



Sustainable livestock systems: integrating animal welfare and the provision of environmental services

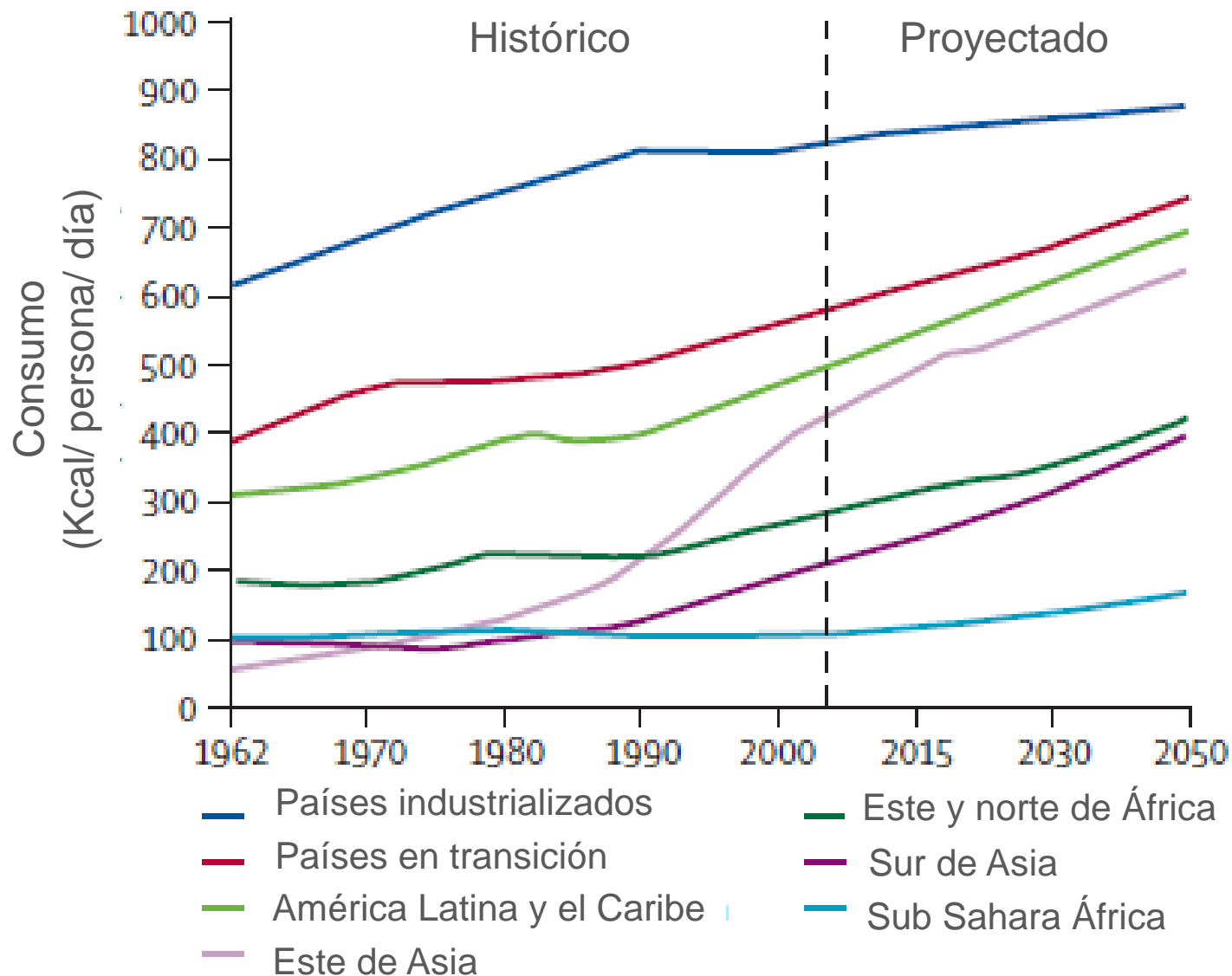
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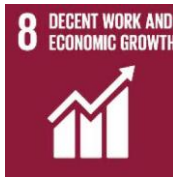


World Organisation
for Animal Health
Founded as OIE

CONSUMPTION OF ANIMAL PRODUCTS



Livestock production impacts and challenges



ANIMAL WELFARE



SUSTAINABLE LIVESTOCK PRODUCTION: URGENT NEED

PRODUCER



ANIMAL WELFARE



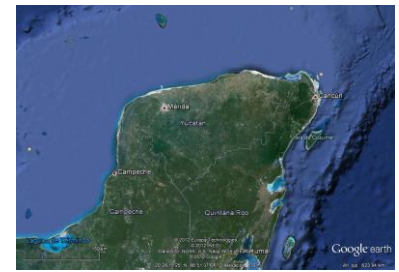
CONSUMER



ENVIRONMENTAL SERVICES



Production units



Monoculture



Intensive silvopastoral



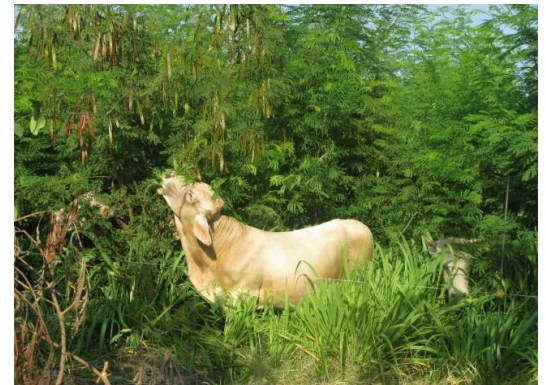
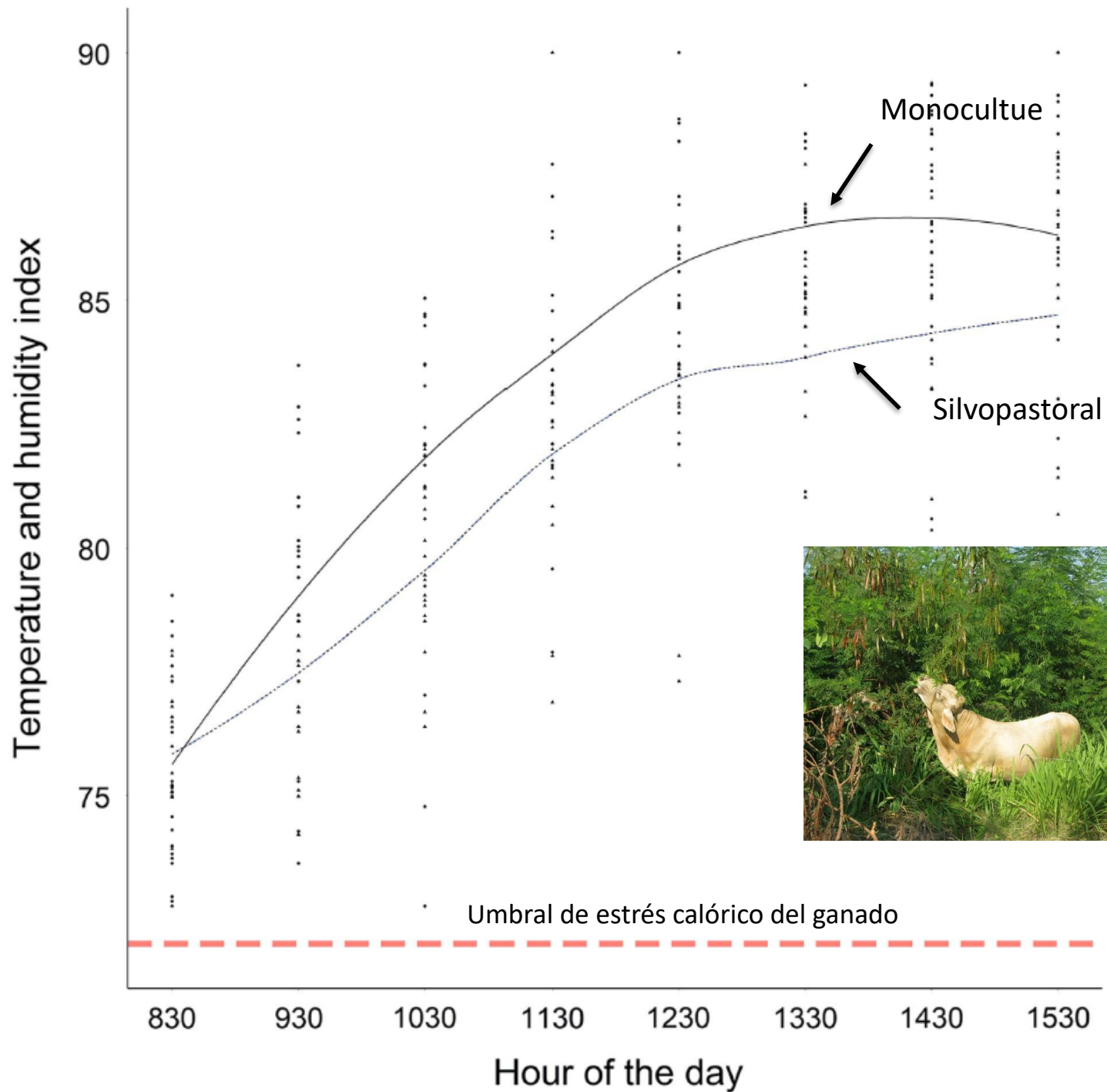
- Grass
- Shrubs
- Trees and `live fences`

Native silvopastoral



- Three strata
- More than 150 spp edible plants

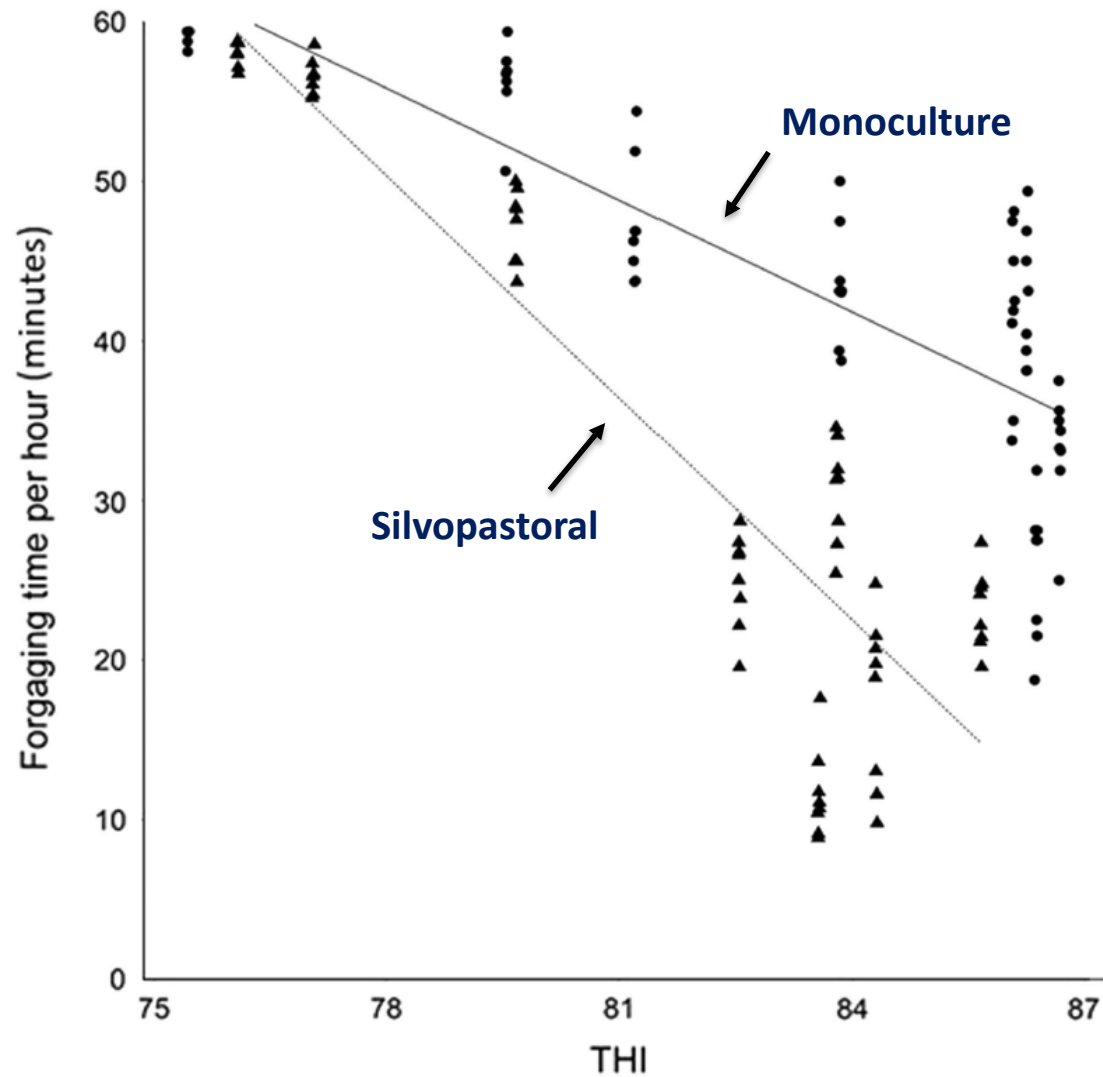
RESULTS



Animal welfare indicators:

Animal behaviour

Foraging time in relation to the temperature-humidity index (THI) in both systems



Social behaviour

Non-agonistic interactions (30,000 leucaenas/ha) ($P < 0.05$) in Mn and Sspi

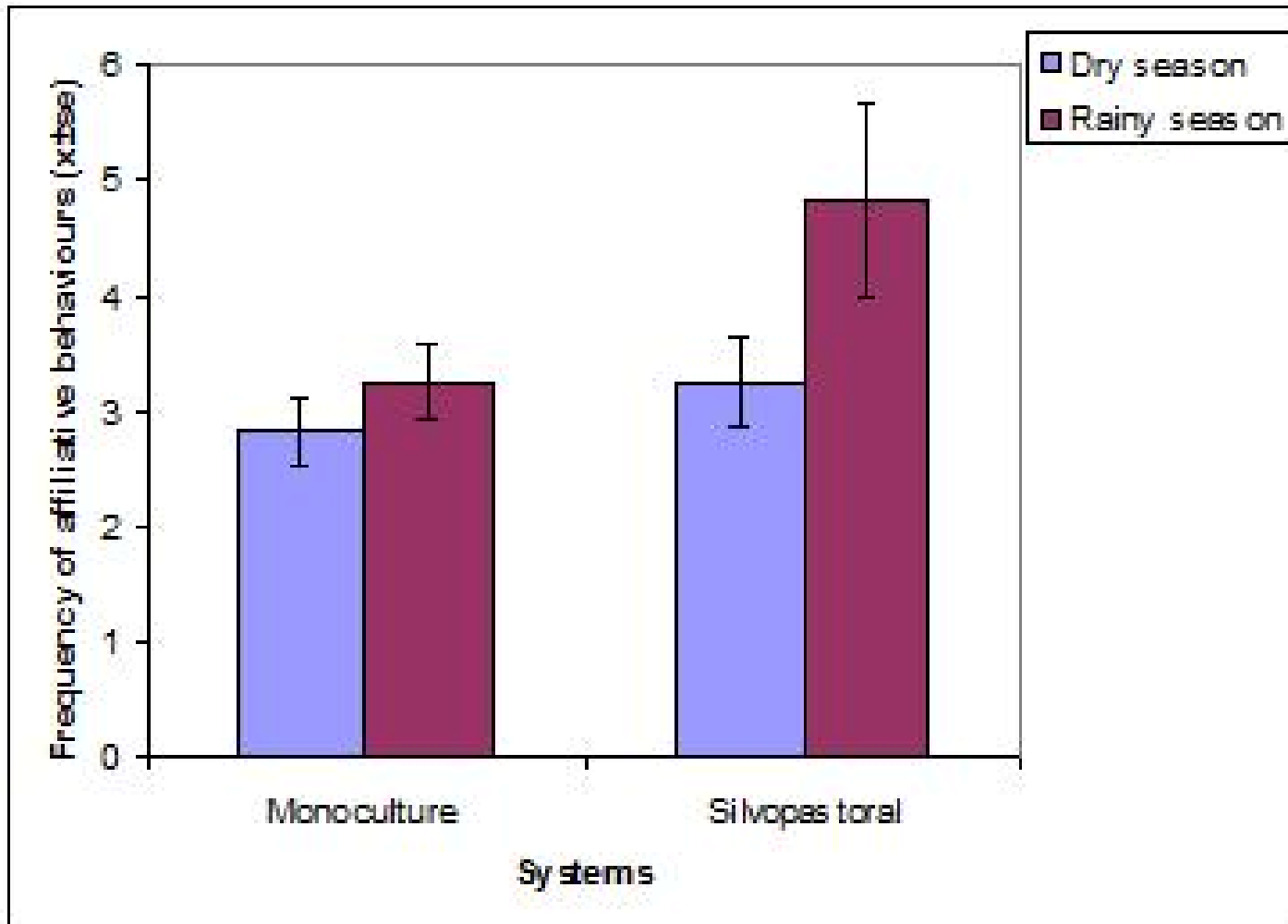


Table 2 *Dominance hierarchy attributes estimated for the two systems*

Landau's linearity index (h')	Season	Value	P
Monoculture system	Dry	0.57	0.08
	Rainy	0.54	0.31
Intensive silvopastoral system	Dry	0.96	0.00**
	Rainy	0.99	0.00**
Directional consistency index (DCI)	Season	Mean	SE
Monoculture system	Dry	0.55	0.09
	Rainy	0.57	0.11
Intensive silvopastoral system	Dry	0.89	0.06
	Rainy	0.88	0.06
Dietz R -test for correlation between seasons	R	P	
Monoculture system	0.22	0.07	
Intensive silvopastoral system	0.78	0.00**	

** $P \leq 0.01$.

HUMAN-ANIMAL INTERACTIONS:

% tree coverage = % of cows with short flight distance



(Rs= -0.9)

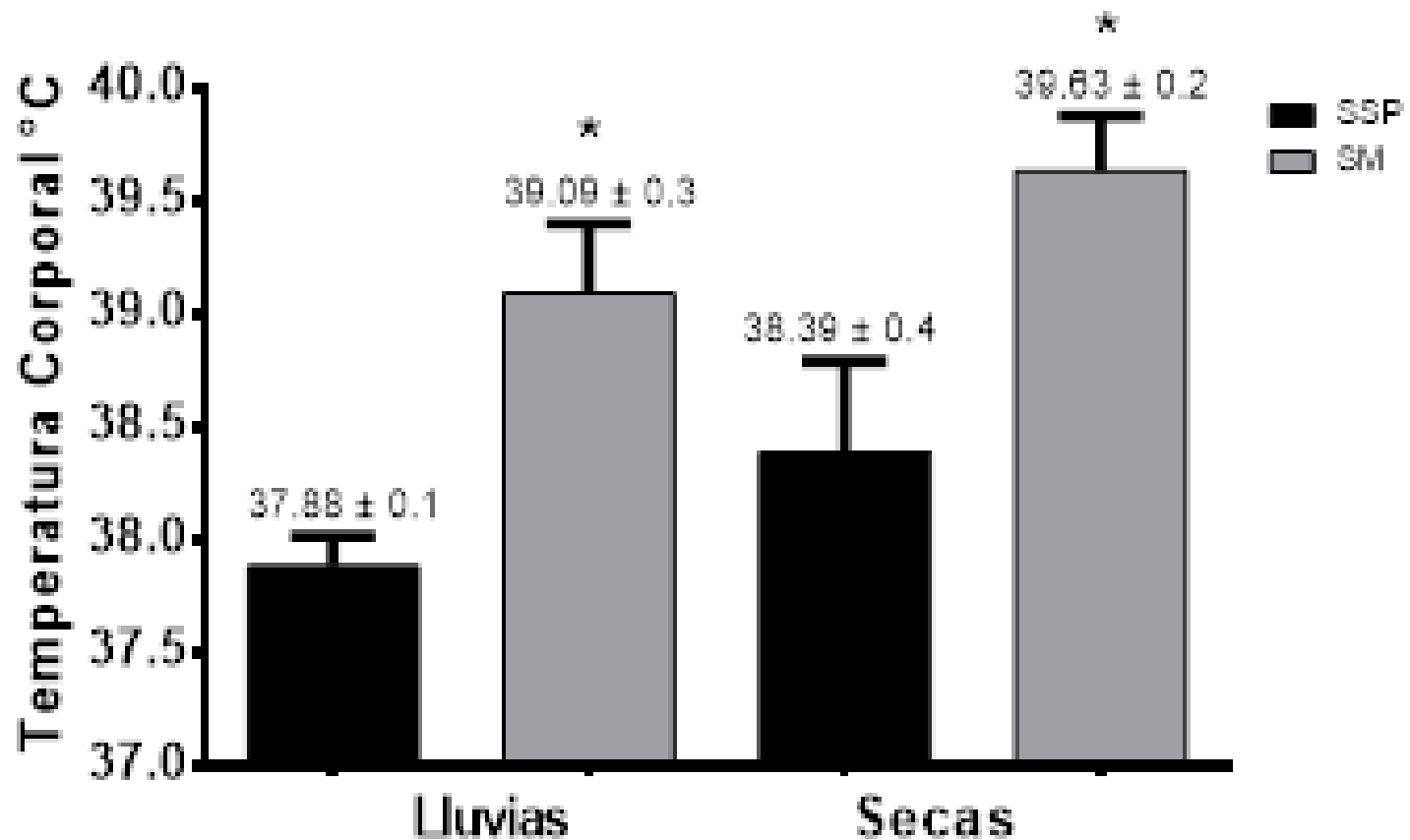


Animal welfare indicators:

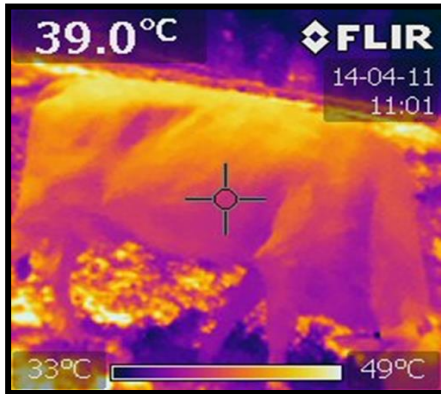
Physiology

THERMOGRAPHY

Skin temperature



THERMOGRAPHY

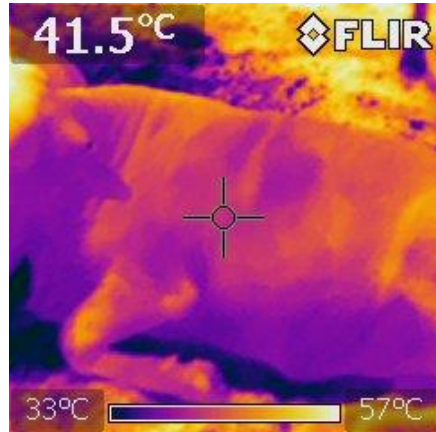
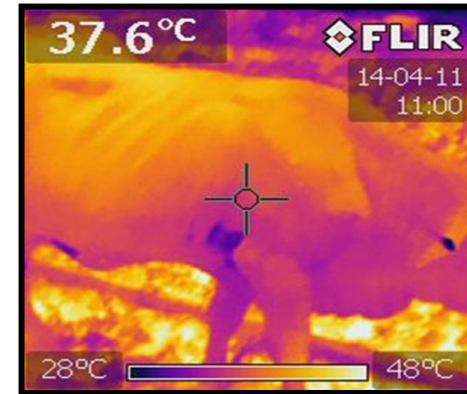


PADDOCK

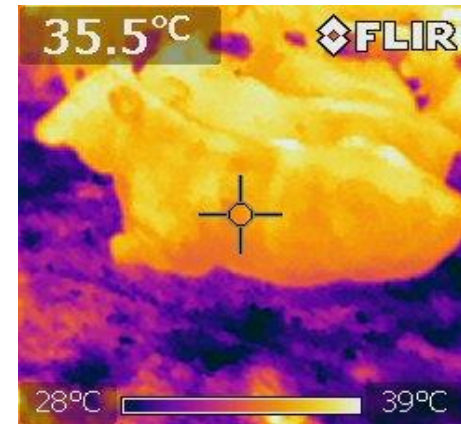


+ 2h

PEN

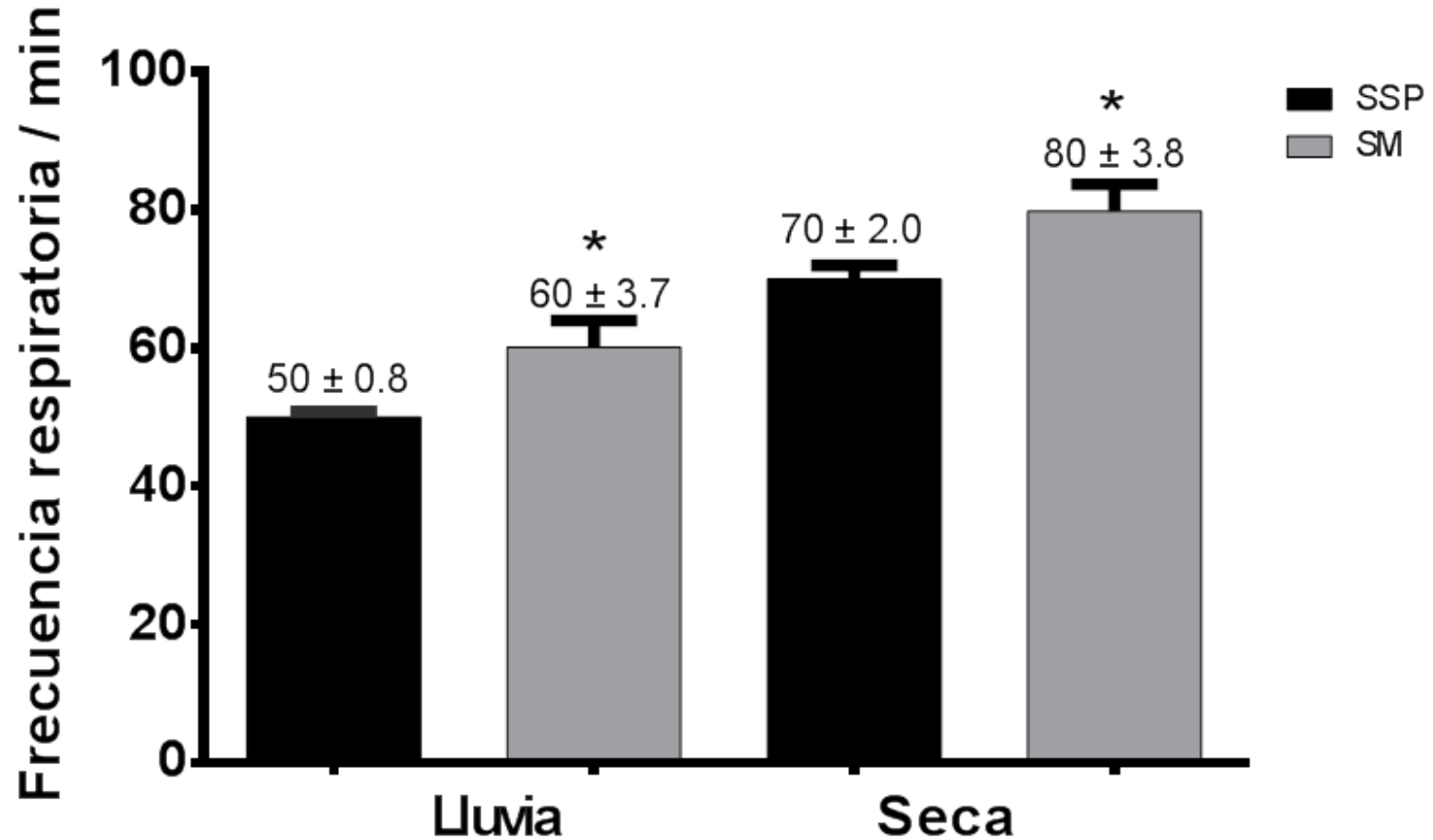


MONOCULTURE



SILVOPASTORAL

Respiratory rate (Holstein x Zebu), in Sps y MS, rainy and dry seasons



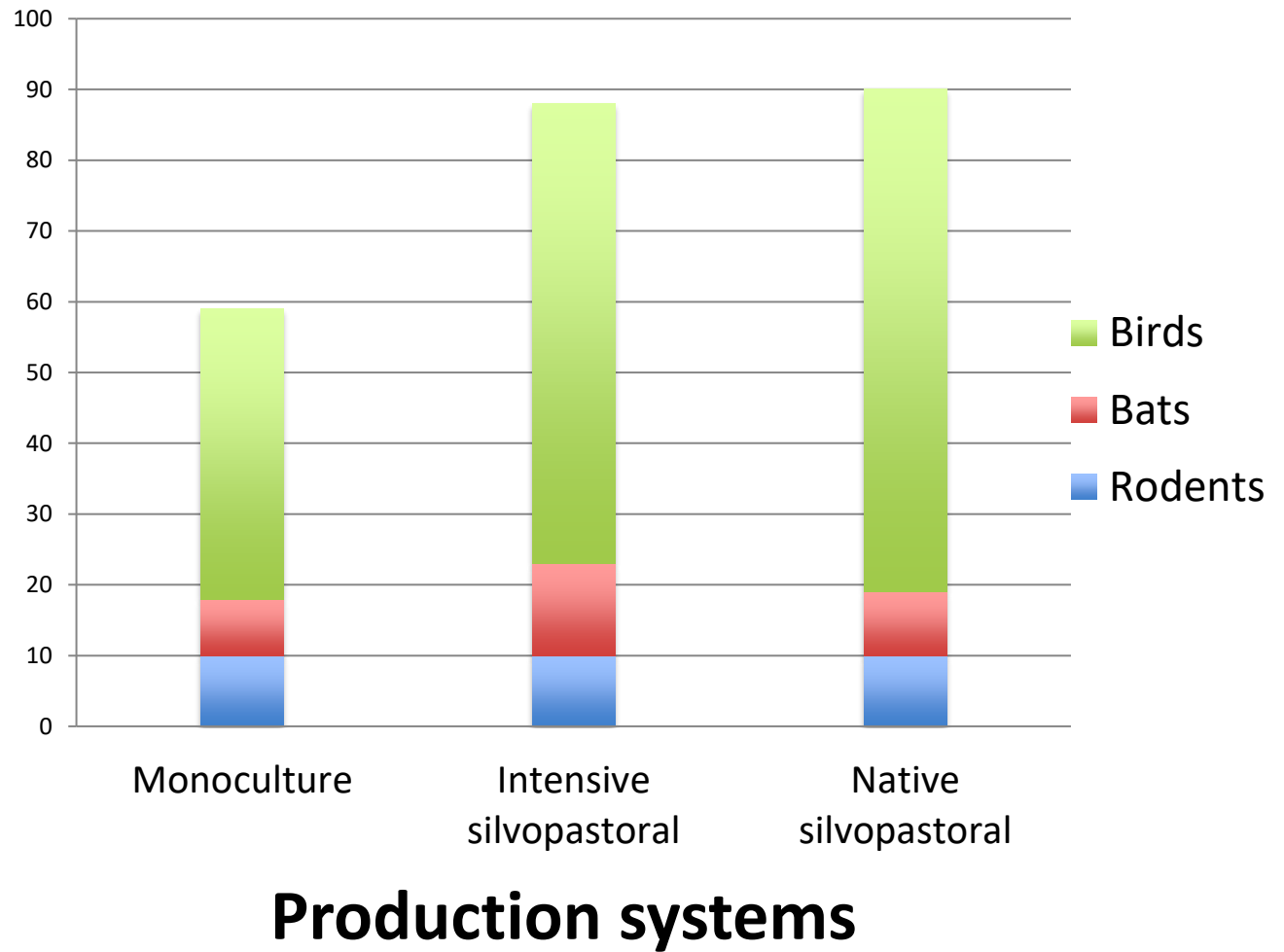
Environmental services:

Biodiversity

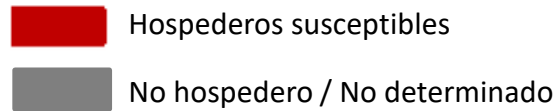
Biodiversity: wildlife



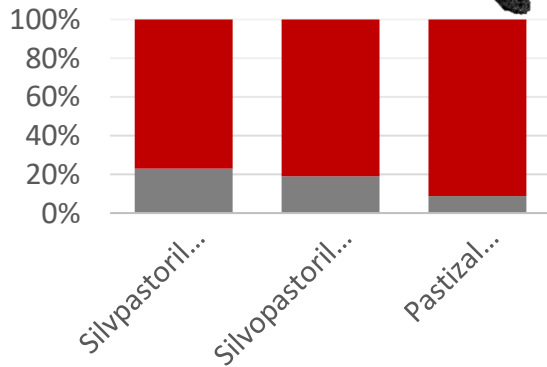
Species richness



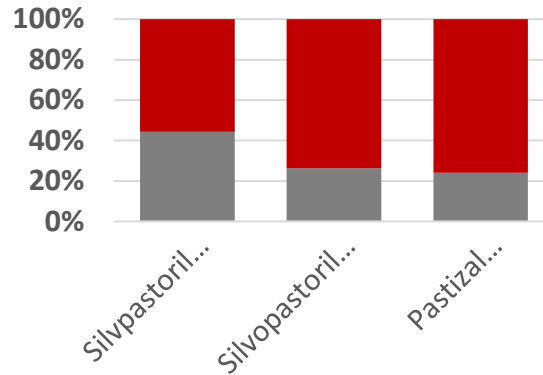
Land use and abundance of susceptible hosts to zoonotic pathogens (West Nile virus)



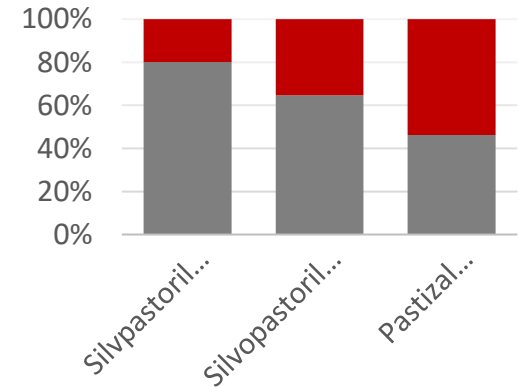
Aves residentes



Murciélagos



Roedores



Environmental services:

Gases (GHG)

Ssp intensive

C (67 kg/tree/y)

C (3.26 ton/ha/y)

C (1.4 kg/plant/y)

Biodiversity and CStorage
(R= 0.9, P<0.05)



DISCUSSION: ONE WELFARE APPROACH

- Animal welfare must be considered a criteria for sustainability
- Synergies and trade offs between sustainability criteria must be assessed at a system level
- Transdisciplinary research is needed to develop new policies integrating sustainability criteria

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