

EFFoRTS-ABM Description

What is this?

This is a simulation model, which predicts the agricultural land-use change between rubber and oil palm plantations in Jambi province, Indonesia. Simulated land-use changes are based on the behaviours and decisions of the individual farmer households. Farmers choose what they grow in their fields, depending on a number of factors, primarily price. Although rubber usually has a higher price than palm oil, palm oil is a less labor-intensive crop. However, rubber is able to store larger amounts of carbon. One aim of the model is to find out under what conditions both the farmer (*income*) and the environment (*carbon storage*) do well. Thus, the model helps to explain land-use patterns in Indonesia.

What is in the model?

The model represents a village. This area is 25km² and is broken up into 100 × 100 cells, each representing individual fields 50m × 50m in area. Farmer households are represented as black squares and they own a variable number of fields surrounding themselves. Green fields are undisturbed forest, yellow fields are rubber plantations, and orange fields are oil palm plantations. Farmers are always found close to roads (white lines).

What happens when the model runs?

The model simulates a 50 year time period. Each year **four** steps occur. **First**, farmers may learn to be better and more efficient. Farmers learn based on the knowledge of their neighbors and some random chance. **Second**, the farmers consume an amount of their total wealth to survive and maintain their farms. If they do not have sufficient wealth they sell up and leave the village. **In the third step** the farmers decide based on the expected profits whether to harvest their crops, change crop type, or just continue on with their current crop. If the farmers change crops they remove their current crop releasing any carbon stored in that crop. **In the last step** the actual profits for each farmer household are calculated based on that year's product prices.

Your challenge

Your aim is to find a price for each crop that is beneficial to both the environment and farmers. Adjust the price (in USD/kg) of palm oil kernels and rubber by changing the position of the sliders (the price limits are set according to the observation in the last 50 years). Some farmers can handle their fields very well or have better growth conditions than others, this can be controlled with the inefficiency sliders. However, the latter can learn (through exchanges with neighbors and workshops) and improve their cultivation. You can see in the dynamic plots and monitors the effects of any changes you make to the amount of stored carbon and the wealth of the farmers.

