



100% rotation necessary?

Which rotation strategy should be applied?



Biological facts lead us to a lattice model

$I2^3$

Development of a discrete spatiotemporal model

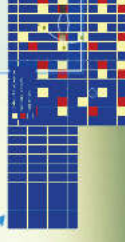


Sampling into a lattice: cells are the fields



Objective:
simulation model for
optimal crop rotation
strategy against the pest

Model output:
the percentage of maize fields with
population level above economic threshold
over the simulation years
under no varying input factors:



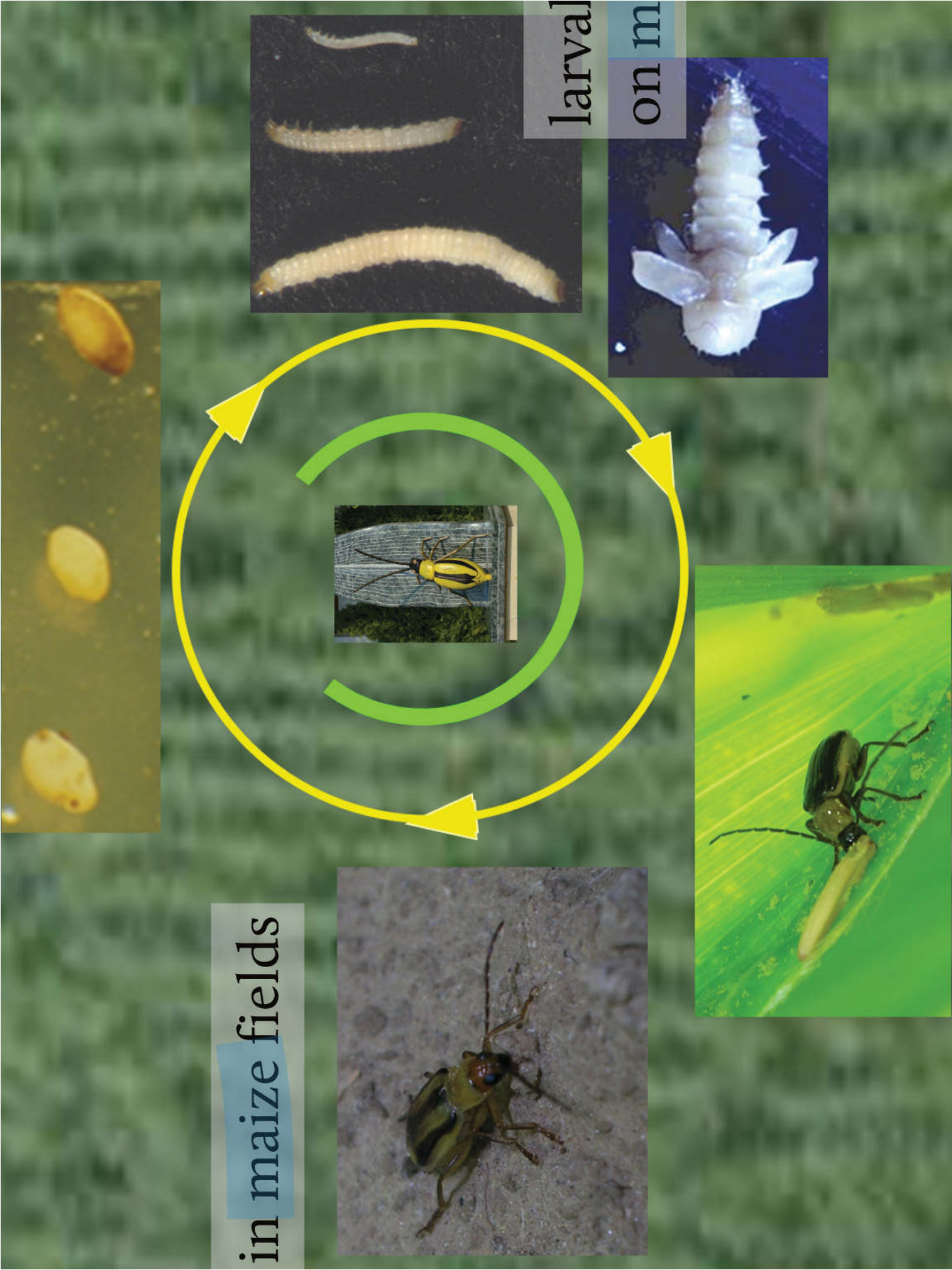
END
of the session

Further info on this model:

<https://dx.doi.org/10.1016/j.agry.2013.10.009>

Lattice models to help design IPM strategies for
future climate
example of Diabrotica





larval damage

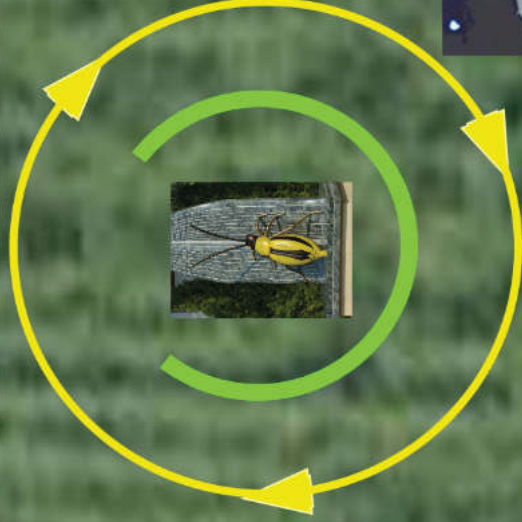


feeding on roots → plant lodging → yield loss

egg laying in maize fields



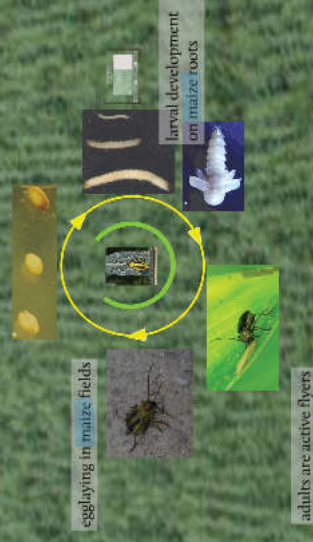
adults are active flyers



larval development
on maize roots



rotation of maize works



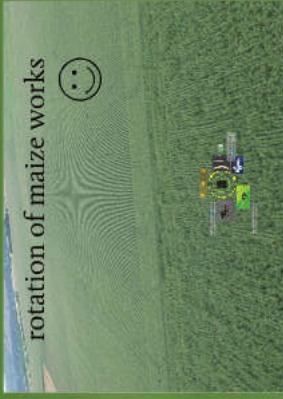
rotation of maize works



100% rotation necessary?

Which rotation strategy
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100% rotation necessary?

Which rotation strategy should be applied?



Objective:
simulation model for
optimal crop rotation
strategy against the pest

Biological facts
lead us to a lattice
model



The background of the slide features a close-up photograph of a green plant stem, possibly a vine, with small, dark, segmented nodes. A thick, solid black vertical bar runs along the right side of the image. A semi-transparent white rectangular box is positioned in the center, containing the text.

univoltine (discrete in time)

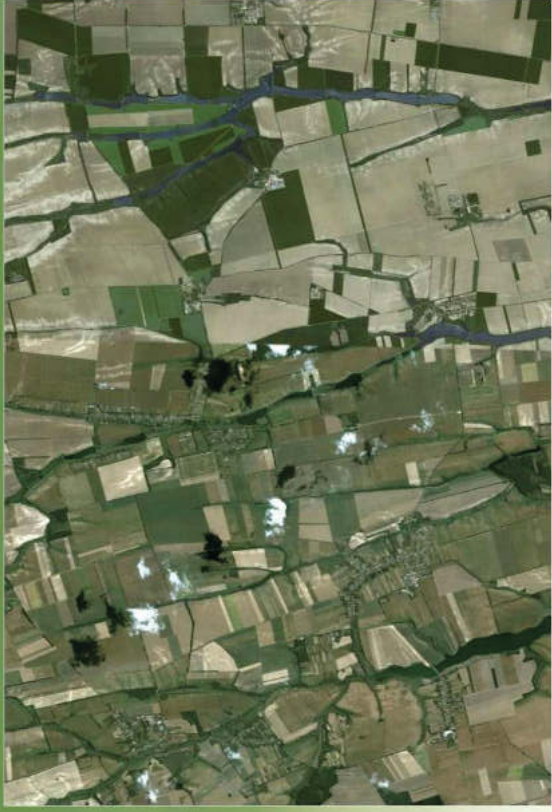


closely related to maize (spatially discrete)

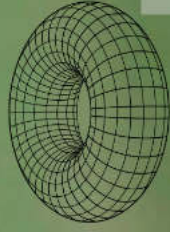
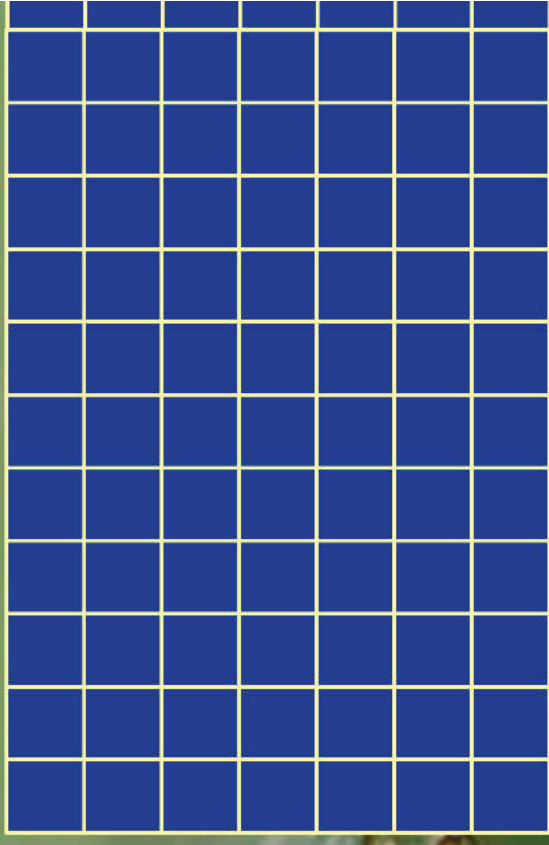
The background features a soft green-to-yellow gradient. Large, solid black curved shapes are positioned on the left and right sides, framing the central text area.

no specific key natural enemy

Development of a discrete spatiotemporal model



simplifying into a lattice
cells are the fields

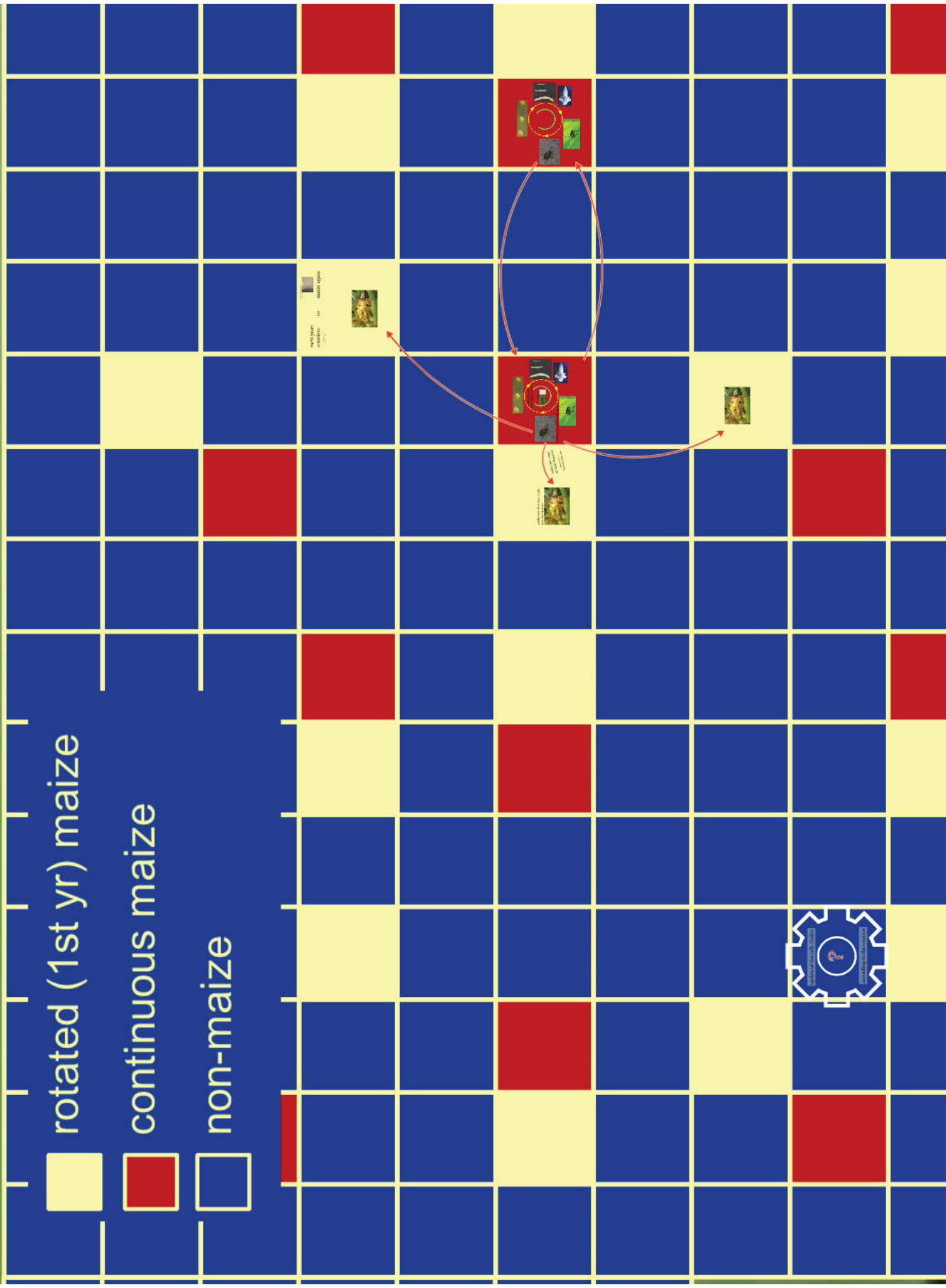


encapsulated into a torus
to avoid edge effects

rotated (1st yr) maize

continuous maize

non-maize

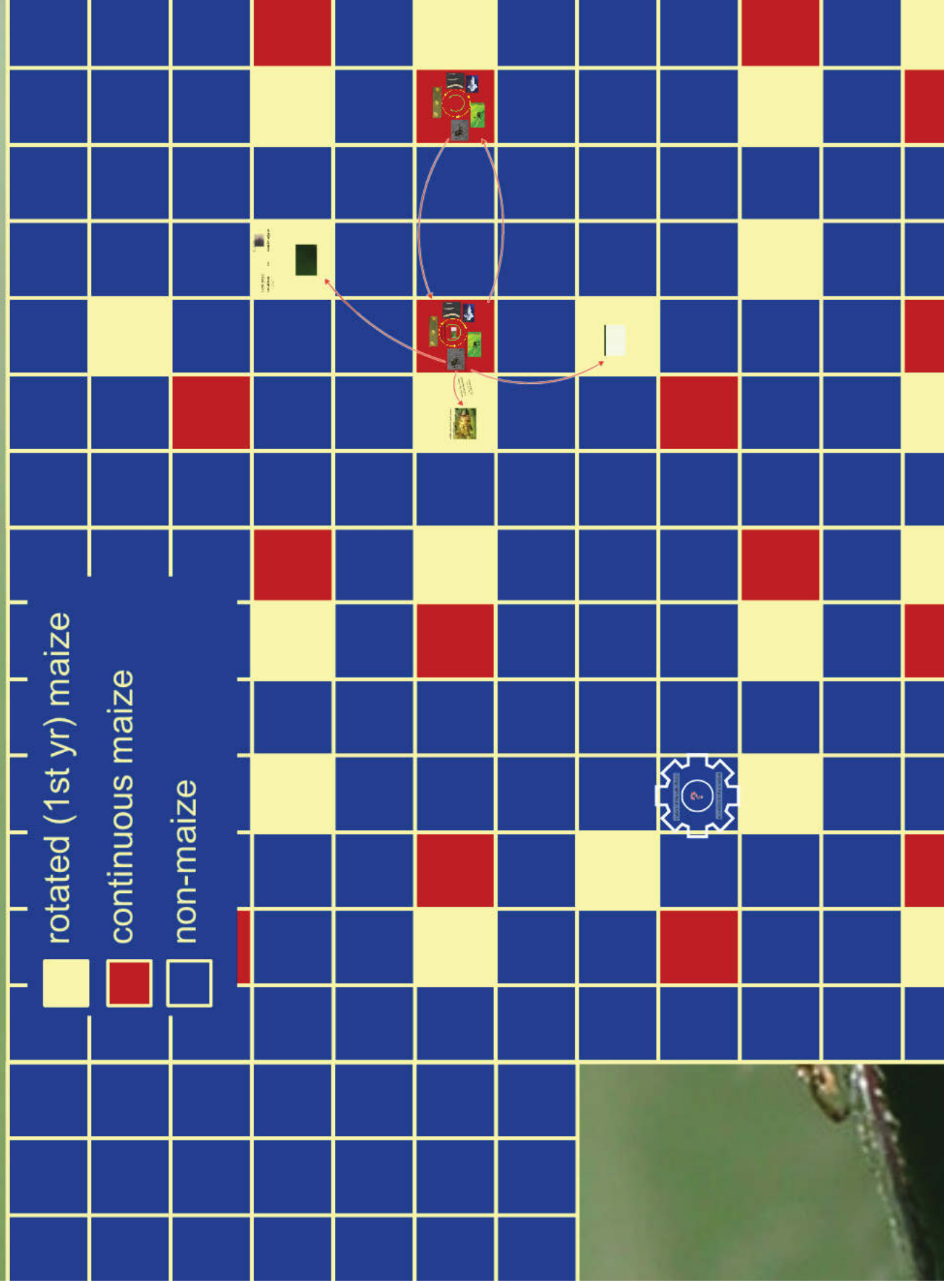


update of the cells (fields)



according to the rotation

under 20 vary







within the range
of adult dispersal

measured as
Chebishev distance

emergen

adults into first year maize:
new infestation





adults into first year marine new life-station

next year:
rotation

no offspring at all
rotation has 100% efficacy

or
maize again

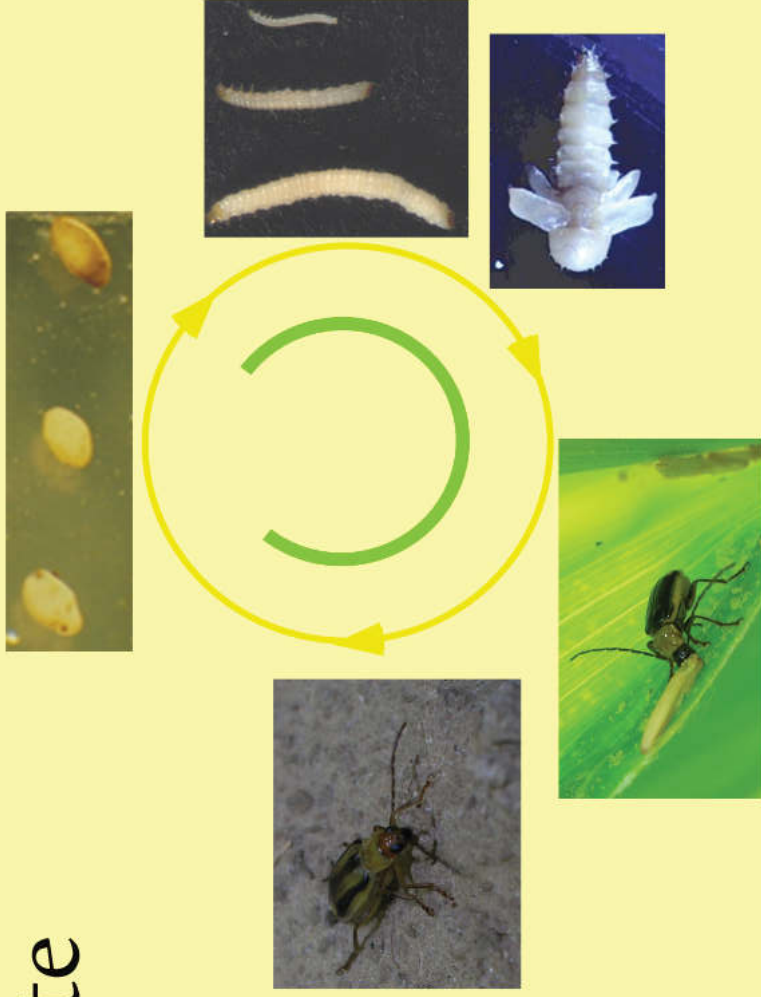


rotation

no offspring at all

rotation has 100% efficacy

offspring according to
growth rate



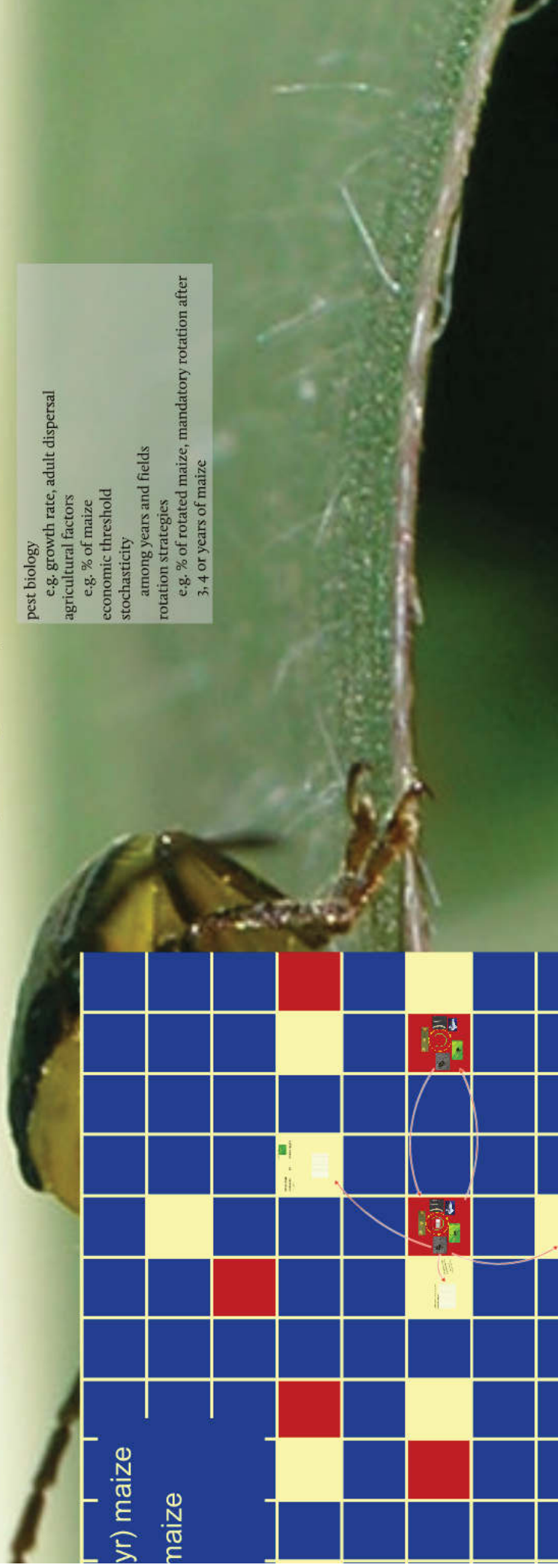
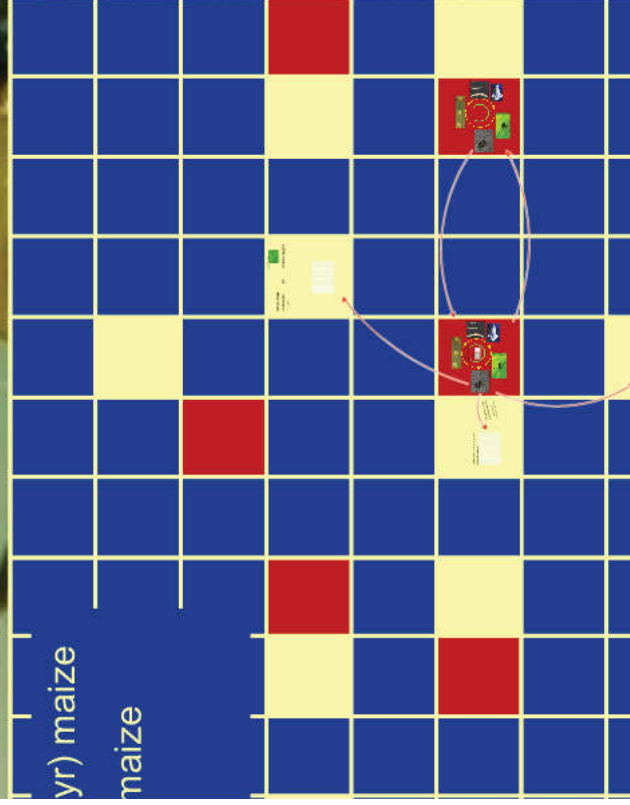
maize again

model output:

the percentage of maize fields with
population level above economic threshold
over the simulated years

under 20 varying input factors:

pest biology
e.g. growth rate, adult dispersal
agricultural factors
e.g. % of maize
economic threshold
stochasticity
among years and fields
rotation strategies
e.g. % of rotated maize, mandatory rotation after
3, 4 or years of maize



input factors:

pest biology

e.g. growth rate, adult dispersal

agricultural factors

e.g. % of maize

economic threshold

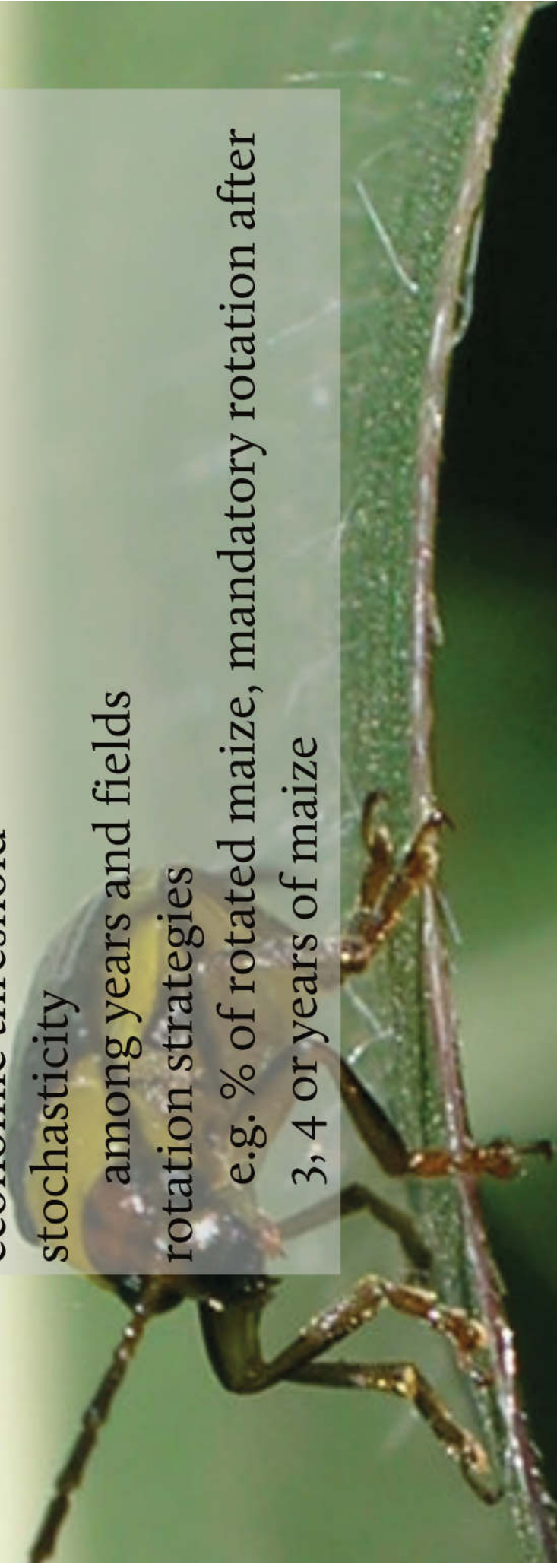
stochasticity

among years and fields

rotation strategies

e.g. % of rotated maize, mandatory rotation after

3, 4 or years of maize

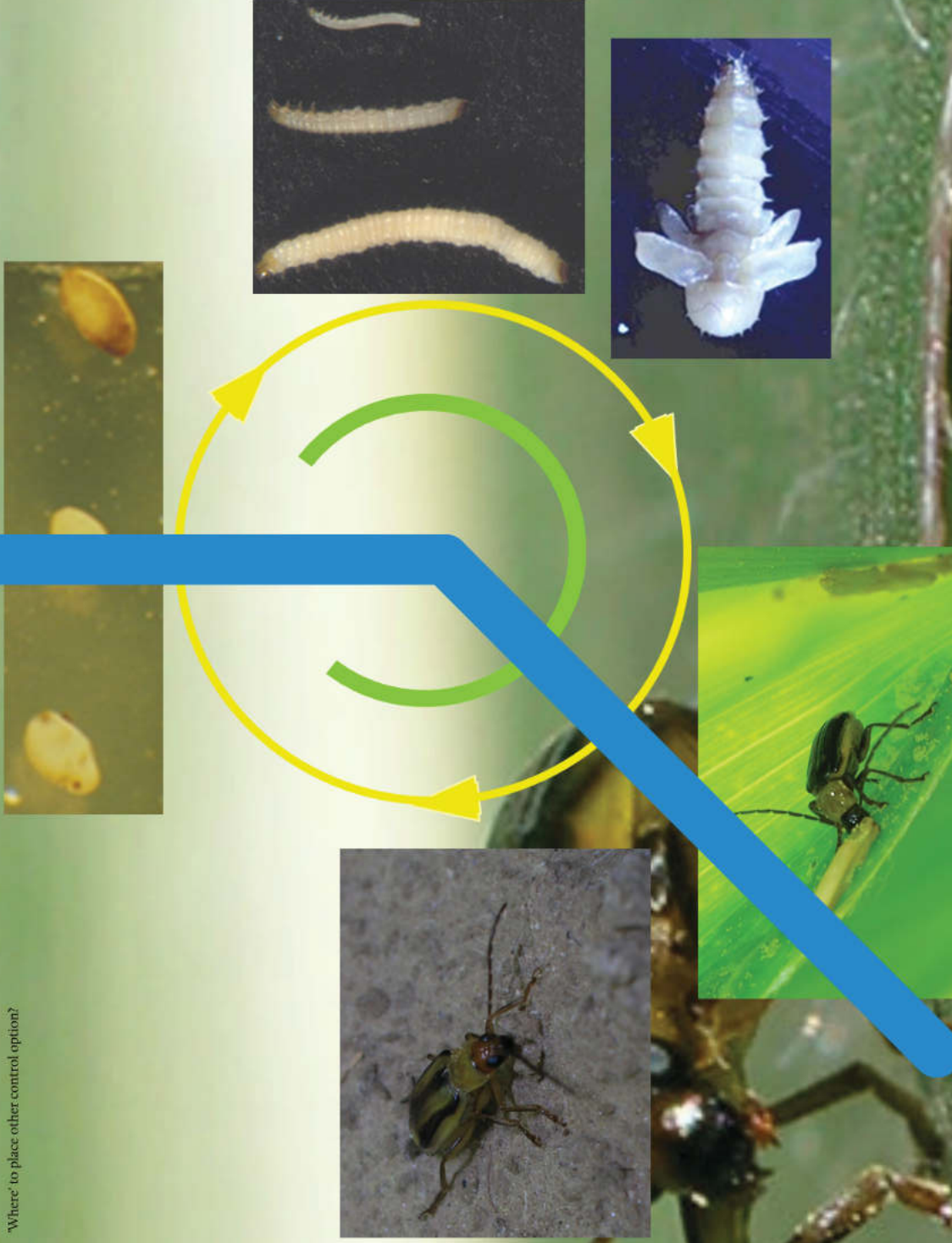


'Where' to place other control option?



two discrete time steps per year

Where to place other control option?



A close-up photograph of a yellow and black beetle, possibly a ladybug, on a green leaf. The beetle is positioned in the lower right corner, facing left. A semi-transparent white rectangular box is overlaid on the image, containing the text "END of the session" in a black serif font. The word "END" is in all caps and larger than "of the session", which is in title case.

END
of the session



Further info on this model:

<https://dx.doi.org/10.1016/j.agry.2013.10.009>