## environment.py

This module simply sets vegetation to certain types. See the table below:

|  |  |
| --- | --- |
| Type | Vegetation |
| 1 | Bamboo |
| 2 | Coniferous |
| 3 | Broadleaf |
| 4 | Mixed |
| 5 | Lichen |
| 6 | Deciduous |
| 7 | Shrublands |
| 8 | Clouds |
| 9 | Farmland |
| 10 | Household |
| 11 | Farm |
| 12 | PES |
| 13 | Forest |
| -9999 | Outside\_FNNR |

It also sets elevation deemed to be “out of bounds” of normal monkey movement range. By default, here are the settings:

class Elevation\_Out\_of\_Bound(Environment):  
 lower\_bound = 1000  
 upper\_bound = 2200

# land.py

**The *GTGP-participation* function**

\*\* Once in GTGP, no exit, until contract expires (simulation pauses and parameters reset)\*\*

GTGP-participation

PES\_Span = 8\*73; \*\* PES\_Span is a global parameter equal to years of planned PES payment since beginning of simulation—default to 8 years, but changeable. Convert from years to steps. Note this is Okay, but may explain why there are drops of enrollments after some years as pay stops\*

YearsPassed = # of steps passed/73; \*\*YearsPassed is a global variable, equal to number of years since start of simulation\*\*

No\_Pay\_pct = 0.4; \*\* Change to 0.25 or another value around it A % parameter that decreases GTGP\_par\_prob (the prob a HH is willing to participate in GTGP) even if payment stops\*\*

minThreshhold =0.3; \*\* Change to 0.2 or o.25 A % parameter that decreases GTGP\_par\_prob when the parcel is a GTGP one\*\*

If (YearsPassed < PESSpan) then

[

PayExist=True; \*\*A logical variable that takes true or false\*\*

]

Else

[

PayExist=False; \*\*A logical variable that takes yes or no\*\*

]

[Preset minimum\_non-GTGP = 0.3; \*\*minimum area of non-GTGP land each household should hold, meet what observed and handle issues of land scarcity \*\*

Loop through all households:

[

Loop through all land parcels agents for a household:

[ \*\*\*Note loop thru all parcels as GTGP may be returned to non-GTGP\*

Calculate total\_non-GTGP; \*\* add up all non\_GTGP land \*\*

Calculate hh\_size; \*\* add up all household members\*\*

GTGP\_par\_prob = 0;

crop\_income = land\_output \* unit\_price(with reference to plant\_type)；

Comp\_amt = a rea\_of\_land \* unit\_comp;

GTGP\_net\_cash = Comp\_amt - crop\_income; \*\* on parcel level

\*\*A logistics function will be used to calculate the probability of GTGP participation on parcel level \*\*

GTGP\_par\_prob = exp(2.52 - 0.012\* Age\_1 - 0.29\* Gender\_1 + 0.01\* Education\_1 + 0.001\* hh\_size - 2.45\*land\_type + 0.0006\* GTGP\_net\_cash + 0.04\* time\_land)/(1 + exp(2.52 - 0.012\* Age\_1 - 0.29\* Gender\_1 + 0.01\* Education\_1 + 0.001\* hh\_size - 2.45\*land\_type + 0.0006\* GTGP\_net\_cash + 0.04\* time\_land));

If (PayExist=true) then

[

GTGP\_par\_prob = GTGP\_par\_prob

]

else

[

GTGP\_par\_prob = No\_Pay\_pct\*GTGP\_par\_prob;

]

If (parcel is non-GTGP and total\_non-GTGP >= minimum\_non-GTGP and random #<GTGP\_par\_prob) then

[

Remove the parcel from non-GTGP land parcels agents;

Add the parcel to GTGP land parcels agents;

]

else if (parcel is GTGP and random #<GTGP\_par\_prob\*minThreshhold)

then

[

Remove the parcel from GTGP land parcels agents;

Add the parcel to Non-GTGP land parcels agents;

]

]

Age\_1 + 1; \*\* age of hh head increment

Calculate total\_crop\_income \*\* add up crop\_income for all parcels

Calculate total\_Comp\_amt \*\* add up all Comp\_amtfor all parcels

household\_income = total\_crop\_income + income\_local\_offfarm + total\_Comp\_amt + household\_ remittances

Report household\_income in the output Excel file

]

**The *GTGP-policy* function**

GTGP-policy

[

Scenario\_1: unit\_comp = 270;

Scenario\_2: unit\_comp = 135;

Scenario\_3: for rice\_puddy, unit\_comp = 270;

for dry\_land, unit\_comp = 135;

Scenario\_4: first 4 year unit\_comp = 800;

after 4 year unit\_comp = 200;

]