EAAP conference Belfast 2016

Session 06 - Mixed Farming systems - Does diversity bring any benefits and at what scale?

Livestock farming system diversity and resource use efficiency – What the history tells for France?

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Setting the scene

- Past trend of specialization (Peyraud et al., 2014)
  - Livestock / Crop
- Pattern of specialization is no longer sustainable
- Benefits brought by diverse land use described in literature
  - Recycling of nutrients
  - Biodiversity conservation
  - Provision of ES

→ How more diverse systems help providing better efficiency in the use of resources?

Objective

Assess the production performance in terms NU in areas with contrasted **land use diversity**

Approach :

Nitrogen conversion efficiency

Change over time in the use of feed resources and provision of livestock products

Human-edible protein balance

Competition with human nutrition

Nitrogen self-sufficiency

Livestock feeding and feed imports

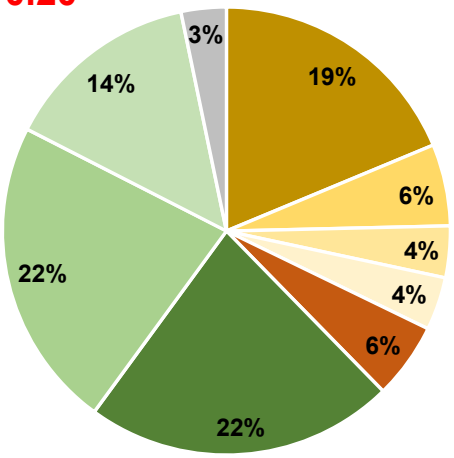
LAND USE DIVERSITY

Two study areas with contrasted LU Diversity

2010

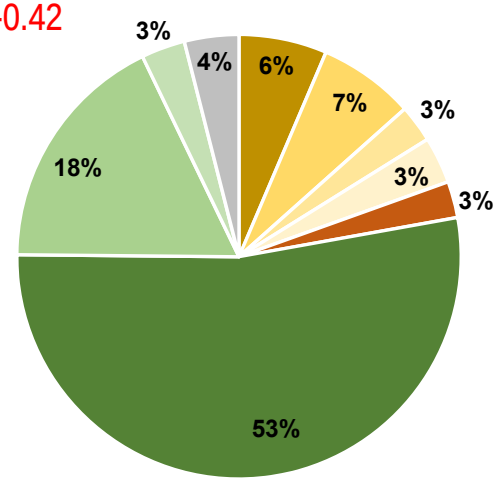
INTENSIVE

1.96
+/-0.20

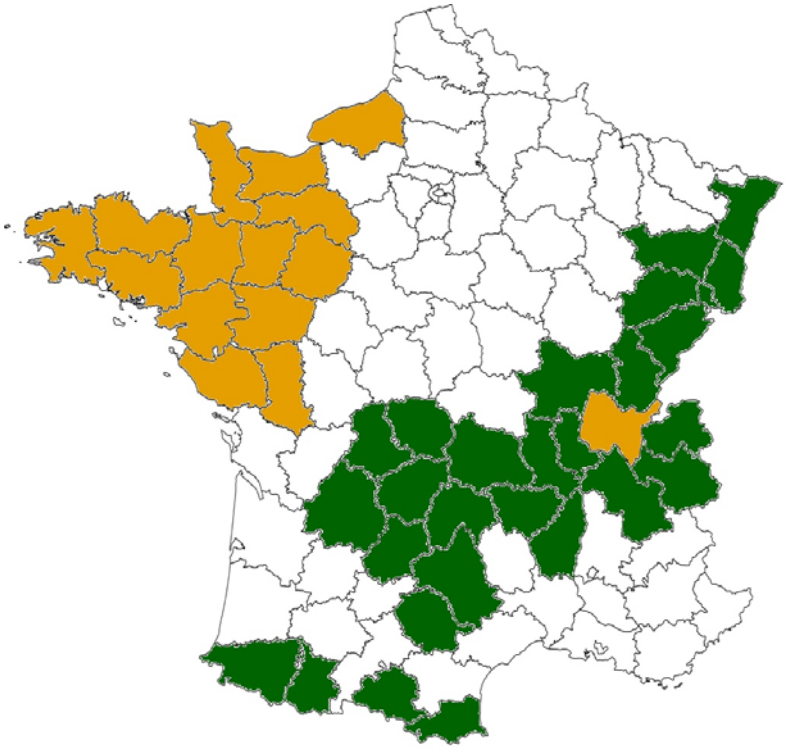


EXTENSIVE

1.47
+/-0.42

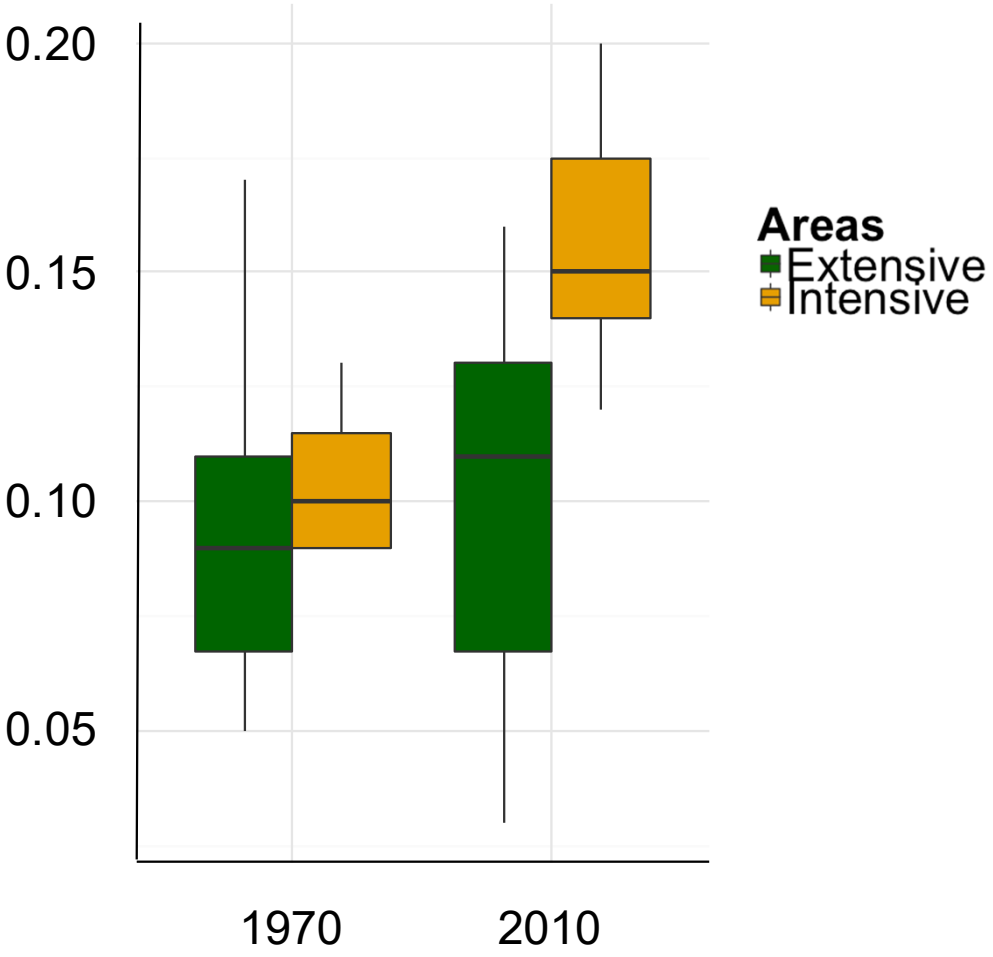


- Wheat
- Maize
- Barley
- Other cereals
- Oil-protein crops
- Permanent grasslands
- Cultivated grasslands
- Maize silage
- Other LU



INTENSIVE EXTENSIVE

Nitrogen conversion efficiency

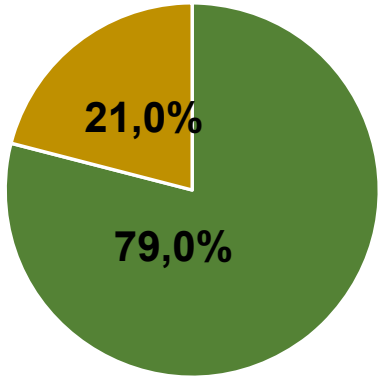


$$NCE = \frac{N\ in\ \text{livestock}\ products}{N\ in\ feed\ resources}$$

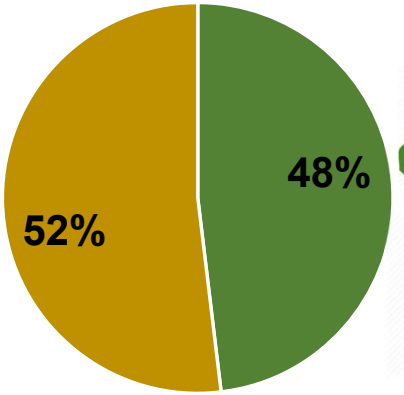
	EXTENSIVE	INTENSIVE
1970	$\frac{46\ Mt}{538\ Mt} = 8.6\%$	$\frac{81\ Mt}{784\ Mt} = 10.4\%$
2010	$\frac{50\ Mt}{574\ Mt} = 8.8\%$	$\frac{172\ Mt}{1\,044\ Mt} = 16.5\%$

INTENSIVE

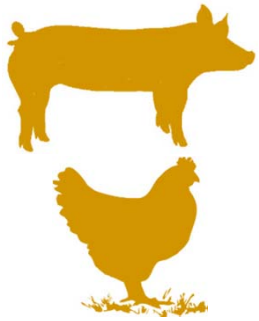
1970

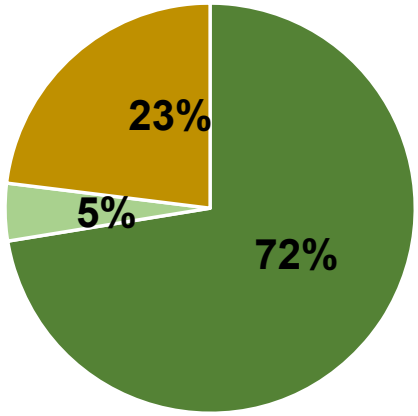


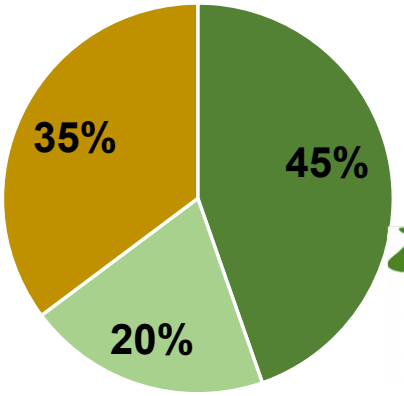
2010

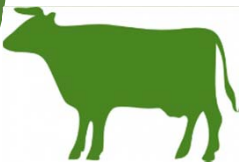


$$NCE = \frac{N\ in\ \text{livestock}\ products}{N\ in\ feed\ resources} = \frac{81\ Mt}{784\ Mt} = 10.4\% \qquad \frac{172\ Mt}{1\,044\ Mt} = 16.5\%$$

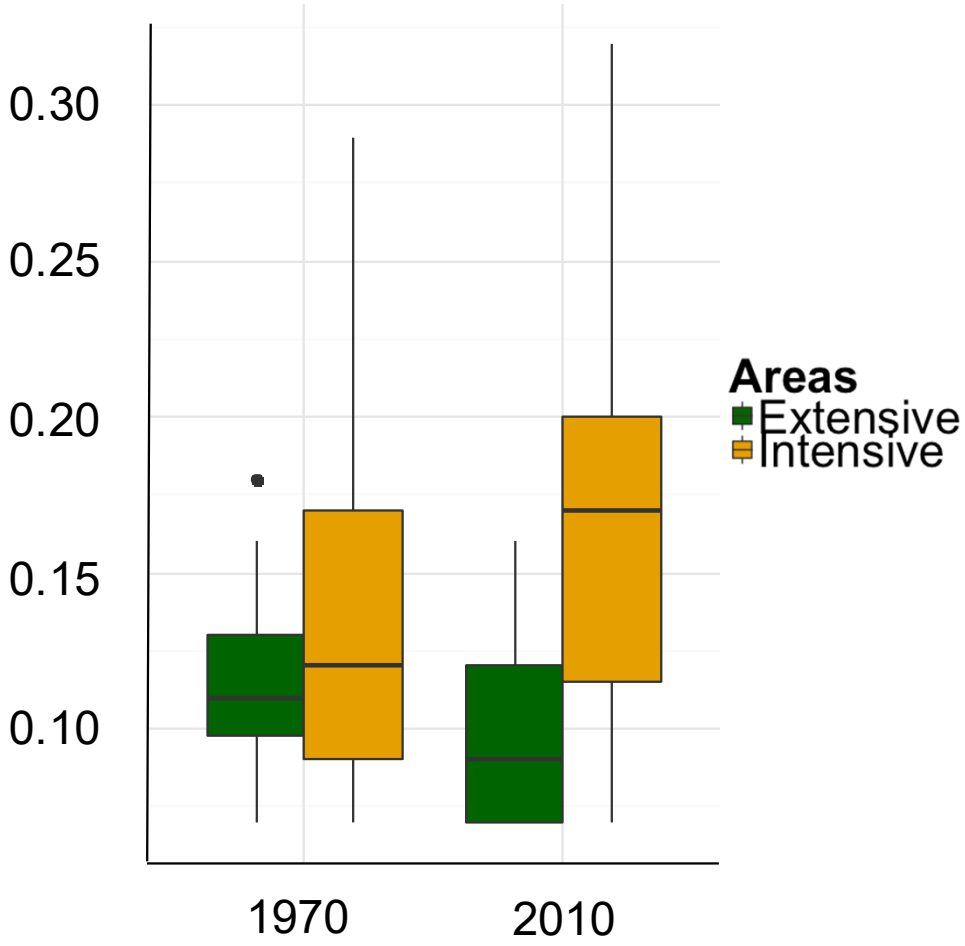








Human-edible protein



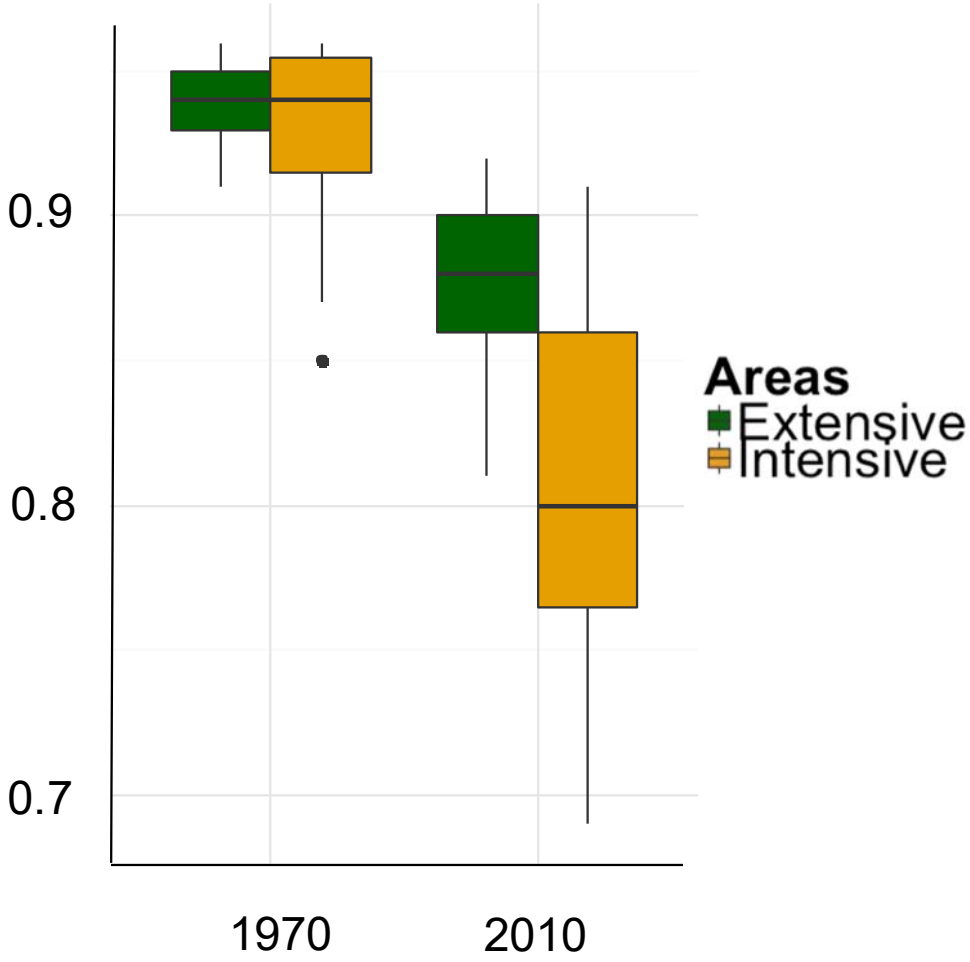
2010

Balance = ***Edible protein output*** − ***Edible protein input***

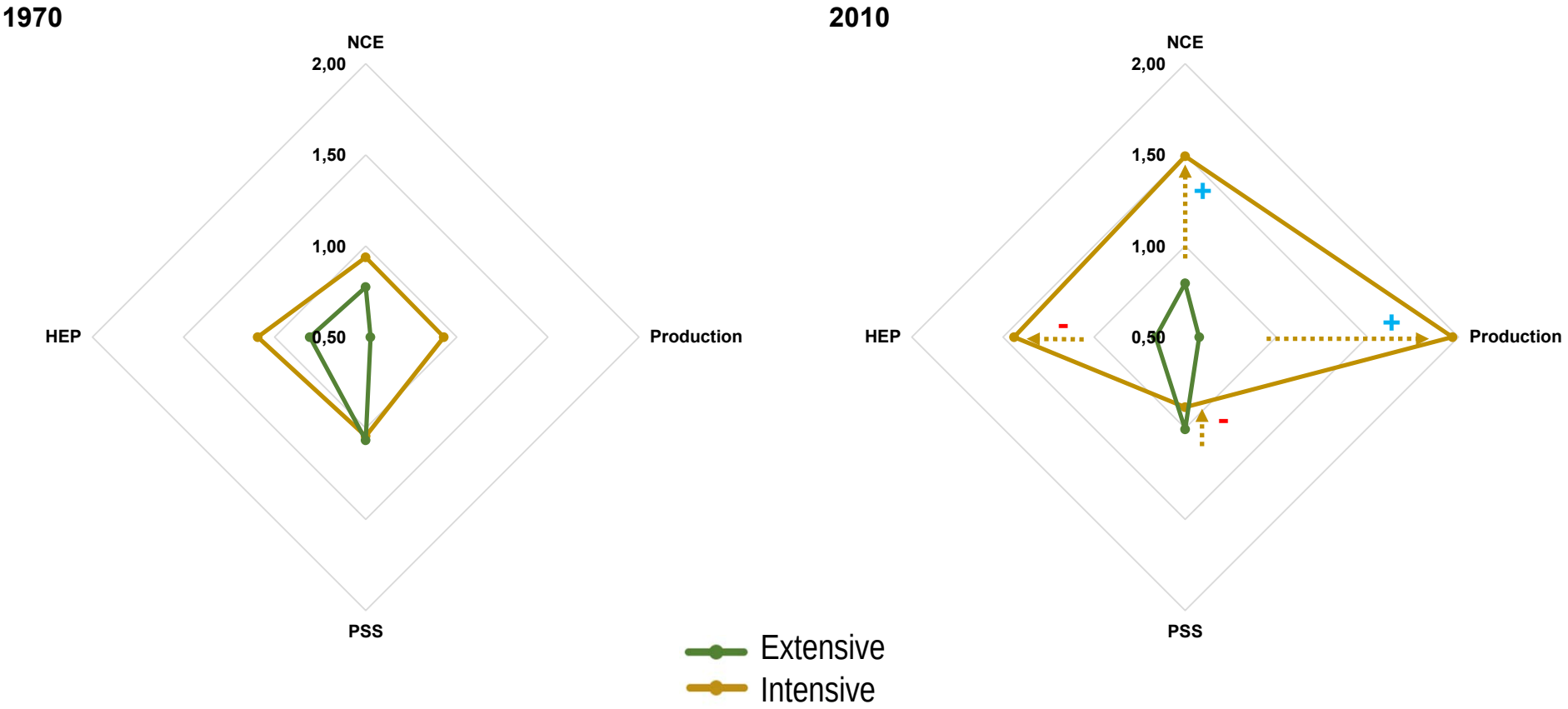
INTENSIVE = - 42 Mt N (262 Mt protein)

EXTENSIVE = - 4 Mt N (25 Mt protein)

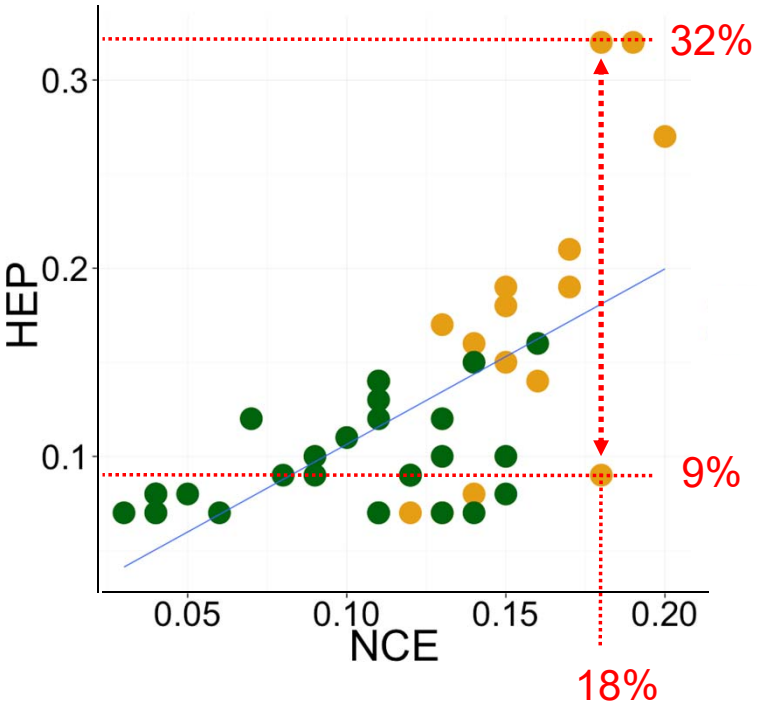
Nitrogen self-sufficiency

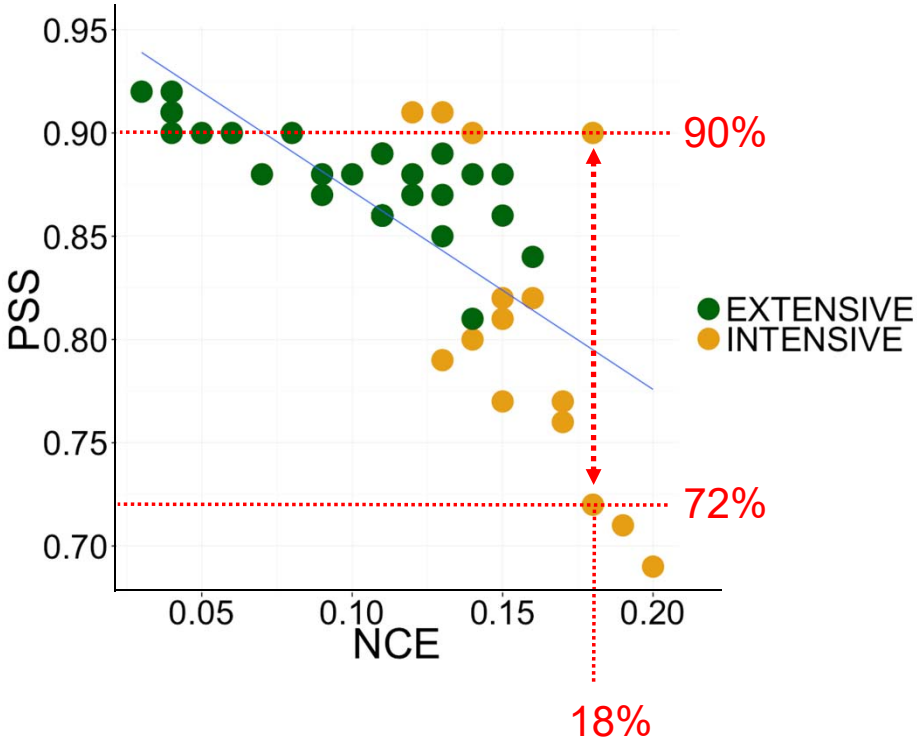


Results Summary



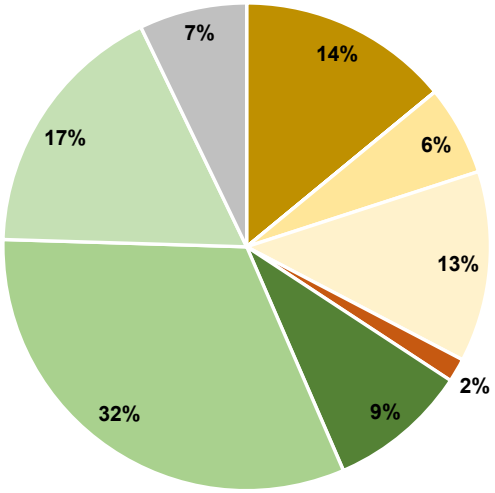
Trade-off: NCE / HEP – NCE / PSS





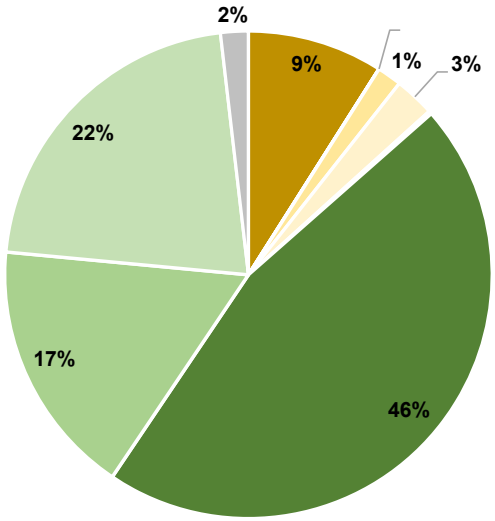
Zoom: Intra-Intensive Area

29 - Finistère

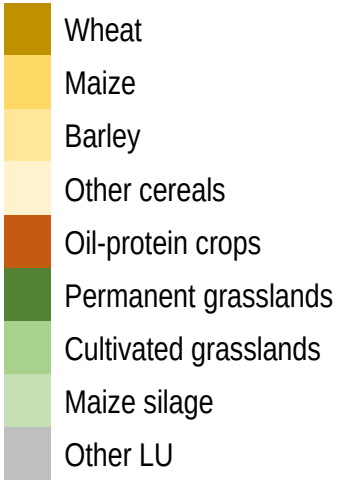


NCE	18%
PSS	72%
HEP	32%

50 - Manche



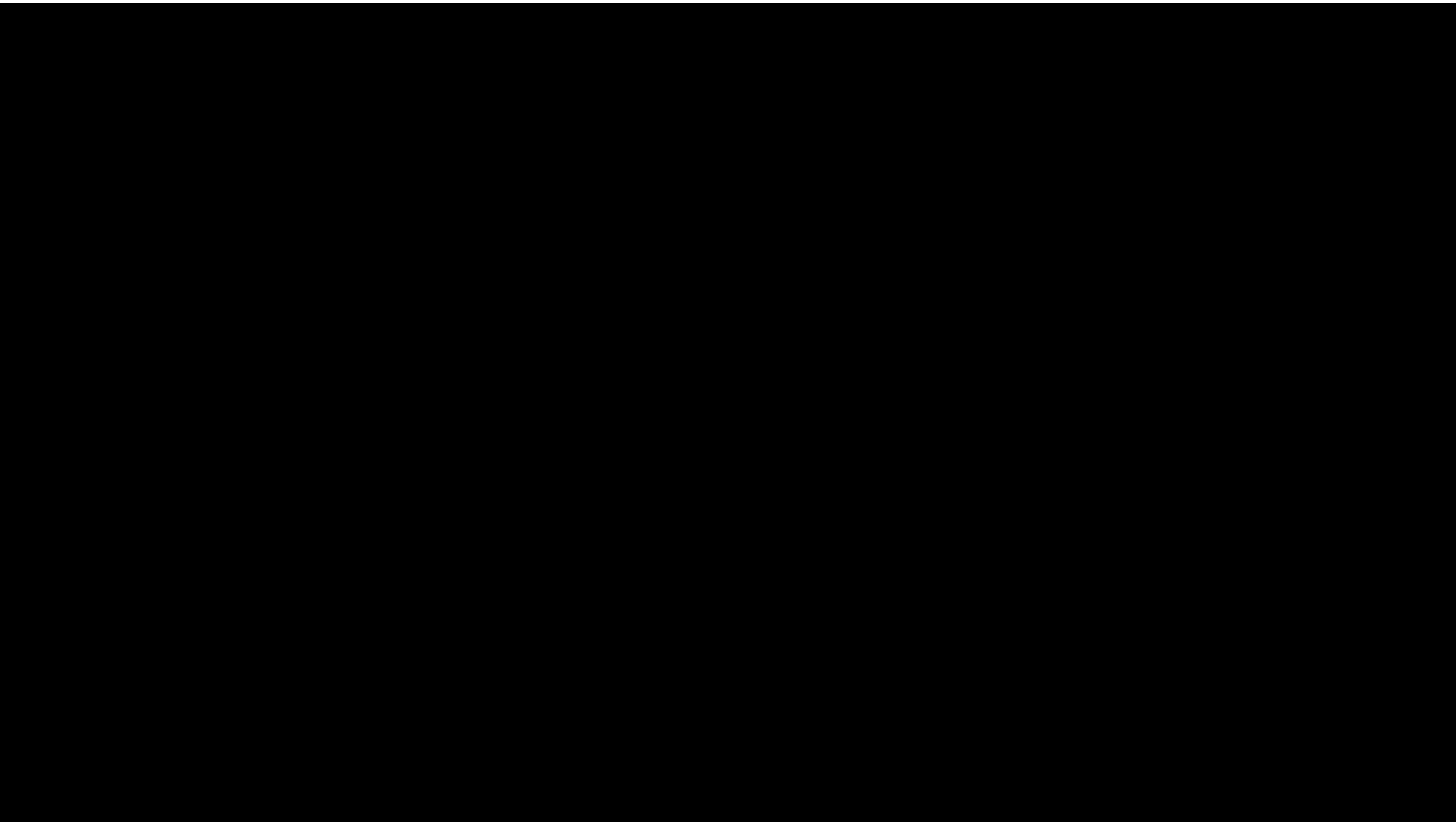
NCE	18%
PSS	90%
HEP	9%

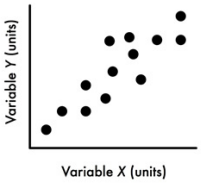


Conclusion

→ How more diverse systems help providing better efficiency in the use of resources?

- More diverse patterns of land use → better efficiency in the use of resources
- Areas with higher NCE + more diverse LU types hide:
  - increased competition with human nutrition
  - dependence on global protein sources
- Achieve an optimal balance: livestock species and available resources (LU)





PRODUCTION PERFORMANCE & LAND USE DIVERSITY

\+ <u>CORRELATION</u>

Land use diversity and

NCE

Correlation is weak (0.48)

P value = 0.0011