

IGU-LUCC CONFERENCE 2010, PRAGUE

The influence of land use changes on the provision of ecosystem services in the Cezava region, the Czech Republic

Jana Kozáková

Outline

- Introduction
- Purpose of the study
- Case study area
- Methods
- Results
- Uncertainties
- Conclusion



Introduction

■ Landscape

- A place for natural and semi-natural ecosystems, from which people gain goods and services enhancing human well-being (MA, 2003)
- Influences ecological, economical and socio-cultural conditions

■ Importance of maintaining the capacity of landscape to provide its benefits

Introduction

European trends in land use

■ Intensification

- Increase of land use, enlargement of farming business

■ Extensification

- Land abandonment, depopulation

■ Overexploitation

- Fragmentation, erosion, biodiversity loss, acidification, eutrofication, etc.

Purpose of the study

- To understand how landscape of Cezava changed with different forms of land use from 1845 until now
- To identify changes in the provision of ecosystem services in Cezava during the observed period

The Case Study Area Cezava

- South Moravia
- 15 municipalities
- Total area: 160 km²
- One of the warmest and the most fertile regions in the Czech Republic
- Agricultural collectivization during 1950's
- Transformation of land use triggered degradation of landscape



Research Methods

- Land use analysis
 - LUCCC Czechia Database
 - Comparison of historical and actual maps
 - Aerial photos
 - Chronicles of municipalities

Moutnice Municipality



Research Methods

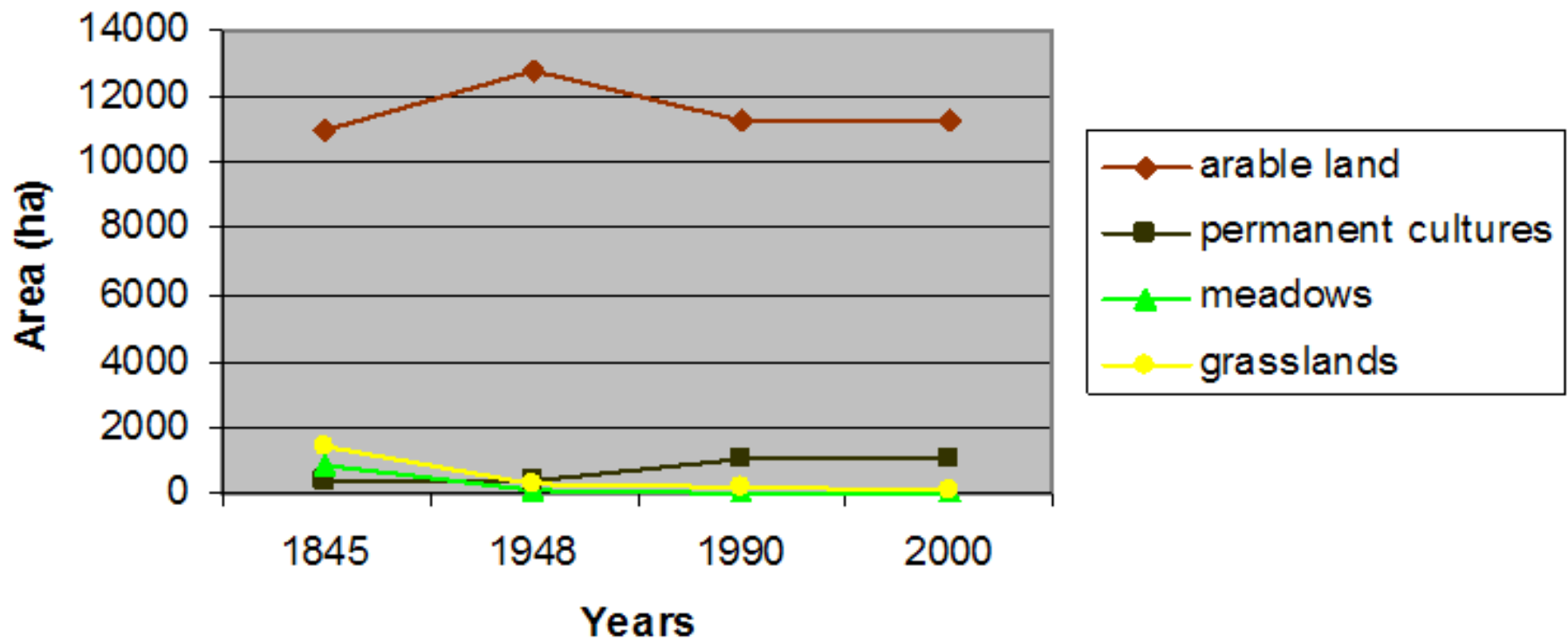
- Ecosystem services analysis
 - Method assessing the ecological impacts of human activities
 - MA (2003) definition of ecosystem services: “the benefits people obtain from ecosystems”

Ecosystem services under the scope of the research

Function categories	Importance	Services
Regulation	Regulation of biogeochemical cycles and biospheric processes	Climate regulation Air quality regulation Erosion control Flood protection
Habitat	Provisioning of habitats for species	Biodiversity
Production	Supporting humans with material benefits	Food and material production
Information	Supporting humans with knowledge, information, cultural values etc.	Historical heritage Recreation and tourism

Results Land Use Analysis

Agricultural Land (1845-2000)



Results Ecosystem Services Analysis

	Arable land (11,432 ha)	Forests (747 ha)	Water bodies (40 ha)
Regulation s.			
Climate regulation	CO ₂ fixation by crops x Non-vegetation season 9,603 t/y of carbon released	CO ₂ stored in wood biomass (119.5 t/ha) CO ₂ fixed (7 t/ha/y)	Fixation of CO ₂ by water vegetation CO ₂ dissolved in water
		Positive microclimate reg.	
Air quality reg.	Air pollution	Dust catching Positive air moisture reg.	
Erosion control	Water (2.65 t/ha/y) and wind erosion Streams siltation	Soil erosion prevention	No soil losses (regulated streams)
Flood protection	Diminished infiltration and retention capacity Flood risks	Hydrological flows regulation	Rainwater storage Flood prevention

	Arable land	Forests	Water bodies
Habitat s.			
Refugium and nursery	Habitat and biodiversity loss	Natural x Artificial Enhancement x reduction of sp. diversity	Massive stream regulation (90%)→habitat and biodiv. loss
Production s.			
Food provision	Total average yield: 9.4 t/ha/y	55.6 kg of meet/ha	Fish production 141 kg/ha
Raw material and fodder prov.	Lucerne (ø yield: 24 t/ha) Silage maize(ø yield: 28 t/ha)	Tot. growing stock of timber – 135 m ³ /ha	Collection of mineral water – 1,800 m ³ /y
Cultural s.			
Historical heritage	Digs (Blučina) Slavkov Battlefield	-	Mineral water Šaratica
Recreation and tourism	Biking trails (140 km) Wine tourism Monotonous lsc.	Forest visits Hunting	Fishing

Results Changes in Ecosystem Services Provision

	Ecosystems								
	Arable land			Forests			Water bodies		
Years	1845–1948	1990–2005	Trend	1845–1948	1990–2005	Trend	1845–1948	1990–2005	Trend
Regulation Services									
Climate regulation	++	---	↓↓↓	++	+++	↑	+	--	↓↓
Air quality	-	---	↓↓	++	+++	↑	++	--	↓↓↓
Erosion control	-	---	↓↓	++	+++	↑	+	++	↑
Flood protection	-	---	↓↓	++	+++	↑	+	++	↑
Habitat Services									
Refugium and nursery	+	---	↓↓↓	+	++	↑	+++	--	↓↓↓
Production Services									
Provision of food	+	+++	↑↑	+	+	↔	++	+	↓
Provision of raw material	+	++	↑	+	+++	↑↑	+	+	↔
Provision of ornament. species	0	0	0	+	+	↔	0	0	0
Cultural Services									
Historical heritage	+	+	↔	0	0	0	+	+	↔
Recreation and tourism	+	-	↓↓	+	++	↑	++	+	↓

Results Changes in Ecosystem Services Provision

- 1845 – 2005

Service	Mean change (%)
Regulation	- 22
Habitat	- 55
Production	+ 15
Cultural	- 11

Uncertainties

- Ecosystem services analysis
 - Not all services provided by observed ecosystem types have been identified or quantified
 - Ecosystem services are considered as linearly available
 - The changes in the capacity of ecosystems to provide services were believed to be triggered by the anthropogenic influence

Conclusion

- Ecosystem services analysis identifies significance of particular services, can help to assess the costs of their loss
- Social recognition of the values of ecosystem services
- Innovative methodology
- Constructive landscape planning

An aerial photograph of a rural landscape. A wide, light-colored road or path runs diagonally from the upper left towards the lower right. The land is divided into numerous rectangular and irregular plots of varying colors, including shades of brown, tan, green, and dark green, suggesting different agricultural uses or stages of crop growth. In the lower-left quadrant, there is a cluster of buildings, possibly a farm or a small village. The background shows a hazy horizon under a clear blue sky.

Thank you for your attention!