USTH 2024 – Project 6

Pasture and Forest

Shepherds graze their herds (a species of goat called *Logo*) in the undergrowth of a forest with *Cormasis gama* as the dominant tree species. Patches of *Cormasis gama* form groves that are disseminated in a pasture. The feeding potential for *Logo* goats is higher in the forest than in the pasture, but *Cormasis gama* do not resist grazing by *Logo* goats: the cover then turns from forest to pasture. On the other hand, *Cormasis gama* trees recolonize fringe-pasture at the edge of a grove with a monthly probability ranging from 0.0025 to 0.02 proportionally to the relative abundance of *Cormasis gama* in the surrounding of the fringe-pasture area.

The grazing is controlled by the shepherds, based on the memorization of the places they visited in the past and also based on their attitude (respectful or disrespectful) toward the Forest Department in charge of protecting *Cormasis gama* trees. The grazing season lasts 10 months. Each month during the grazing season, shepherds must place their animals somewhere. In case there is no unoccupied place within their perception range, they remain at the same place, otherwise they move, preferably into the forest (more food for the *Logo* goats). Yet sometimes some of them will refrain from entering the forest, when the size of the *Cormasis gama* patch is too small according to their opinion.

Shepherds record the number of months they were able to perceive the forest during a grazing season. By the end of the grazing season, each shepherd computes a specific indicator, called "self-authorized minimum size", set as the difference between the grazing season duration in months (10) and the number of months they were able to perceive the forest. When the next grazing season starts, these individual memories are reset. Relating only to their individual representation, shepherds will refrain from grazing within *Cormasis gama* groves whose size is lower than their current self-authorized minimum size.

By the end of each grazing season, the Forest Department determines its own authorized minimum size by requesting all the shepherds to report their self-authorized minimum size and computing the average value, which will determine the institutional-authorized minimum size. If the size of a *Cormasis gama* grove is below the institutional authorized minimum size, it will be marked "protected" for the next grazing season.

Respectful shepherds will indefectibly follow the regulation set by the Forest Department, never entering protected *Cormasis gama* groves. Disrespectful shepherds will only refer to their own perception to decide whether to graze a forest area, not caring about the regulation set by the Forest Department.

What would be the future of such a socio-ecosystem:

- if all shepherds were to enter the forest without any regulation?
- if all shepherds were to follow their idea about the minimum size?
- if all shepherds were to follow the institutional minimum size?

Initial situation

A virtual forest landscape is set as a square grid made of 50 by 50 land units where patches of grove cover approximately 30%