167 EAAE Seminar "European agriculture and transition to bio-economy"
and CONFERENCE : „Visions of bioeconomy and agricultural policies”

SPATIAL DRIVERS OF AGROFORESTRY ADOPTION SUPPORTED BY CAP MEASURES IN HUNGARY

KAPOSVÁRI EGYETEM

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Introduction

Agroforestry (AF) systems are complex agricultural systems that can combine multiple land use in time and space.

It has implemented multiple uses of the area.

(Saláta et al.. 2013. p. 315)

Main principle: exploiting synergic ecological and economic interractions.

(Lungren és Raintree. 1982; Leakey. 1996; Nyári. 2006).

1 ha agroforestry (silvoarable) land = 0.8 ha arable land + 0.6 ha forest

(Dupraz. 2012)

Generating externalities:

- Biodiversity
- Varied landscapes
- Deflation, erosion prevention
- Carbon absorption
- Activity diversification

(Keserű és Honfy. 2015)

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Motivation and objective 1 – policy issues

- Most important AF promoting CAP-measures budgeted in Hungary between 2007 and 2013 (-2015*):
  - Measure 221: First afforestation of agricultural land
  - Measure 222: First establishment of AF systems on agricultural land
- Very low implementation ratio:
  - Measure 221: 58% implemented to the amount of the money budgeted
  - Measure 222: 26% implemented to the amount of the money budgeted
- Future policy challenges (Mosquera-Losada et al, 2017):
  - CAP should promote AF through payments to enhance AF practices
  - European AF Strategy should be designed to foster AF in Europe

There is a need for a better understanding of drivers affecting the uptake of AF practices

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Motivation and objective 2 – research questions

- There is a relative low number of scientific studies regarding environmental socio-economic drivers of AF adoption.
- The vast majority of these studies investigates the environmental factors at spatial level OR socio-economic factors at farm(er)-level.
- Spatial analysis dealing with both environmental and socio-economic factors of AF adaptation is virtually non-existent.

The aim of the research is to explore the spatial hotspots of AF adoptation supported by CAP and identify their environmental and socio-economic drivers at settlement level.

- RQ1: Where can the hotspots of AF adaptation be found in Hungary?
- RQ2: What are the most important drivers shaping the spatial clusters of AF adoption?

Theoretical model of the research

Drivers of AF adoption			
Settlement size	*Population*		*Forests* *rasslands* *l natural areas*
Financial support for sustainable technologies			*arm areas* *orests* *Grasslands* *Croplands*
Farm animals			*from the district*
Farm structure	*Ratio of individual farms*	**cooperations**	*of agricultural* *ves* *Financial support for producer groups*

Proxy variable for
Spatial pattern of AF adoption:

Density of subsidies
(HUF/ha farmland)
spent in measures 221 and 222 at
settlement level
(2007-2015)

Variable code: suppaftot

List of independent variables

Variable code	Variable name	Period	Dim.
pop	Settlement population	2011	heads
totarea	Total area (TA) of the settlement	2011	ha
forest	Ratio of forests to TA	2012	%
natgrass	Ratio of natural grasslands to TA	2012	%
wetland	Ratio of wetlands to TA	2012	%
protarea	Ratio of protected areas to TA	2012	%
farmarea	Ratio of farmlands (FL) to TA	2010	%
agriforest	Ratio of on-farm forests to FL	2010	%
agrigrass	Ratio of on-farm grasslands to FL	2010	%
lstock	Livestock density	2010	LU/ha
rumin	Ratio of ruminents to livestock pop.	2010	%
empagri	Ratio of agriculture in employment	2011	%
indfarm	Ratio of individual farms	2010	%
agricoop	Number of agricultural cooperatives	2007-2015 (avg)	pcs
supppg	Financial support for producer groups to FL	2007-2015 (sum)	HUF/ha
suppextser	Financial support for agricultural extension to FL	2007-2015 (sum)	HUF/ha
suppagrenv	Financial support for agri-environmental projects to FL	2007-2015 (sum)	HUF/ha
distdc	Distance from the district center	2011	minutes

Methodology of empirical analysis

Natural logarithmization of ‚suppaftot’ variable
→ ‚log_suppaftot’

Spatial Cluster Analysis of ‚log_suppaftot’

global Moran’s I and Getis-Ord Gi*

Save Spatial Cluster membership as a binary dependent variable: (c_id=1 if a settlement is the member of a high cluster, c_id=0 otherwise)

Factor analysis of the independent variables (Principal component. Varimax rotation)

KMO. Bartlett test. Eigenvalue>1

Logit regression using c_id as binary dependent variable

Goodness-of-fit and correctly classified index

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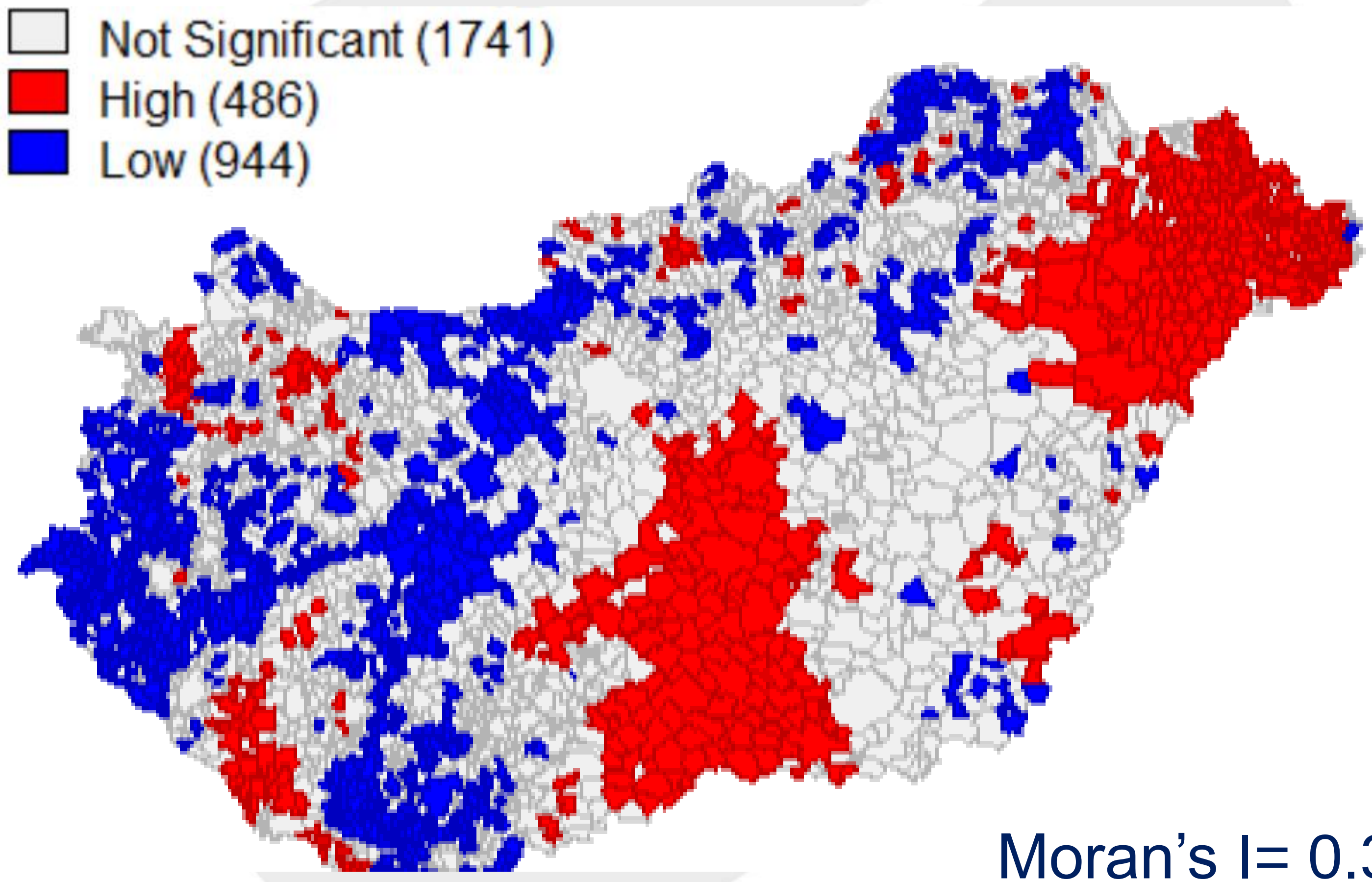
Results 1: Spatial Cluster Analysis

Gi* cluster map of dependent variable



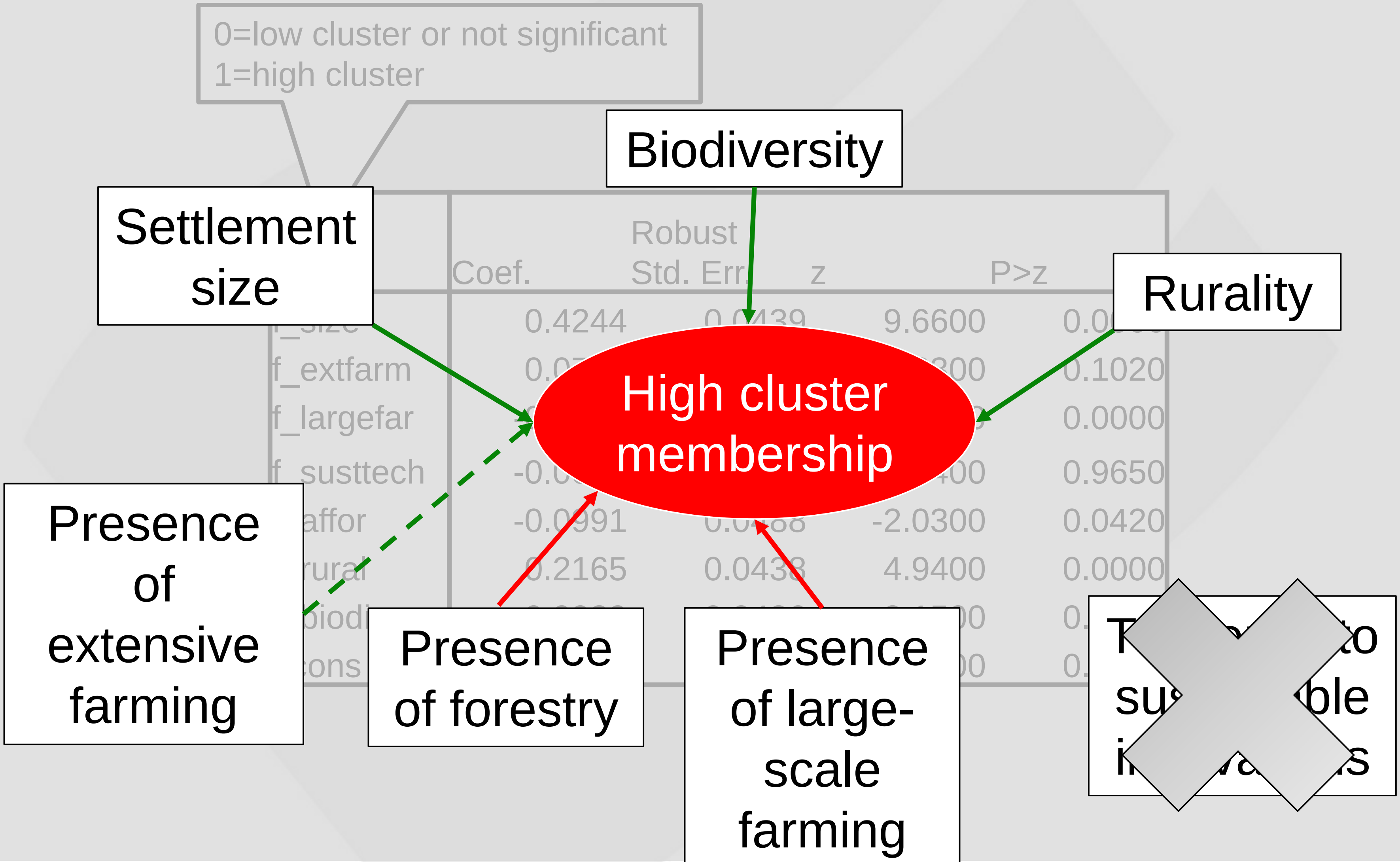
Moran's I= 0.30
Pseudo p< 0.05
Permut.= 10 000

Results 2: Factor analysis

Variable	Settlement size F_Size	Presence of extensive farming F_ExtFarm	Presence of large-scale farming F_LargeFarm	Tendency to sustainanble innovations F_SustTech	Presence of forestry F_Affor	Rurality F_Rural	Biodiversity F_Biodiv
TotArea	0.8660						
Lstock	0.8275						
Pop	0.7034					- 0.4548	
AgriGrass		0.9103					
AgriCrop		- 0.8281					
Rumin		0.5776					
IndFarm			- 0.8136				
FarmArea			0.7565		- 0.3352		
AgriCoop	0.3969		0.4972				
SuppExtServ				0.9587			
SuppAgrEnv				0.9511			
SuppPG							
Forest					0.7559		
AgriForests					0.7360		
EmpAgri						0.7989	
DistDC						0.6749	
Wetland							0.7725
ProtArea					0.3849		0.6447
Natgrass					0.3354		0.4556

KMO= 0.6393
Barlett p-value< 0.001

Results3: Logit regression



Goodness of fit: chi2(3129)=3110.7 p= 0.5884
Correctly classified= 84.43%

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Conclusions 1

- The structure of spatial drivers identified in this research partly differs from the farm-level models. Our results contribute to developing an empirical tested model explaining spatial diffusion of AF practices.
- According to recent studies the rural character of small-scale farming and the presence of extensive farming affect AF adoptation positively. The positive role of settlement size is probably ensured by the acces of markets and institutions.
- Based on conceptual and empirical literature, we assumed that the high level of afforestation has a positive impact on AF adoptation. Surprisingly, our results show that the presence of traditional forestry is a barrier to apply AF practices. Due to this fact the role of forests should be distinguished from other areas of high biodiversity (grasslands and wetlands).

Conclusions 2

- Contrary to the recent farm-level surveys, our results do not confirm that the tendencies to submit other agri-environmental applications and to use of extension services have a positive impact on application of AF practices.
- Our results suggest that the wider adoption of AF technologies needs a more consistent AF strategy and policy. Future CAP should promote AF both on agricultural lands and in forests. The low AF activity of highly forested areas can be improved by the promotion of forest farming and mountain-linked AF practices (i.e. mountain pastoralism).
- The connection between AF measures and other agri-environmental supports should be improved in the next CAP-period.
- Further possible research direction: Our next aim is to develop and test a spatial weighted autoregression model.

Thank You for Your Attention!

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