservation contract, to not convert their land.

"It can be very complicated to estimate what payments need to be," Ando says. "If there are multiple uncertainties and they're not perfectly positively correlated with each other, simpler models can yield totally incorrect estimates of the payments you would need to give landowners

in order to get them to agree to a conservation contract. Sometimes it's an overestimate. Sometimes it's an underestimate. You can't even predict that. It depends on the particular circumstances. This is a more complicated model with dual uncertainties."

Ando says anything you can do to reduce volatility in the returns to the land that you get when it's not converted reduces the amount of money needed to pay land owners to be willing to conserve. For example, carbon prices.

"Anything you can do to stabilize the prices makes it easier for landowners to agree to be a part of a conservation contract.

"If there are uncertainties in both what you get from developing your land and from permanently protecting it, anything you can do to put them in lockstep with each other lowers the price it takes for landowners to accept a conservation contract," she says.

Ando adds that landowners who enter into conservation agreements can sometimes get two payments. A signed conservation easement agreement, currently 10 to 15 years in length, prevents landowners from doing some things but not everything.

"Landowners may use their conservation-dedicated land for other revenue streams," she says. "The landowner might get payments for not cutting down trees on the land, but may allow people to tap maple syrup from their trees or allow hunting and fishing on their property. The landowner still owns the land. They've just sold part of the rights to the land - the right to cut down trees for example."

More information: Payal Shah et al, Permanent and Temporary Policy Incentives for Conservation under Stochastic Returns from Competing Land Uses, *American Journal of Agricultural Economics*

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