
Animals and Trees
A balancing act
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Dr Lindsay Whistance


Homeostatic equilibrium
balance
Physiological health
Emotional health
Natural behaviour
Animal welfare
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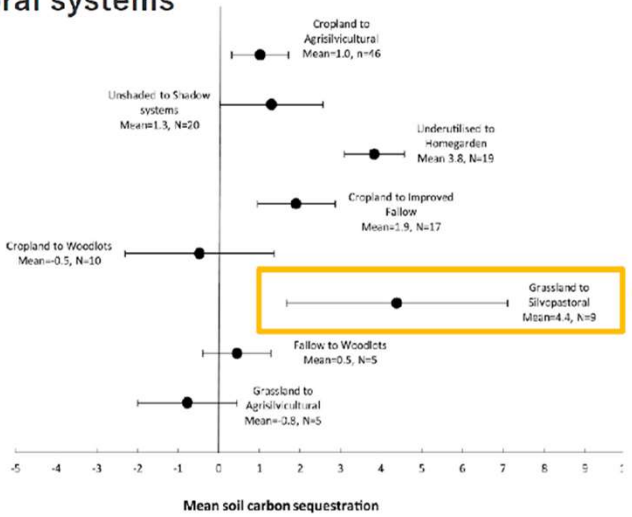
Wiltshire, summer 2018

Soil carbon sequestration rates (t C ha^{-1} yr^{-1}) are higher in silvopastoral systems



Feliciano et al. (2018)

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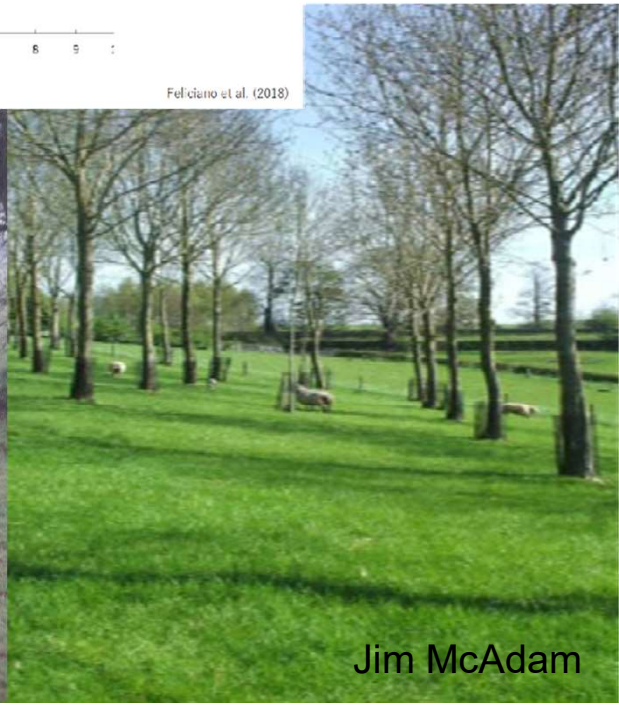
Carmen Segura Quirante slide

Andrew Barbour

Resilient Systems



Jim McAdam

Social relationships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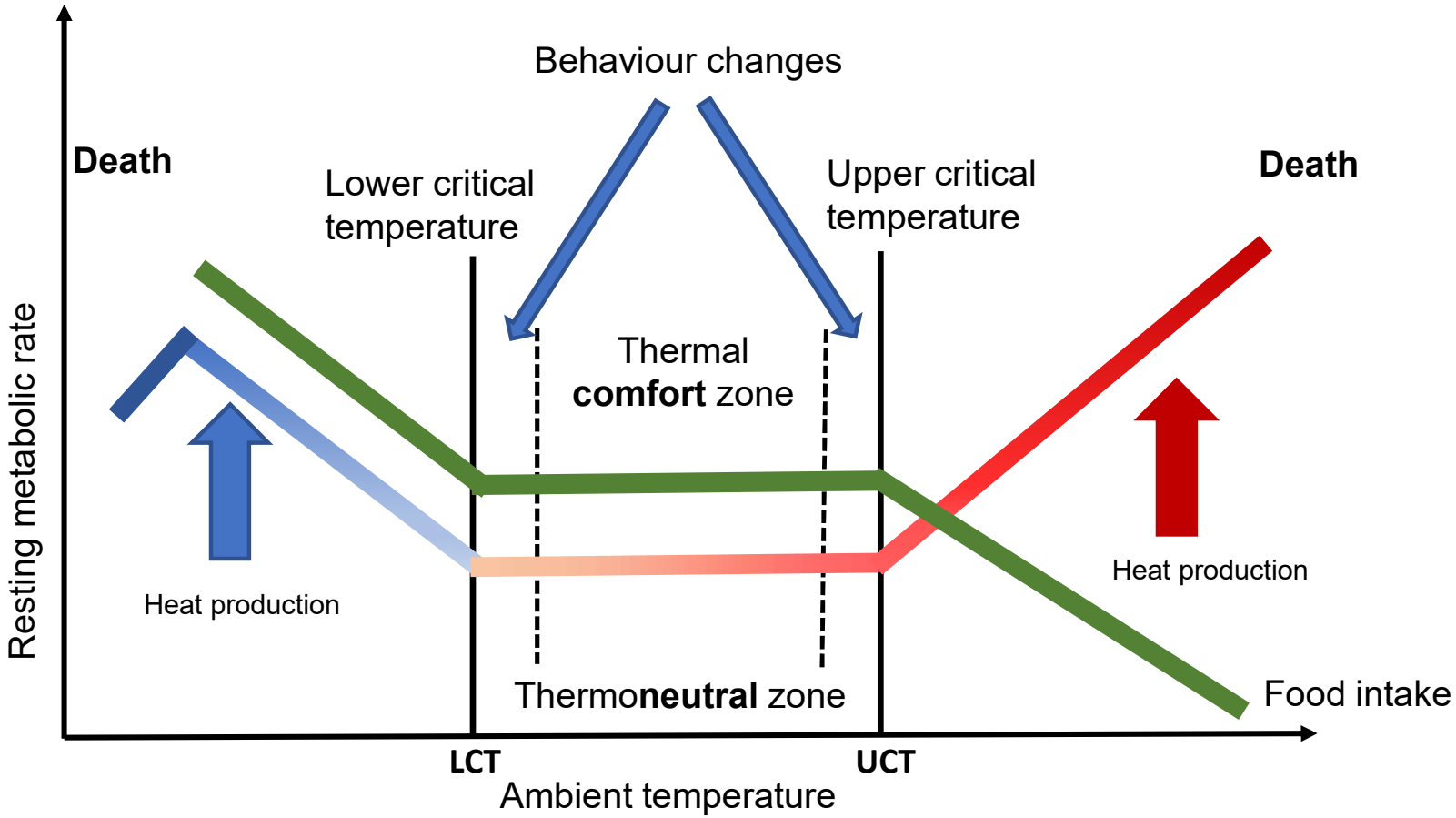
Body care
http://www.forestandwaterside.info/2014/10/pig-new-forest-pannage.html

Thermoneutral zone

Where metabolic rates are low/minimal



Cold stress

(Ralph, 1981)	LAMB MORTALITY (%)	
	SHELTER	NO SHELTER
Single births	8.9	17.5
Multiple births	38.8	51.3

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For every 1°C drop in temperature below an animal's LCT:
Beef: a 2% increase in energy requirements is needed and
Newly shorn sheep: a 1.7% increase is needed.

Same rain storm with and without shelter

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Systems with valid choices for good welfare


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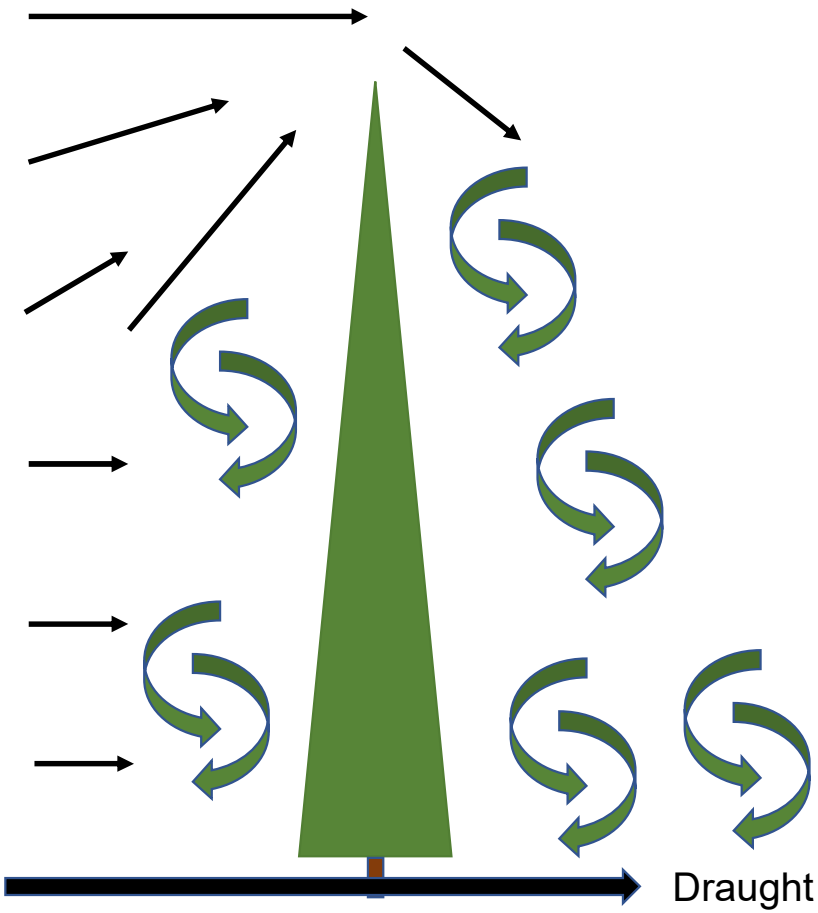
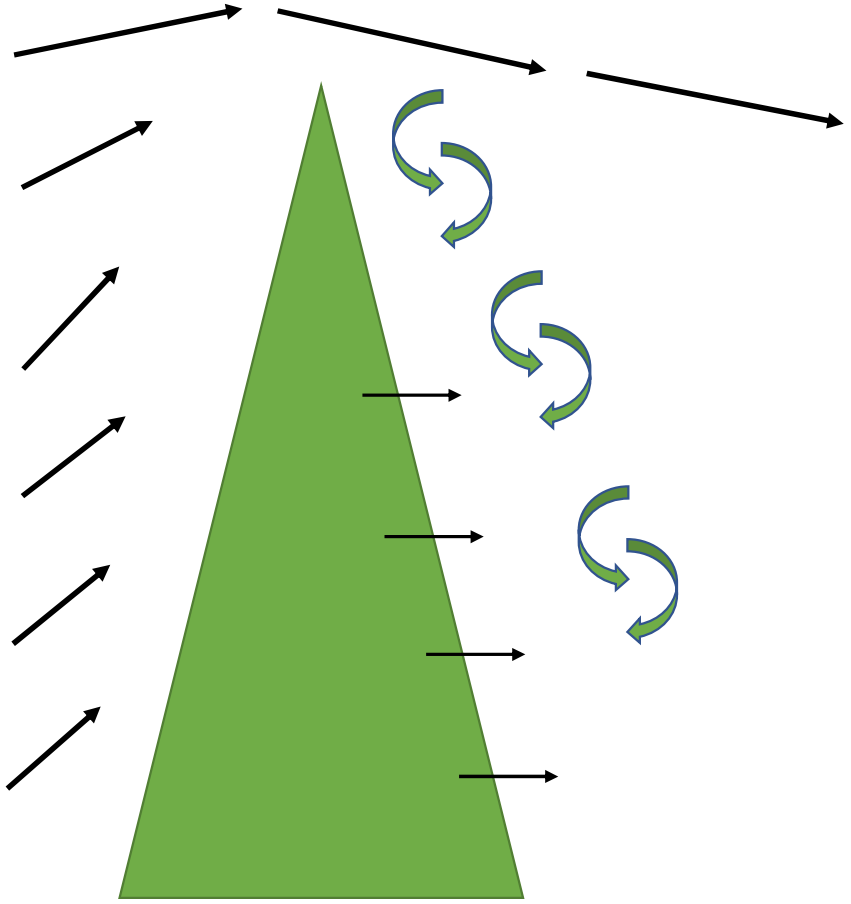
Dafs Owen

Windbreak porosity and turbulence



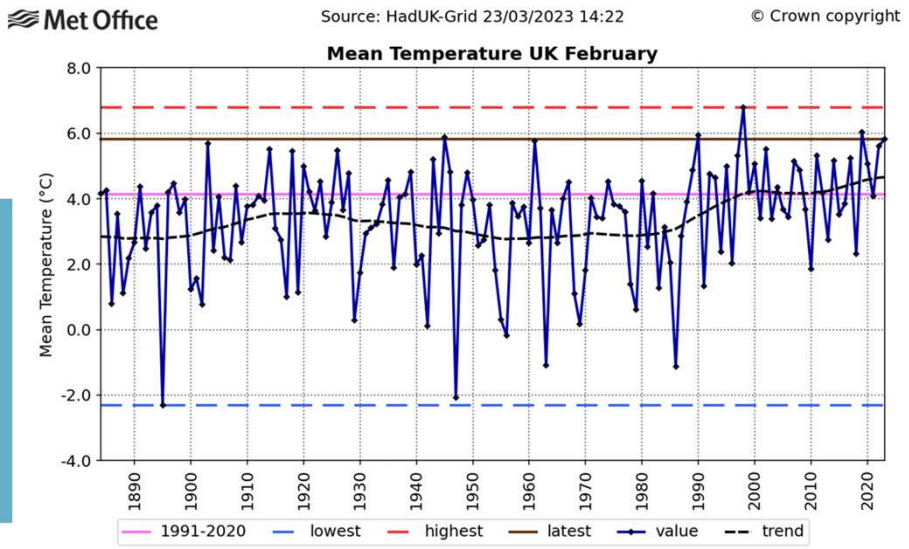
Dense = high turbulence

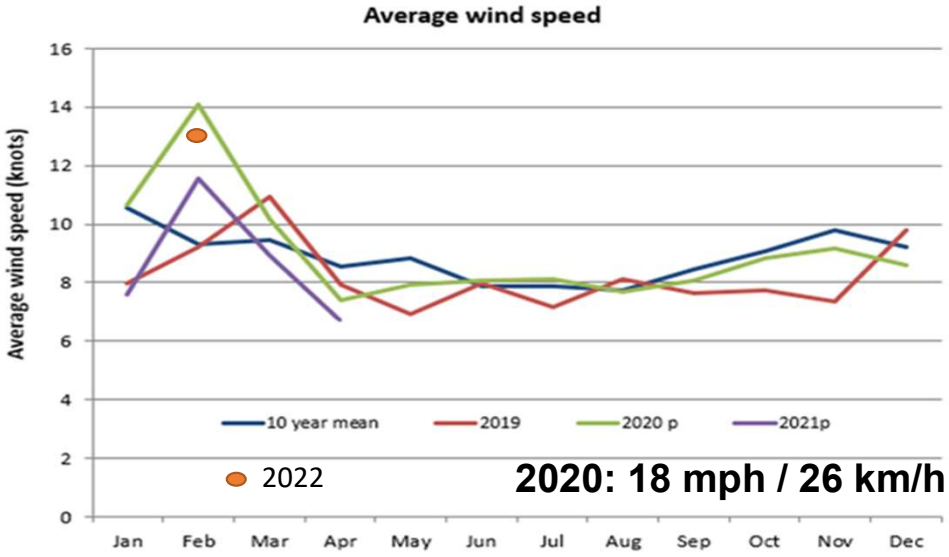


Sloping profile, Porous = reduced turbulence

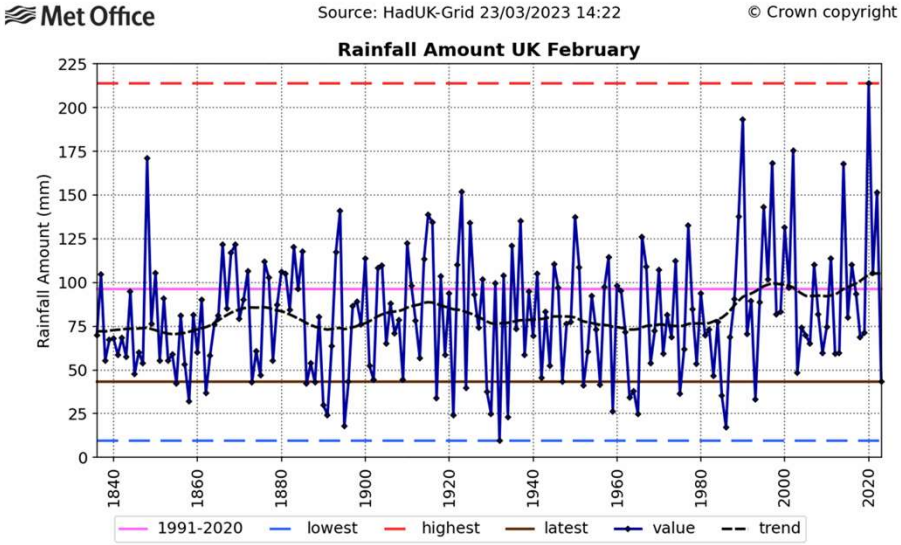
Weather changing

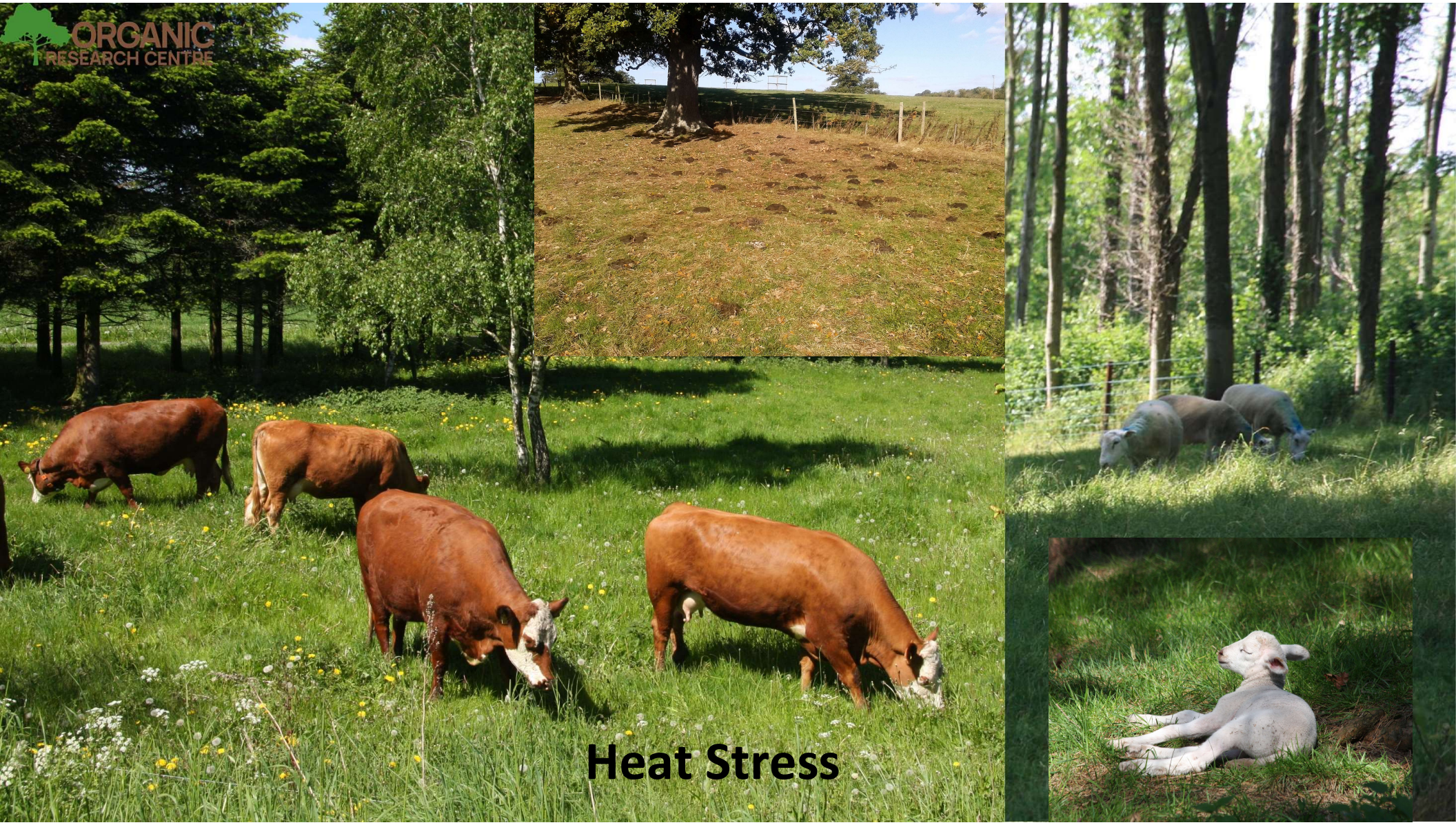
10th consecutive year at 1°C or above average temperature for pre-industrial period





2020: 18 mph / 26 km/h

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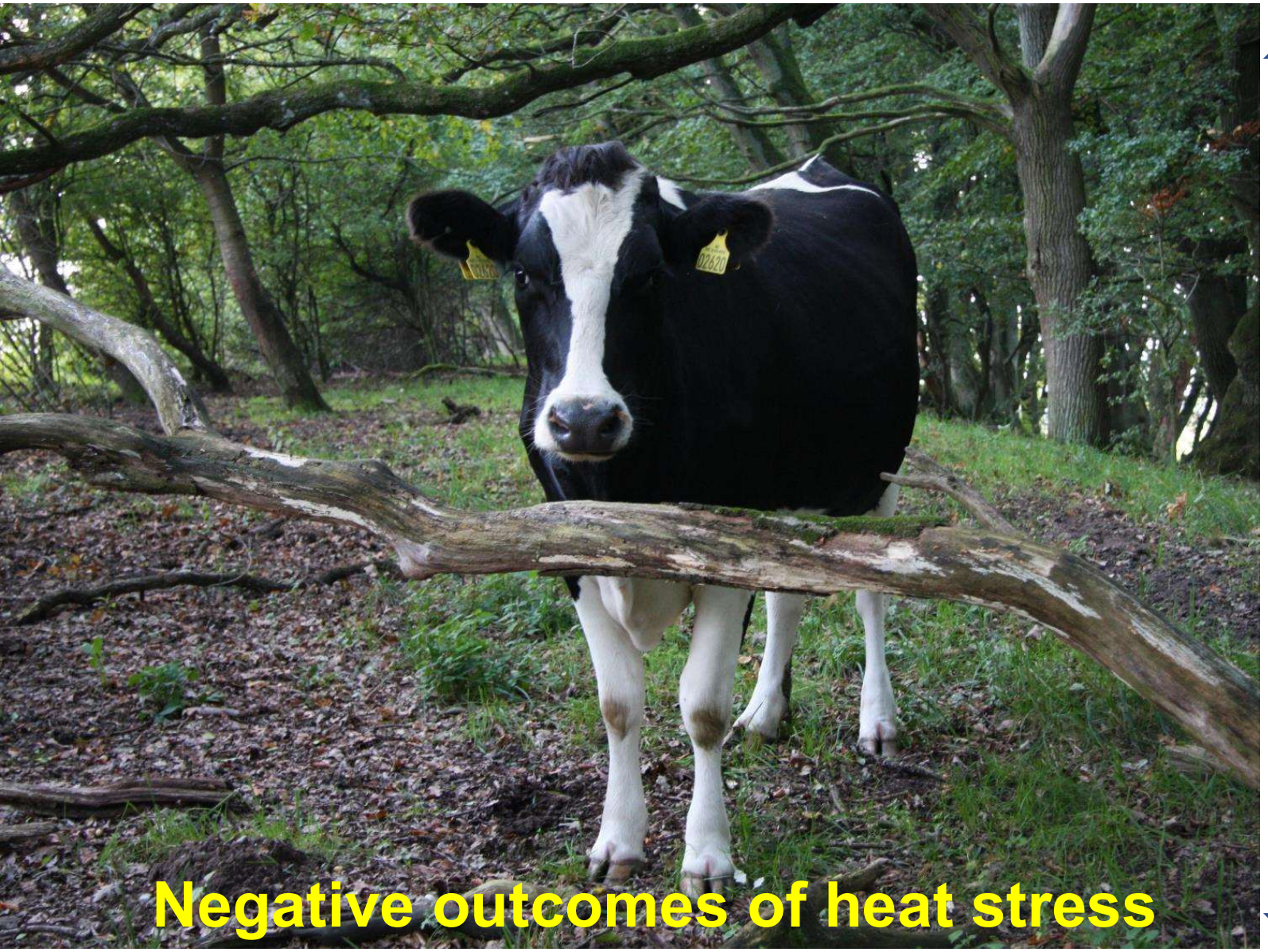
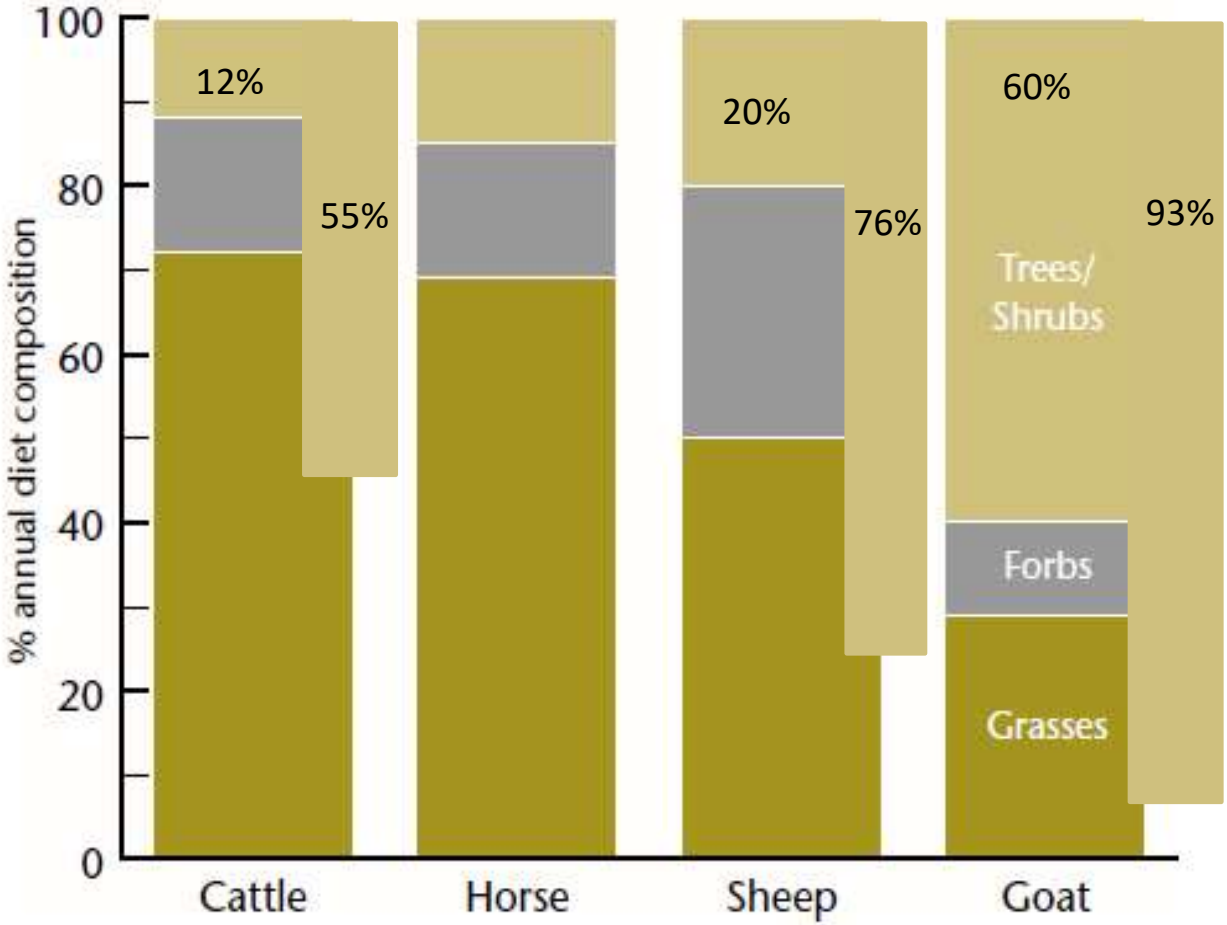
Heat Stress



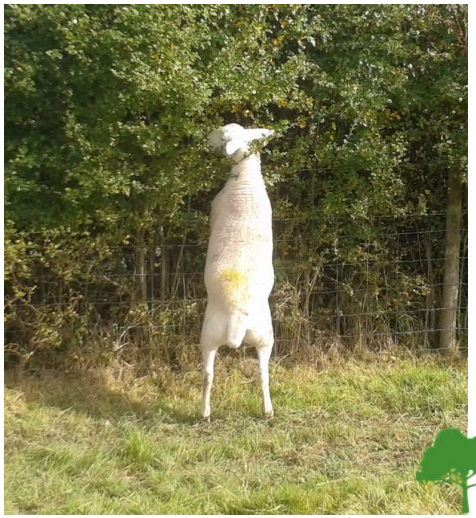
Negative outcomes of heat stress

- Respiratory rate
- Stress hormones
- Feed intake
- Rumen microbes
- Metabolic disorders
- Inflammation
- Oestrus expression
- Embryo growth
- Foetal development
- Calf size
- Milk/colostrum amount/quality

Variation in the diet of domestic stock



http://www.forestry.gov.uk; Dicko and Sikena, 1992



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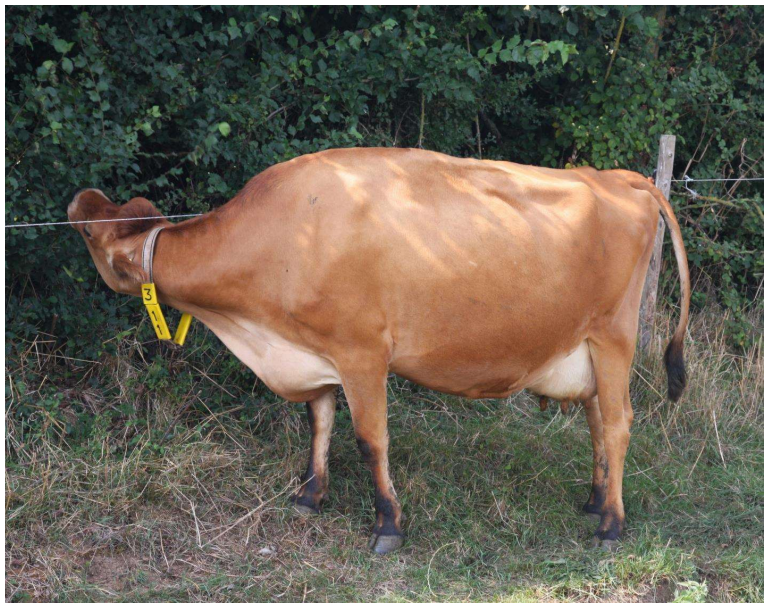

http://scotland.forestry.gov.uk/woodlandgrazingtoolbox/grazingmanagement/foraging/palatability-and-resilience-of-native-trees

Palatability	Tree species
1	Aspen, Willow
2	Ash, Rowan
3	Hazel, Oak
4	Scots pine, Juniper, Holly
5	Birch, Hawthorn
6	Beech
7	Alder

Heifers (May – September)	**Time spent browsing (%)**	**Species preferred**
Spring	**19.3**	**Hazel Hawthorn Hornbeam**
Early summer	**5.9**	
Late summer	**5.4**	

Hedge: field maple, sycamore, hornbeam, dogwood, hazel, hawthorn, ash, black poplar, oak, false acacia and elder.

All species were browsed at least once except false acacia

Vandermeulen et al., 2016

Traditional fodder trees in UK: Ash, Elm and Holly

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Leaf nutrition in tree species compared to hay and red clover (%). In: Birks et al, 1989.

Tree species	Moisture	Ash	Fat	Sugar	Protein	Fibre
Wych elm	12.6	9.9	2.9	49.2	13.2	12.3
Rowan	11.9	5.9	6.5	50.4	9.9	15.4
Goat willow	11.5	6.1	3.8	50.3	11.6	16.7
Aspen	10.8	8.5	6	43.5	13.3	20.9
Ash	11.6	6.3	3	50.4	12	16.7
Grey alder	11.9	3.9	5.9	43.6	17.6	17.4
Birch	11.7	3.9	7	49.2	12	16.2
Meadow hay	14.96	5.42	2.2	44.43	8.51	24.56
Red clover	15.65	5.17	1.88	36.76	10.98	28.56

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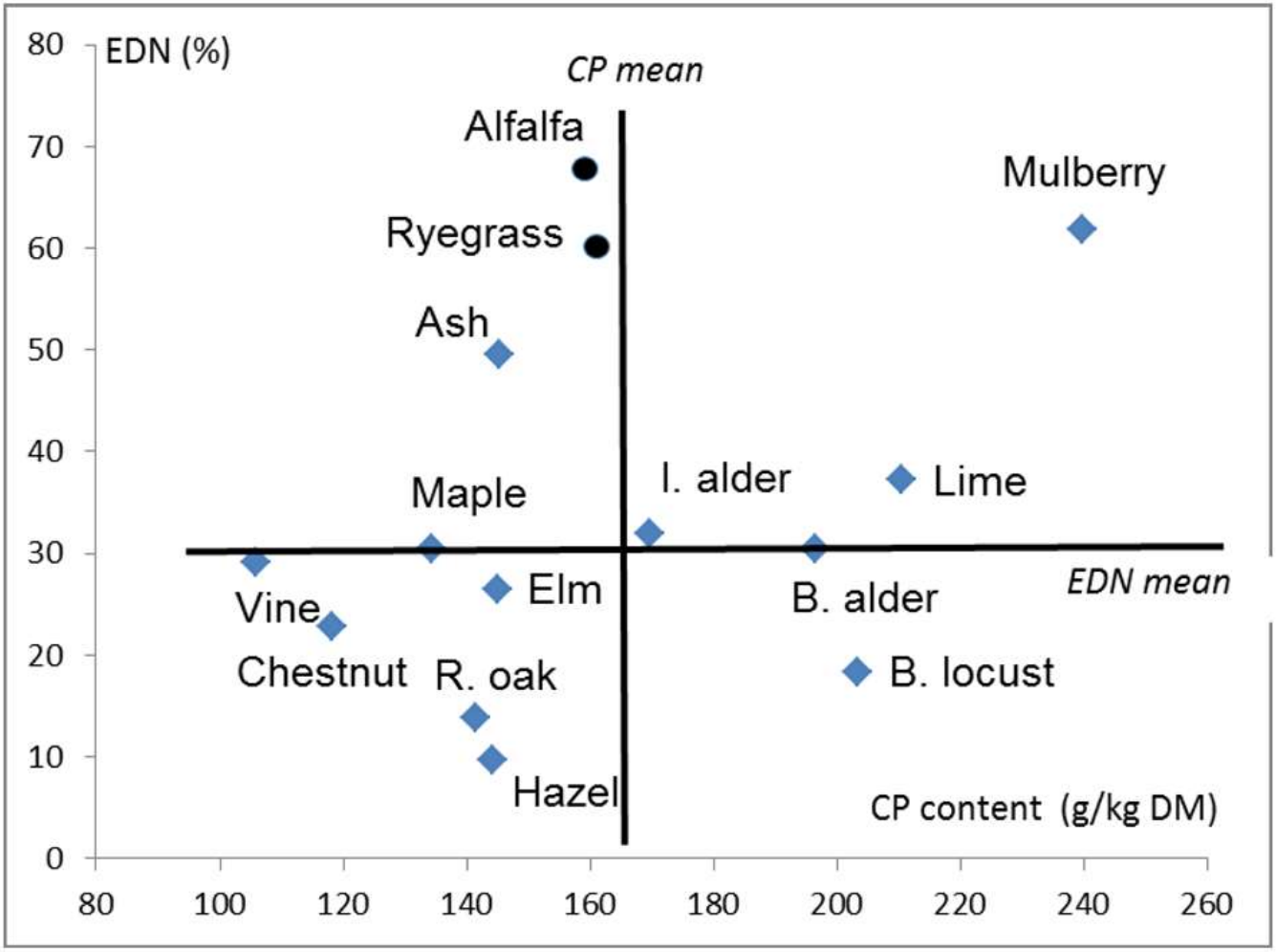
Relationship between **effective degradability of nitrogen** (EDN, %) and nitrogen concentration (CP, g/kg DM) in leaves of woody species during summer. (Emile et al., 2016)



Condensed tannins to **<** 5% of DM in diet has a positive effect on protein quality.

CH_4 (ml/g) produced off willow is less than half that of lucerne

200g of willow leaves per day reduces **N_2O** levels in urine

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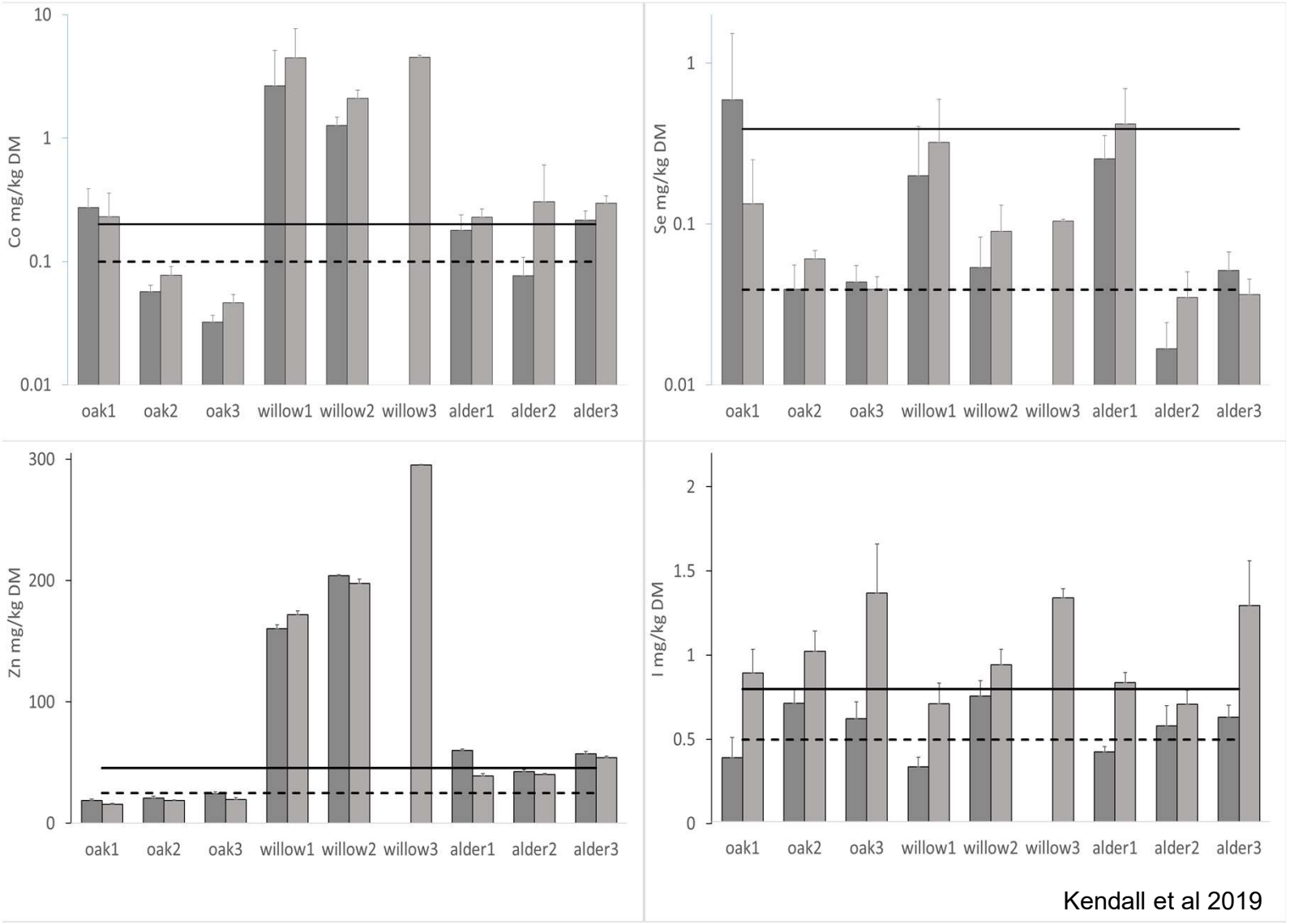

Kendall et al 2019

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	tree	site	time	treexsite	treextime	sitextime
Ca	***	**	***	***	**	*
P	ns	*	***	***	ns	*
Mg	***	ns	ns	***	*	*
Na	***	***	***	***	ns	**
K	***	***	ns	***	ns	**
Cu	***	***	***	***	ns	tr.
S	***	**	ns	*	***	***
Fe	***	***	ns	***	***	***
Mo	***	ns	ns	**	*	ns
Mn	*	*	***	***	*	ns
Pb	***	tr.	***	***	ns	*
Cd	***	***	ns	***	ns	ns
As	**	**	ns	***	**	**
B	*	ns	***	***	**	**
Al	ns	ns	**	*	ns	ns
Ni	**	ns	*	*	ns	tr.
Se	ns	**	ns	ns	ns	ns
Co	***	*	*	*	tr.	ns
Zn	***	***	ns	***	ns	ns

Kendall et al., 2019

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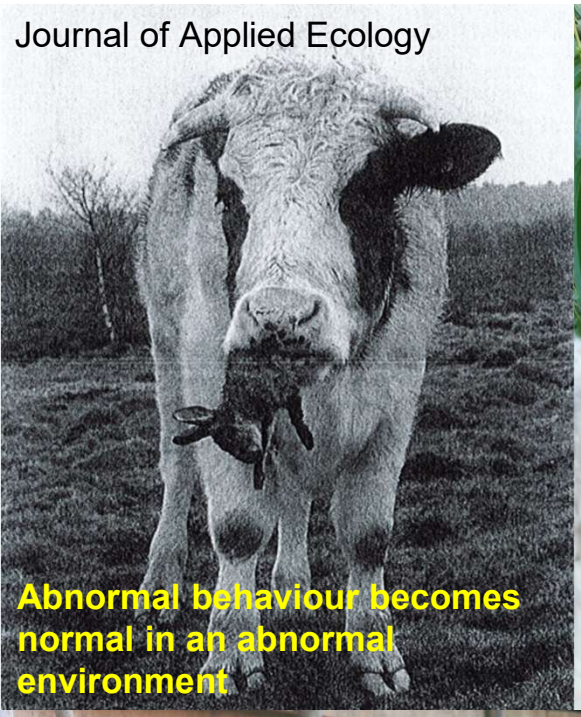

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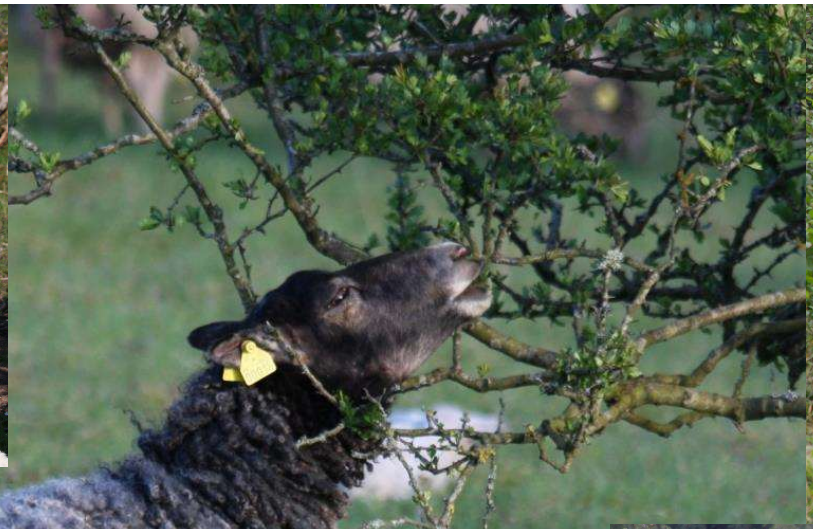
Salicin content in willow

Scientific name	Common Name(s)	Salicylic Acid (mg/g FW)
S. daphnoides	European violet willow	3.21
S. caprea	Goat Willow	1.95
S. fragilis	Crack willow	1.65
S. viminalis	Osier willow	0.21
S. alba	White Willow	0.2

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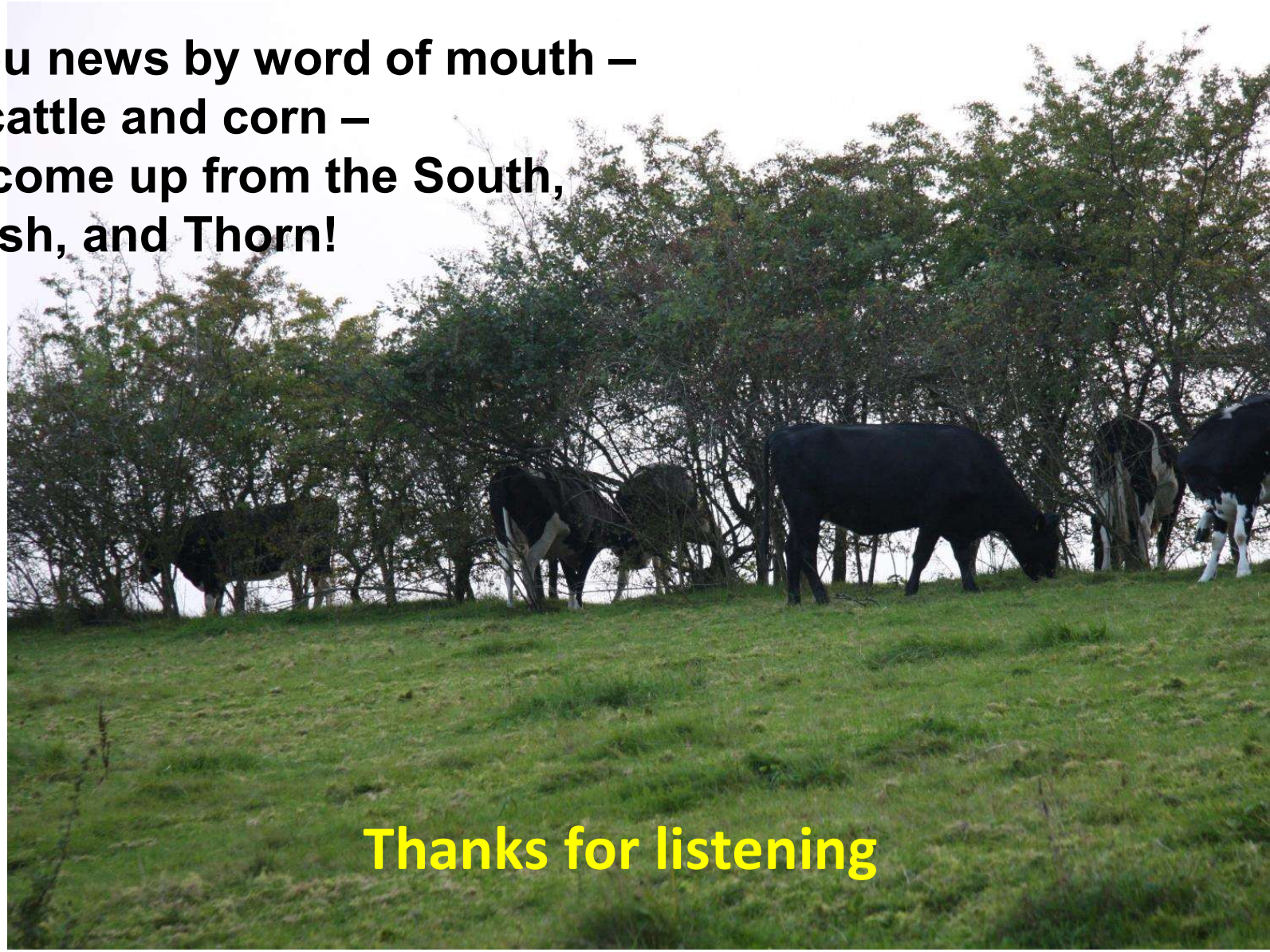
And we bring you news by word of mouth –
Good news for cattle and corn –
Now is the Sun come up from the South,
With Oak, and Ash, and Thorn!

Kipling, 1927



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