The background image shows a dry, hilly landscape with olive trees and stone terraces. The terrain is covered with dry grass and small shrubs. In the foreground, there are stone walls or terraces built into the slope. The sky is clear and blue.

Coupled Human and Natural Systems: Testing the Impact of Agricultural Terraces on Landscape Evolution

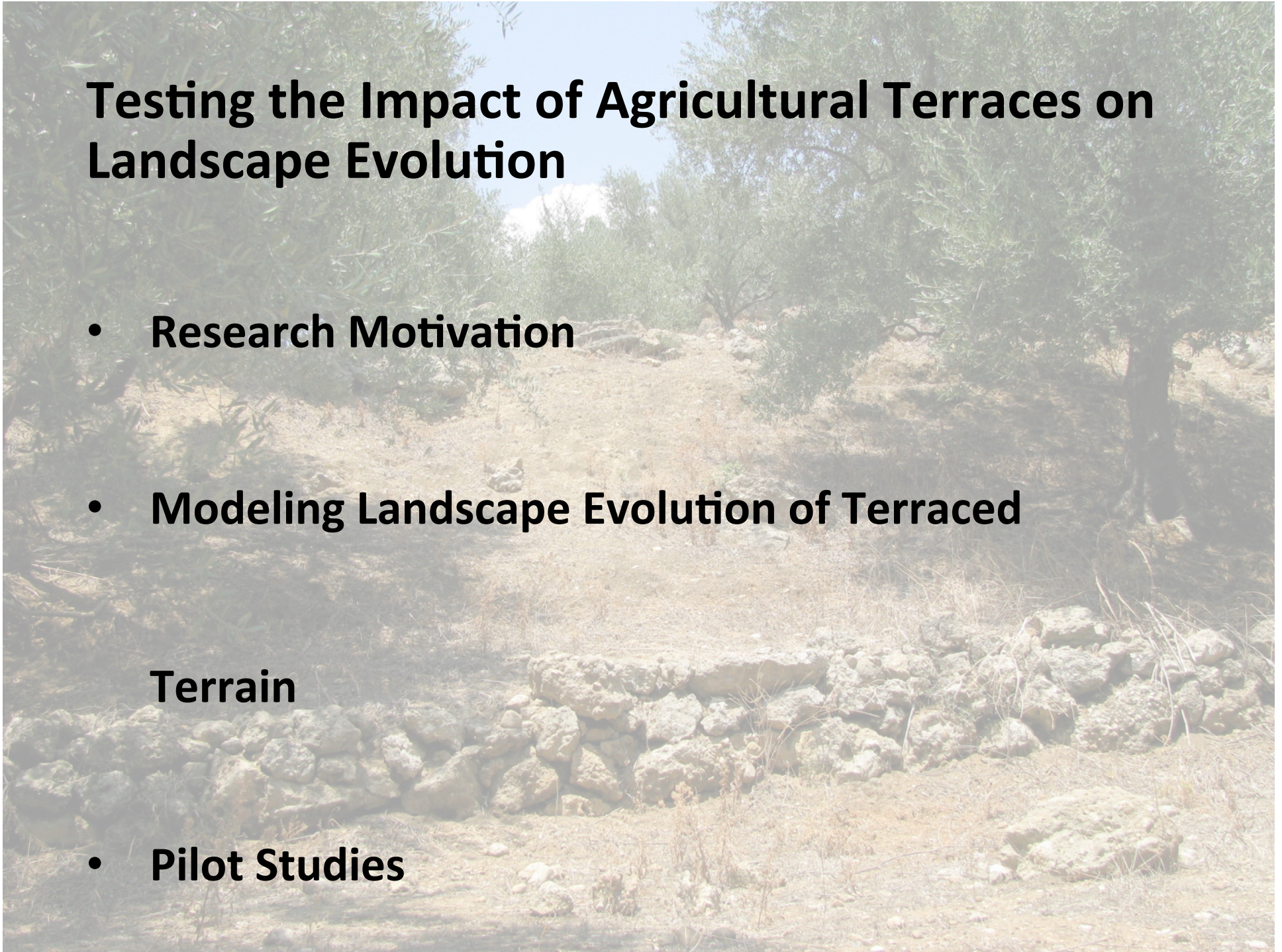
Jennifer E. Glaubius and Xingong Li
Department of Geography, University of Kansas
CSDMS 2015 Annual Meeting
27 May 2015

Testing the Impact of Agricultural Terraces on Landscape Evolution

- Research Motivation
- Modeling Landscape Evolution of Terraced

Terrain

- Pilot Studies



Research Motivation: Agricultural Terraces



Terraced Fields, The Mani, Greece

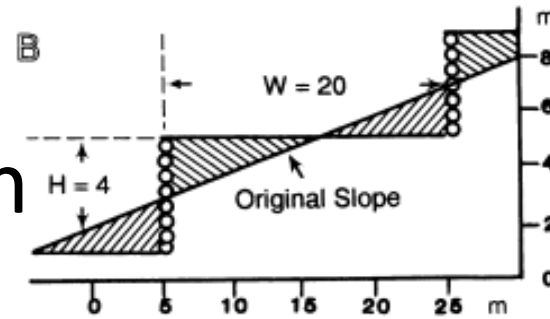


Longsheng Rice Terrace, China



Research Motivation: Terrace Life Cycle Stages

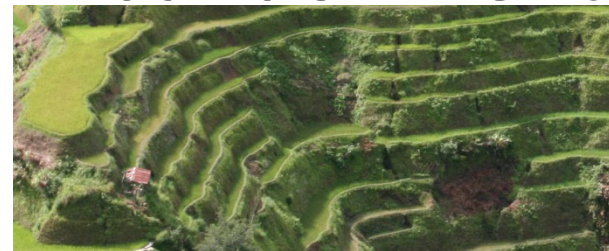
Construction



Use



Abandonment



Reconstruction



ELSEVIER

Review Article
Terraced
for soil

Paolo Tarco

^a Department of L

^b GESAAF, Agricul

^c Department of A

Research Motivation



How do human decisions regarding terrace maintenance impact landscape evolution?



Modeling Landscape Evolution of Terraced Terrain



United States
Department of
Agriculture

Agricultural
Research
Service

Agriculture
Handbook
Number 703

Predicting Soil Erosion by Water: A Guide to Conservation Planning With the Revised Universal Soil Loss Equation (RUSLE)

RUSLE

USPED



Available online at www.sciencedirect.com



Geomorphology 99 (2008) 329–340

GEOMORPHOLOGY

www.elsevier.com/locate/geomorph

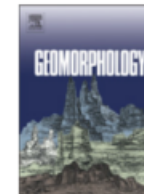
Simulation of soil erosion and deposition in a changing land use:
A modelling approach to implement the support practice factor



Contents lists available at ScienceDirect

Geomorphology

journal homepage: www.elsevier.com/locate/geomorph



olfi

LAPSUS

Modelling runoff and erosion for a semi-arid catchment using a multi-scale approach
based on hydrological connectivity

J.P. Lesschen ^{a,*}, J.M. Schoorl ^b, L.H. Cammeraat ^a

Modeling Landscape Evolution of Terraced Terrain

Model Control

Landscape Evolution Model

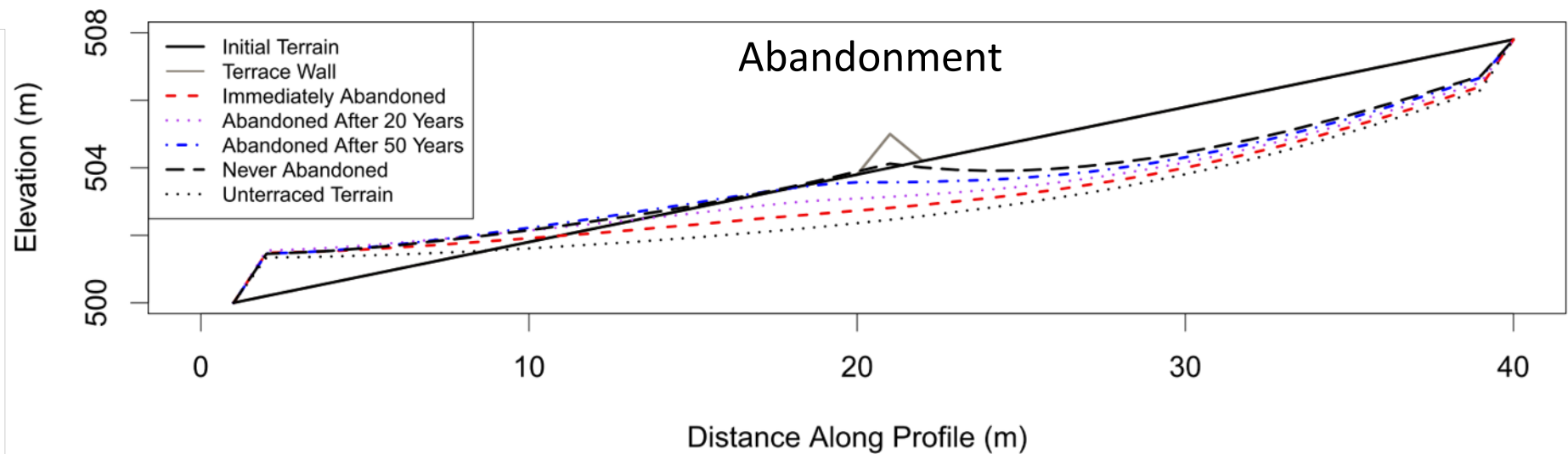
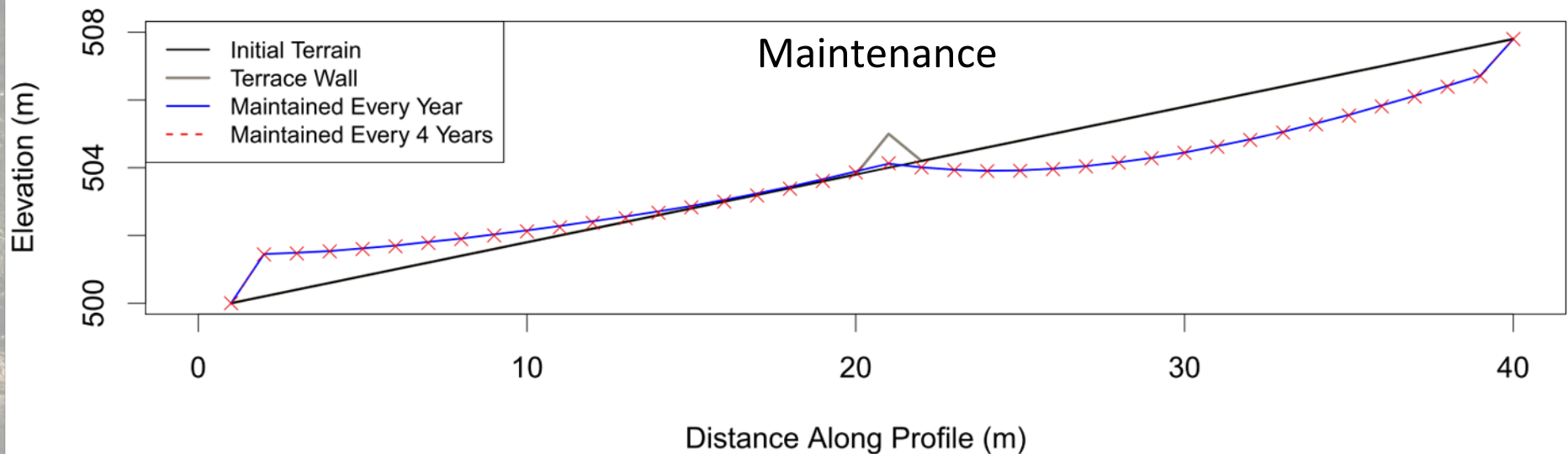
- Water transport and conservation
- Landscape evolution
- Conservation of sediment
(Chen et al. 2014)

Agricultural Terrace Model

Agent-Based Model (ABM)

- Land use
- Terrace maintenance
- Riser collapse
- Impact of biological factors

Pilot Studies: Maintenance and Abandonment



Pilot Studies: Goats ABM



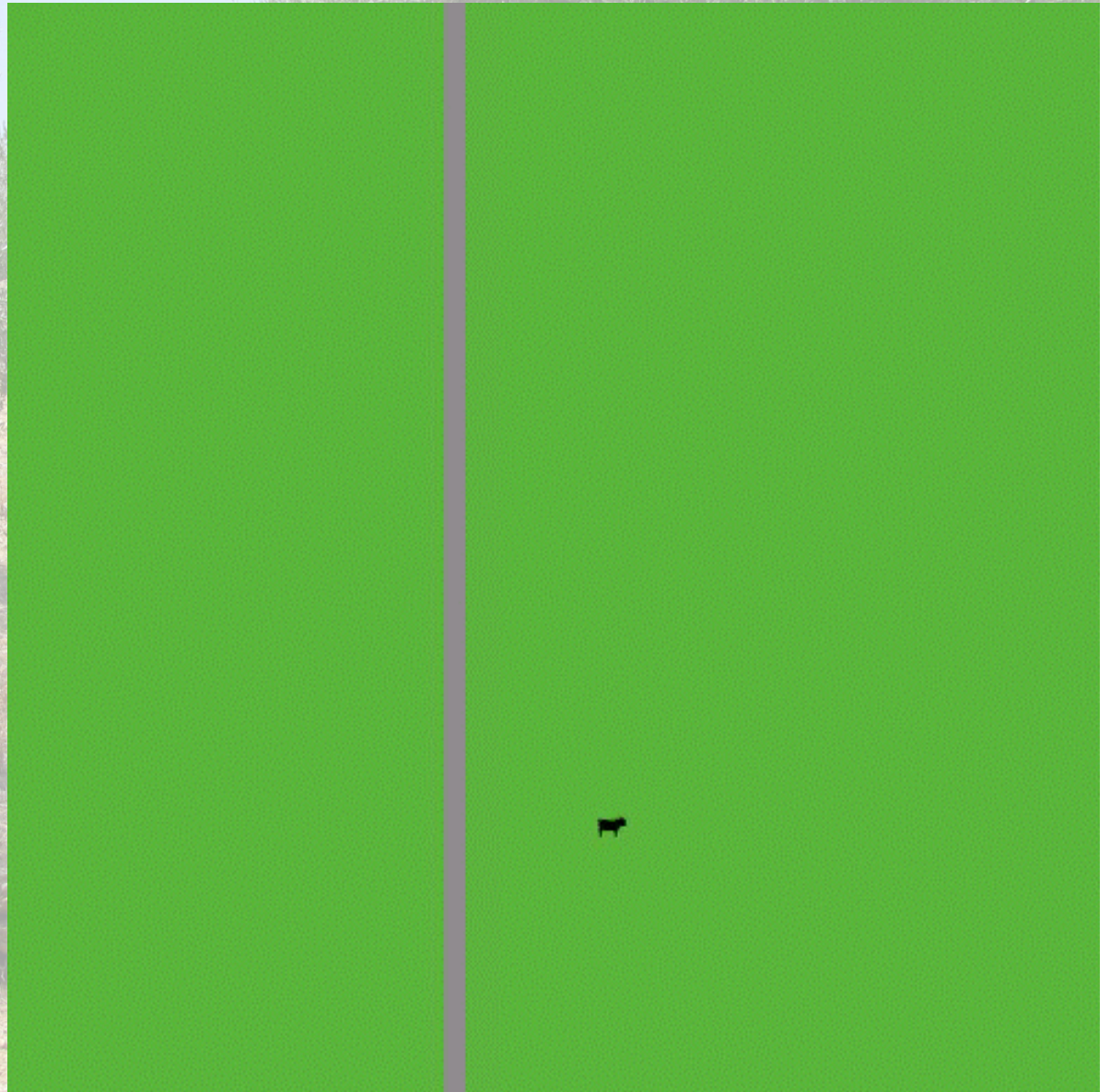
Terrace Wall




Damaged Section of Wall



Goat



A photograph of a dry, rocky hillside. In the foreground, there is a low, rustic stone wall made of irregular, light-colored rocks. The hillside is covered with dry, yellowish-brown grass and scattered rocks. Several olive trees with green, silvery leaves are scattered across the slope, some in the foreground and others further up. The sky is a clear, pale blue. The overall scene is arid and sunlit.

Questions? Comments?

Contact jen.glaubius@ku.edu

Modeling Landscape Evolution of Terraced Terrain

3-eqn Landscape evolution model from Chen et al. 2014

$$\frac{\partial \theta}{\partial t} = \nabla \cdot (\theta \nabla (z + \theta)) + r$$

$$\frac{\partial z}{\partial t} = c \Delta z - \varepsilon \theta^m |\nabla (z + \theta)|^{2m} + s \frac{\lambda}{\theta}$$

$$\frac{\partial \lambda}{\partial t} = \nabla \cdot (\lambda \nabla (z + \theta)) + \varepsilon \theta^m |\nabla (z + \theta)|^{2m} - s \frac{\lambda}{\theta}$$