

Biotic components of sustainability:

Assessing ecosystem services in livestock farming systems

Marie, M.^{1,2} and Merchier, M.¹

¹INRA, SAD-ASTER, 662 avenue Louis Buffet, 88500 Mirecourt, France

²Université de Lorraine, ENSAIA, 2 avenue de la Forêt de Haye, 54505 Vandoeuvre lès Nancy, France

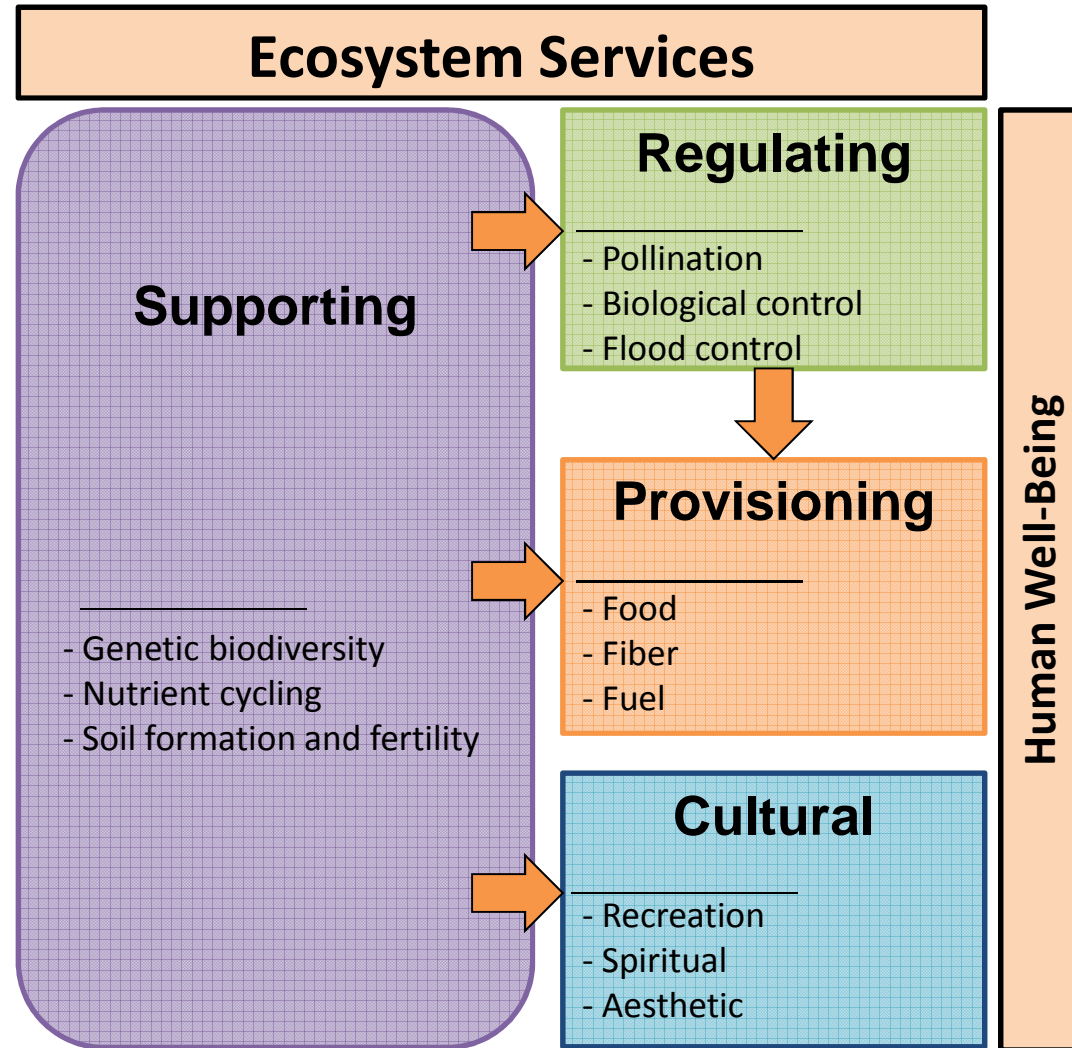
michel.marie@mirecourt.inra.fr



SAD – ASTER-Mirecourt

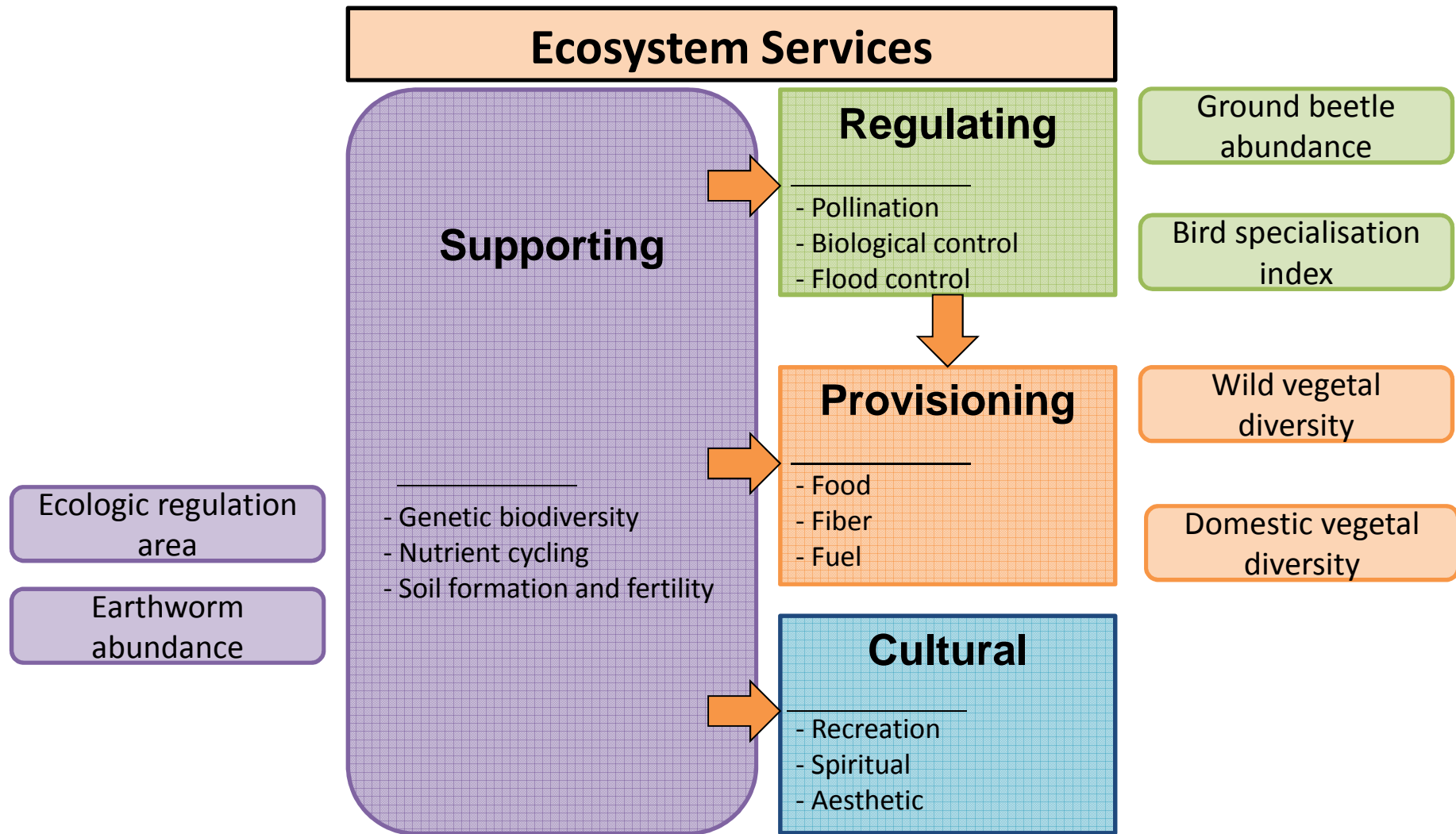


EAAP 63rd Annual Meeting, Bratislava, Slovakia, August 27th-31st, 2012



Alcamo et al., 2003, Millenium Ecosystem Assessment, 2005,
 Zhang et al., 2007, Sandhu et al., 2010, ...





SPCE (mixed): 60 dairy cows, 48 ha meadows, 106 ha cultures

SH (grassland): 40 dairy cows, 80 ha meadows



Ecologic regulation area

- hedges, groves, trees, streams, ...
- $I_{ERA} = f(s/S, k_{dist})$ max if $s/S \geq 14\%$ and $dist < 50m$
- (Vilain, 2003; Pointereau et al 2007; Olson & Wäckers, 2007)



Ecologic regulation area

SPCE

SH

%ERA= 9.6%
26% of fields <50m from an ERA

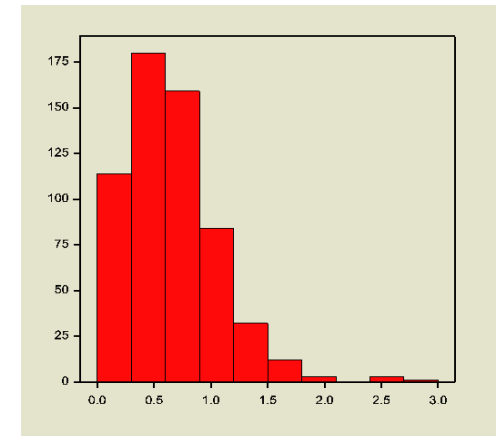
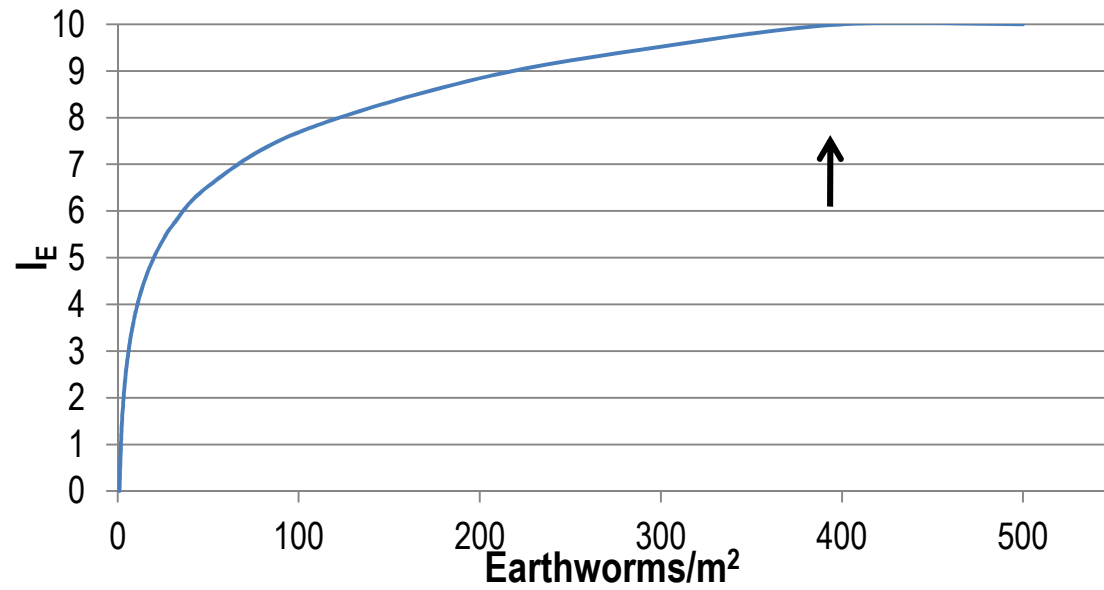
%ERA= 20.1%
53% of fields <50m from an ERA

$I_{ERA}=4.8/10$

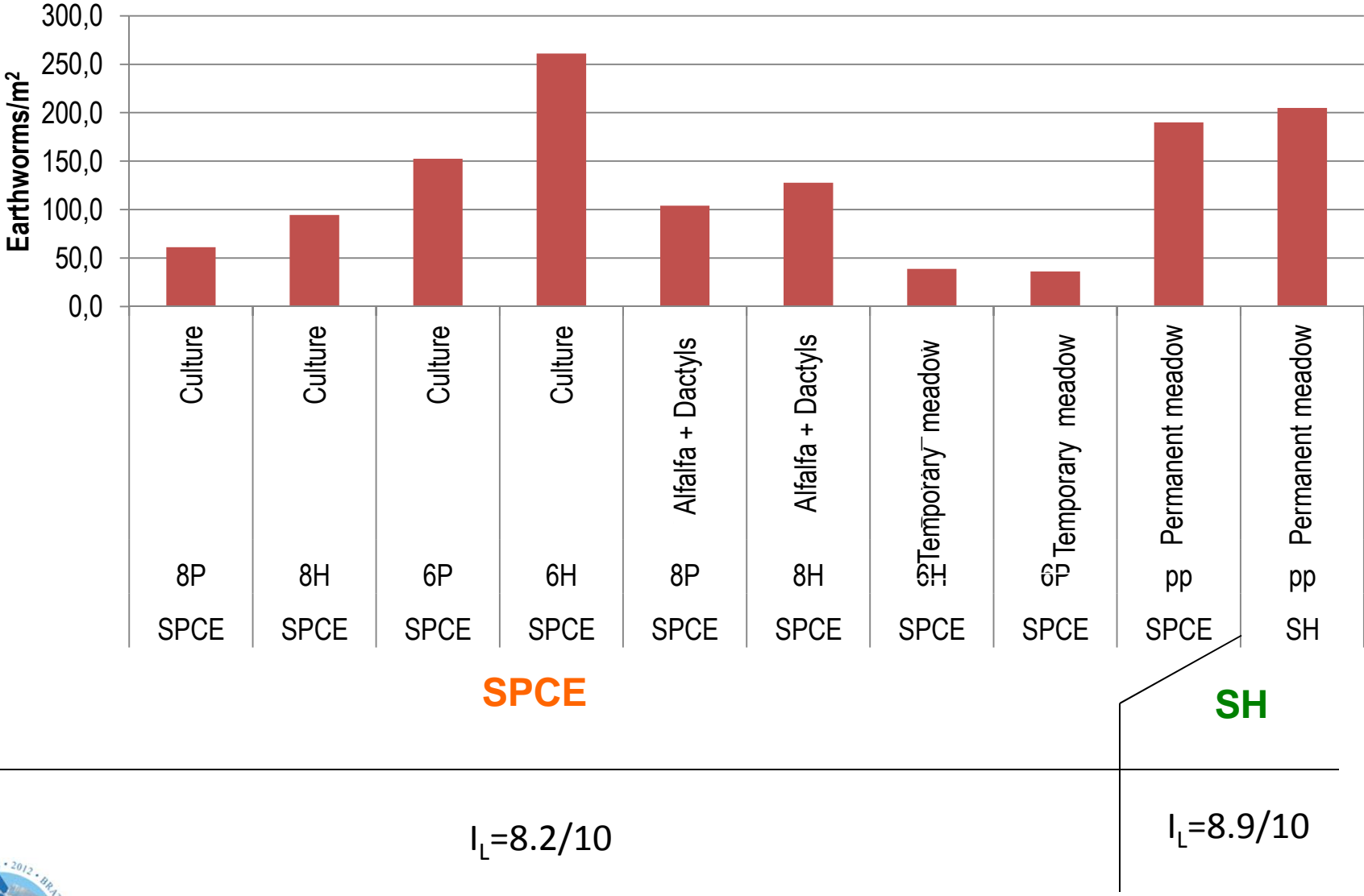
$I_{ERA}=8/10$



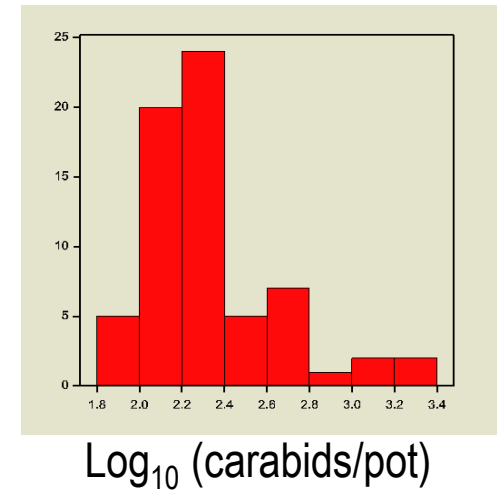
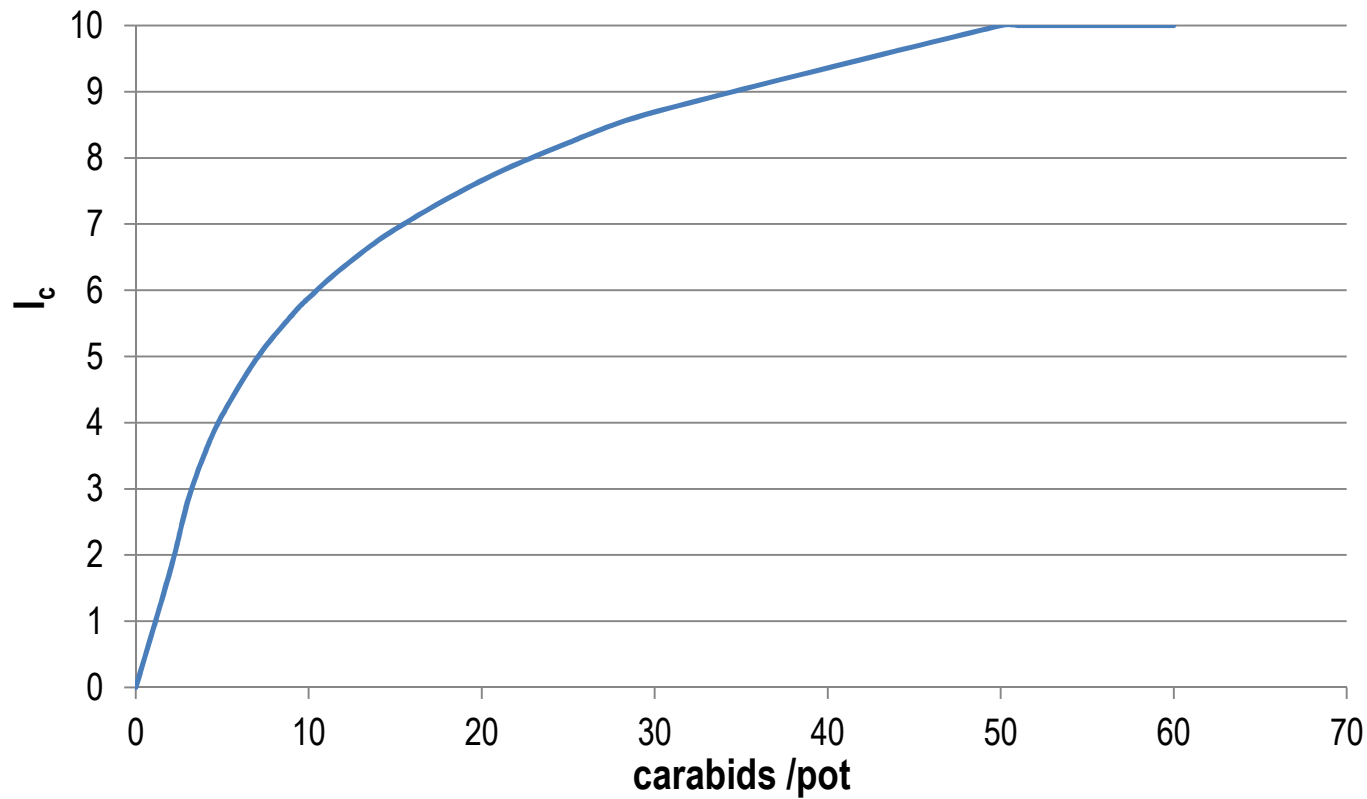
Earthworm abundance



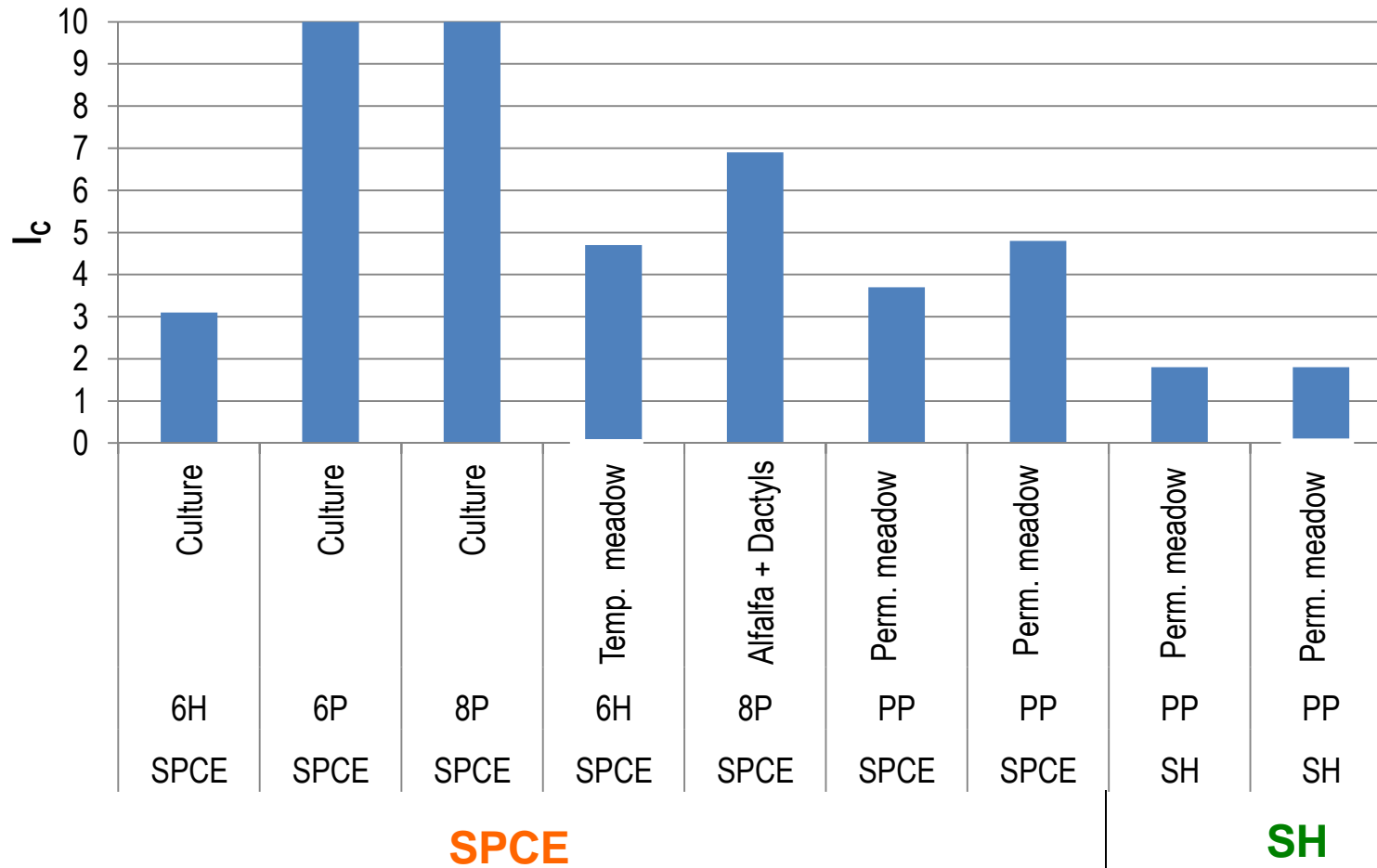
Earthworm abundance



Ground beetle (carabids) abundance



Ground beetle (carabids) abundance



$I_c=6.2/10$

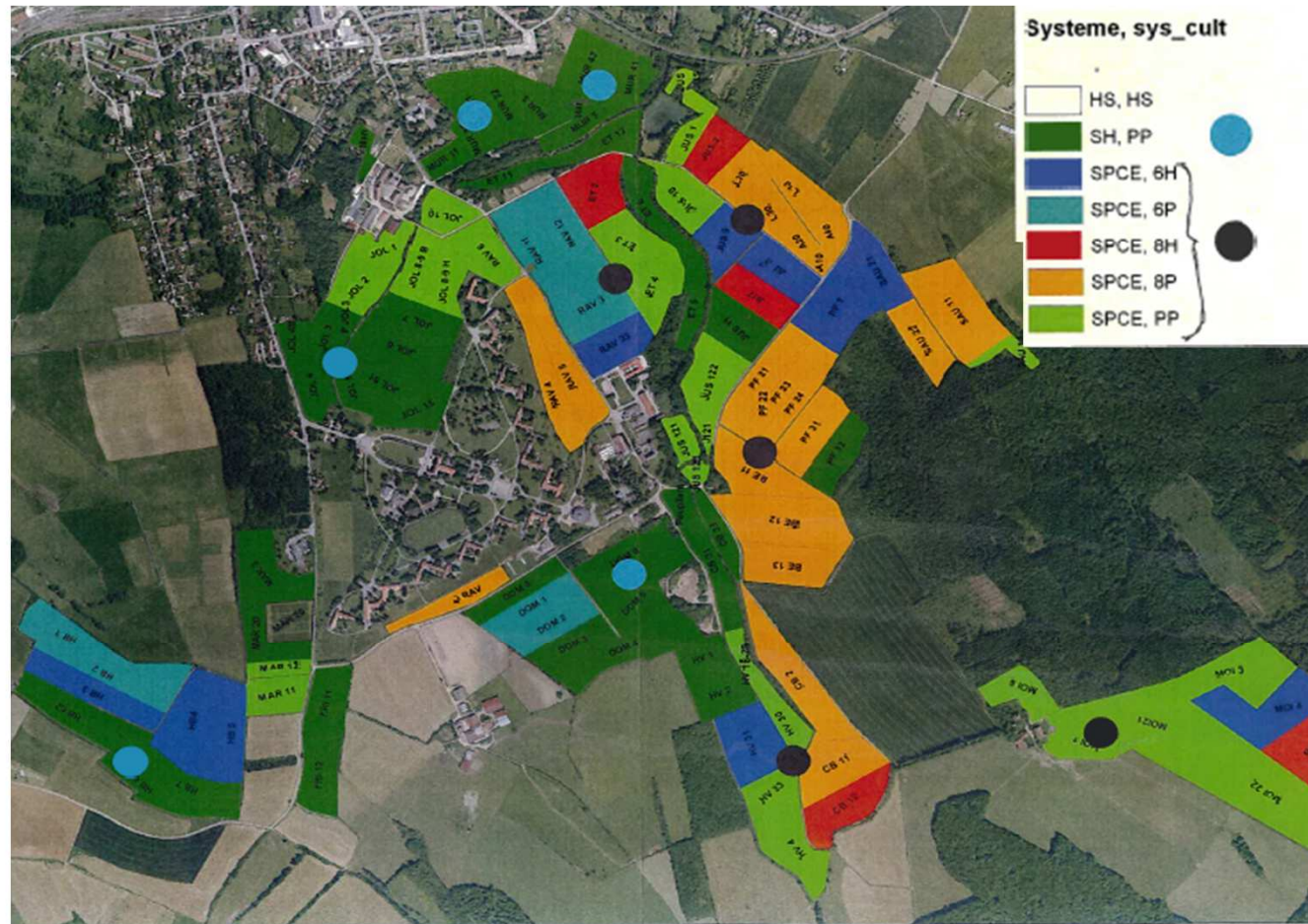
$I_c=1.8/10$



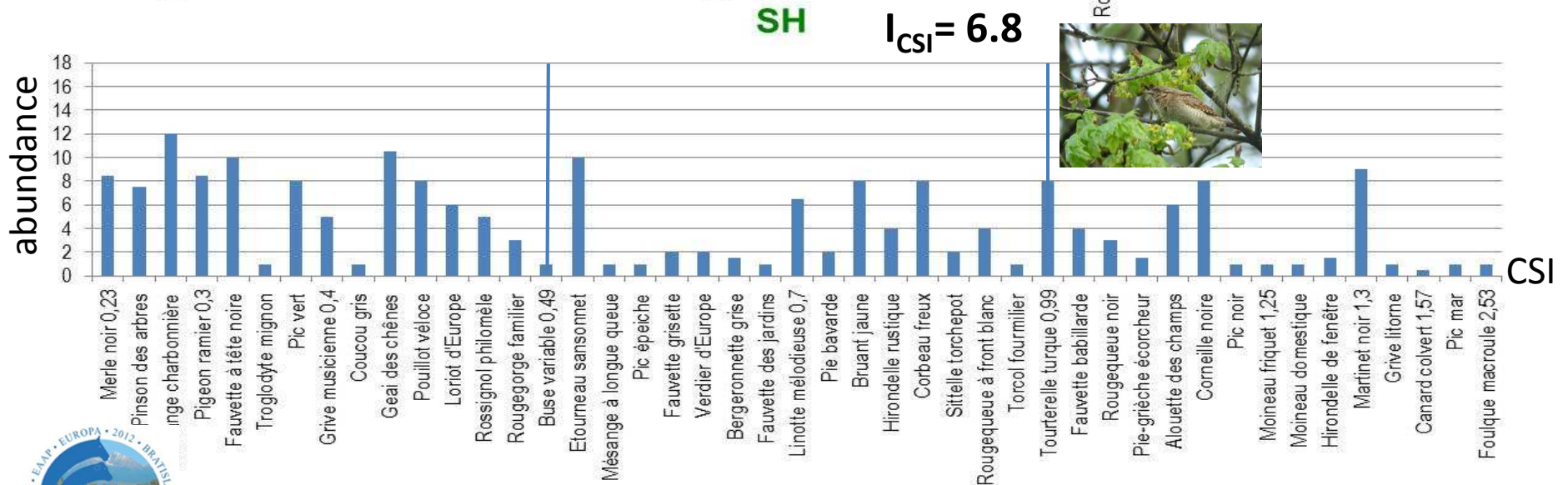
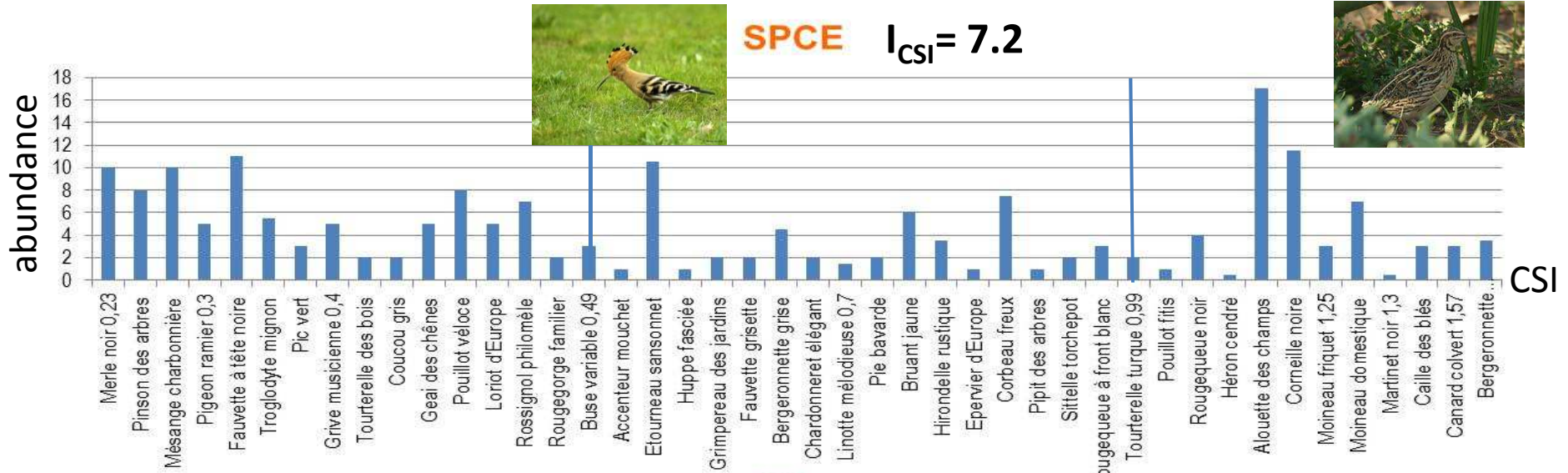
Bird community specialization index

$$CSI = \frac{\sum_{i=1}^N a_{ij} (SSI_i)}{\sum_{i=1}^N a_{ij}}$$

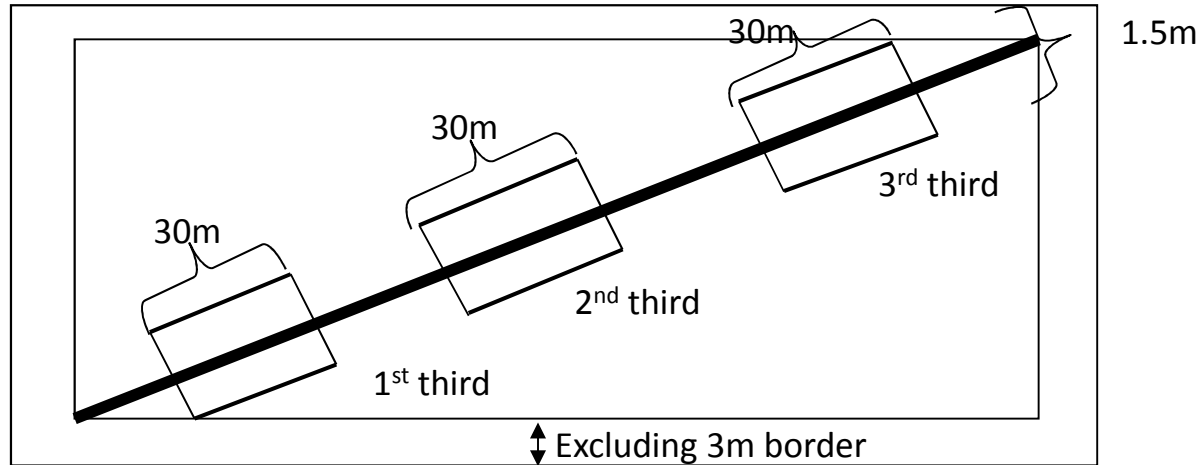
$$I_{CSI} = CSI * 10 / M_{SSI}$$



Bird community specialization index



Wild vegetal diversity



Flowered Meadows Method (Mestelan et al., 2009)

$$I_{WVD} = f(\text{Nb Sp.} * 0.83, \text{rel. Surface})$$

List of 36 species specific of different biotopes



Lotus L.



Silene flos-cuculi L.



Trifolium L.



Tragopogon L.



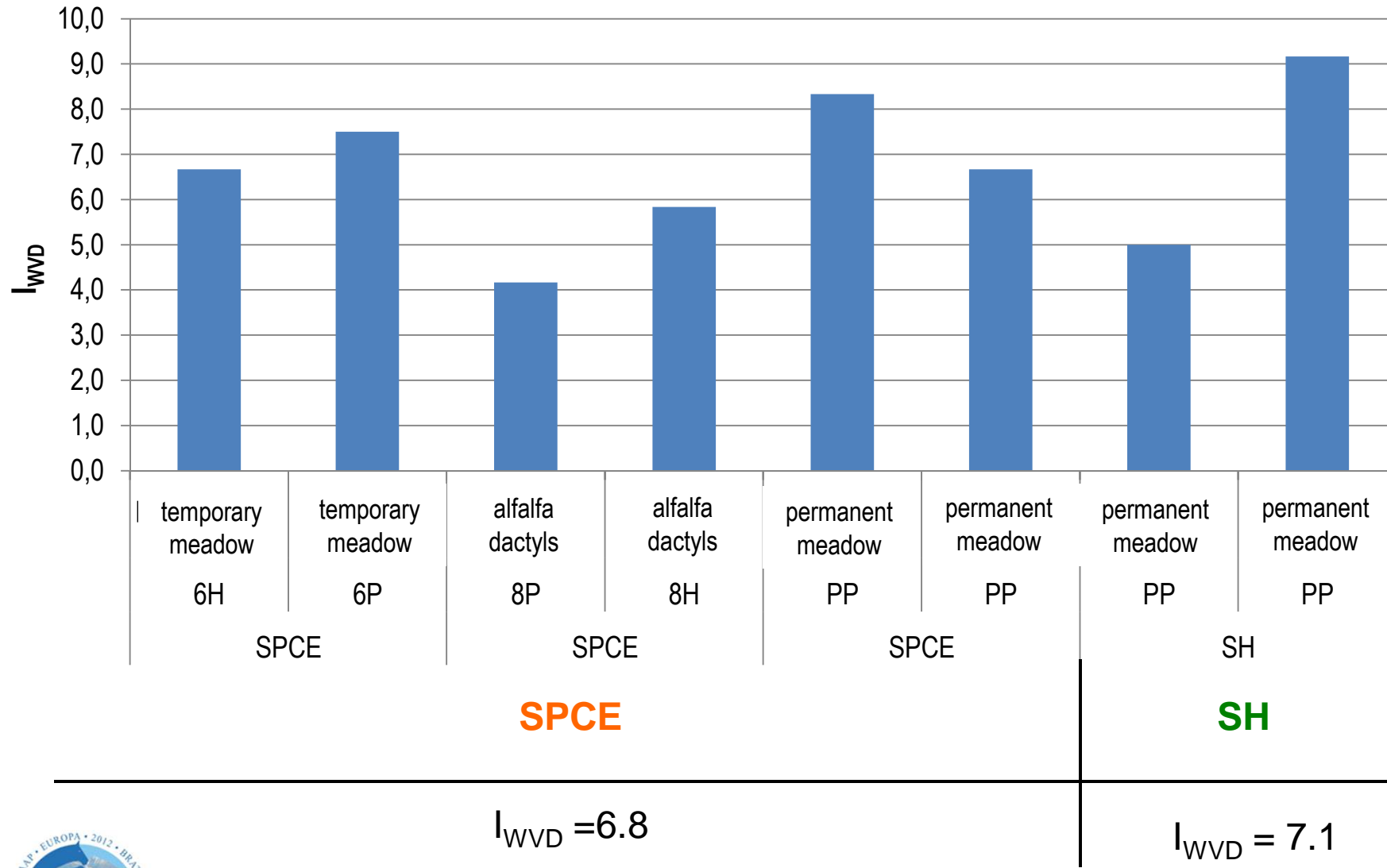
Rumex L.



Achillea millefolium L.



Wild vegetal diversity



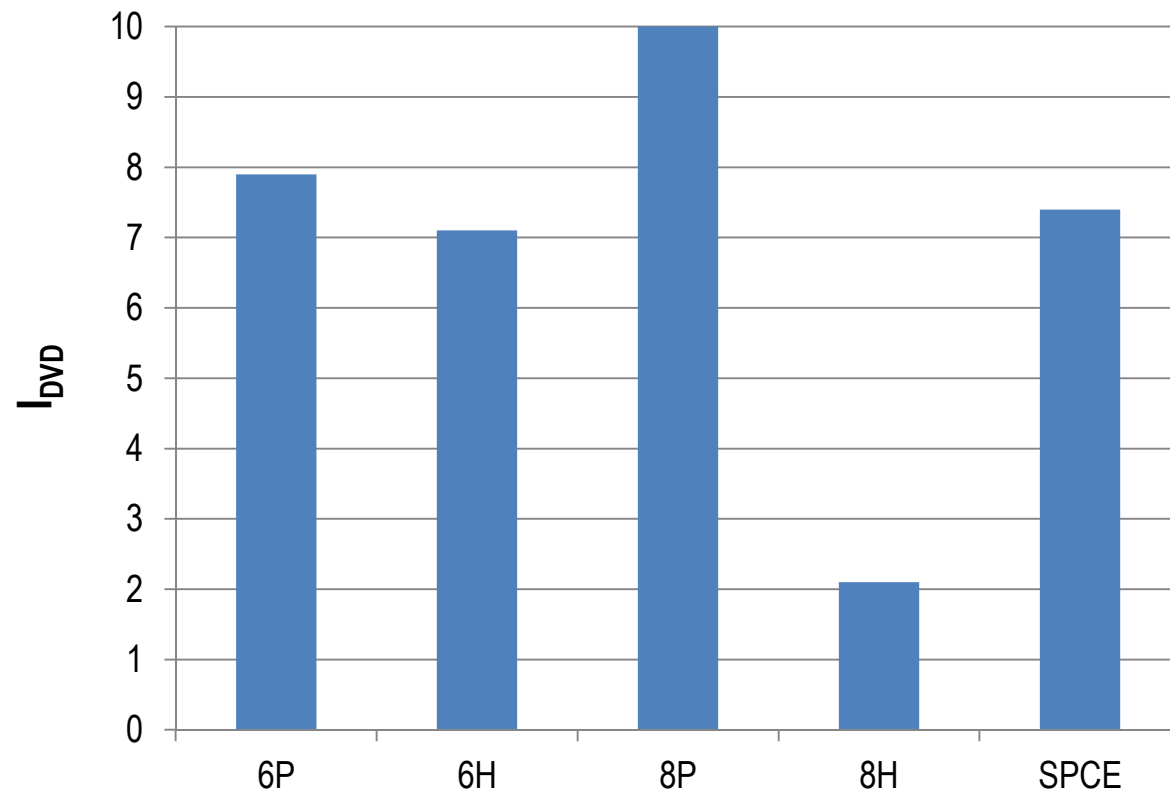
Domestic vegetal diversity

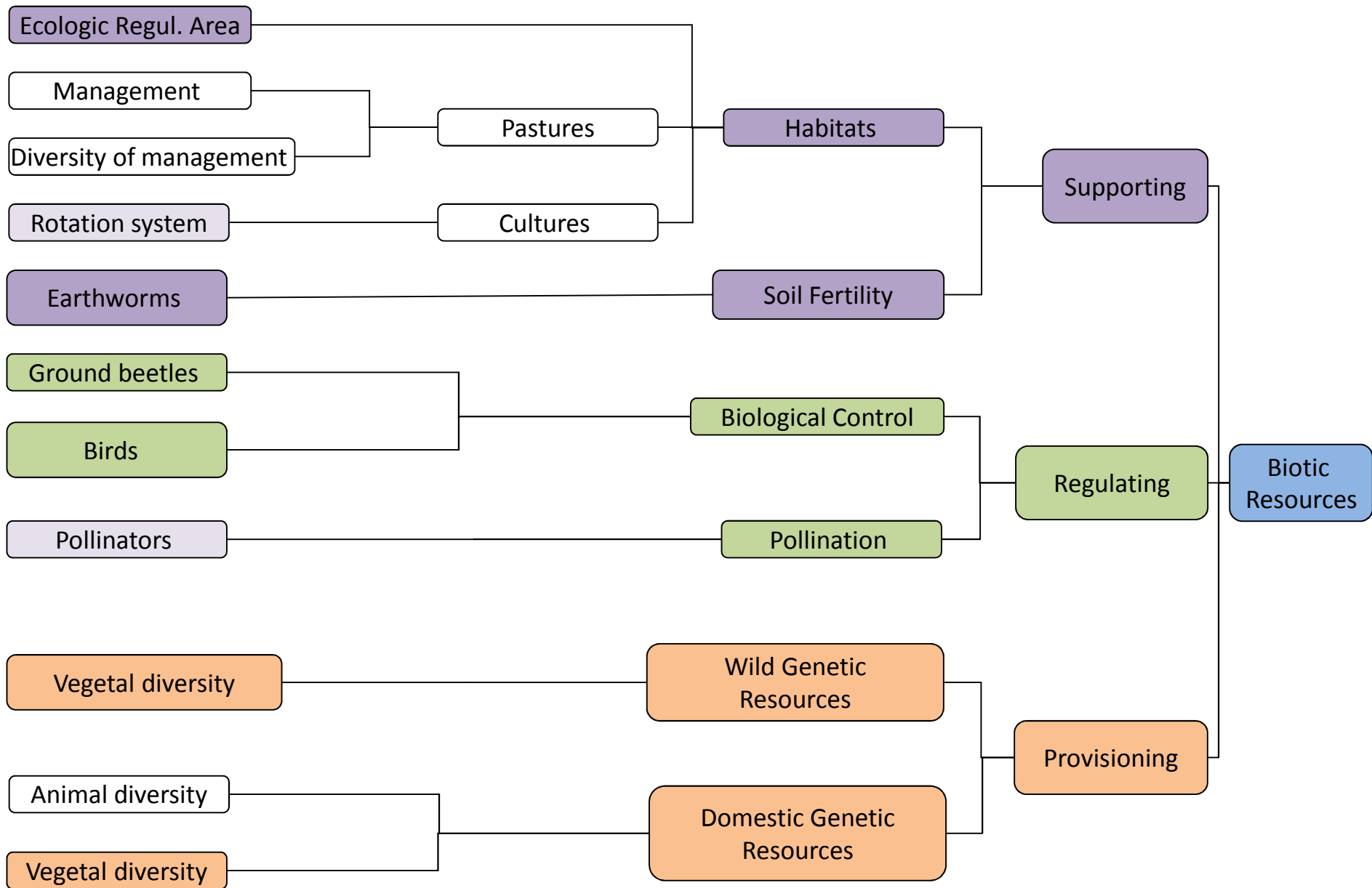
$$I_{DVD} = NC \times k \times D \times T \times C_{av} \text{ (INDIGO)}$$

F(number of cultures, proportions, size, associated cultures)

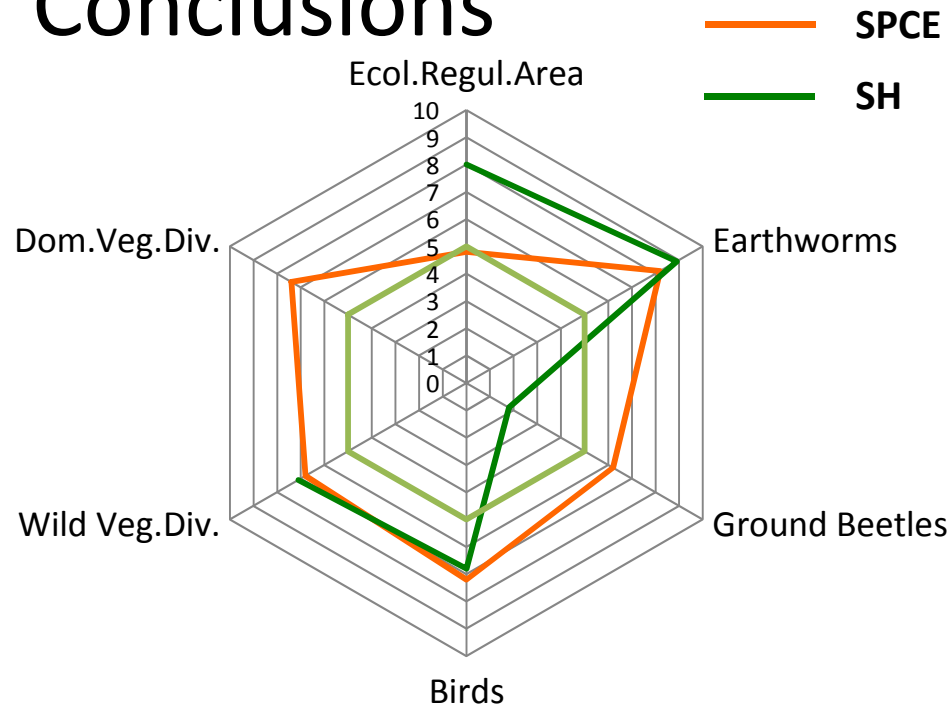
SPCE:

$$I_{DVD} = 7.4/10$$





Conclusions



Assets:

- Organic production systems
- Long-term rotations
- Associated cultures
- Intercultures

To go further:

- Develop hedges
- Adapt mowing dates
- Reduce tillage
- Diversify cultivated species

Thank You for your attention

