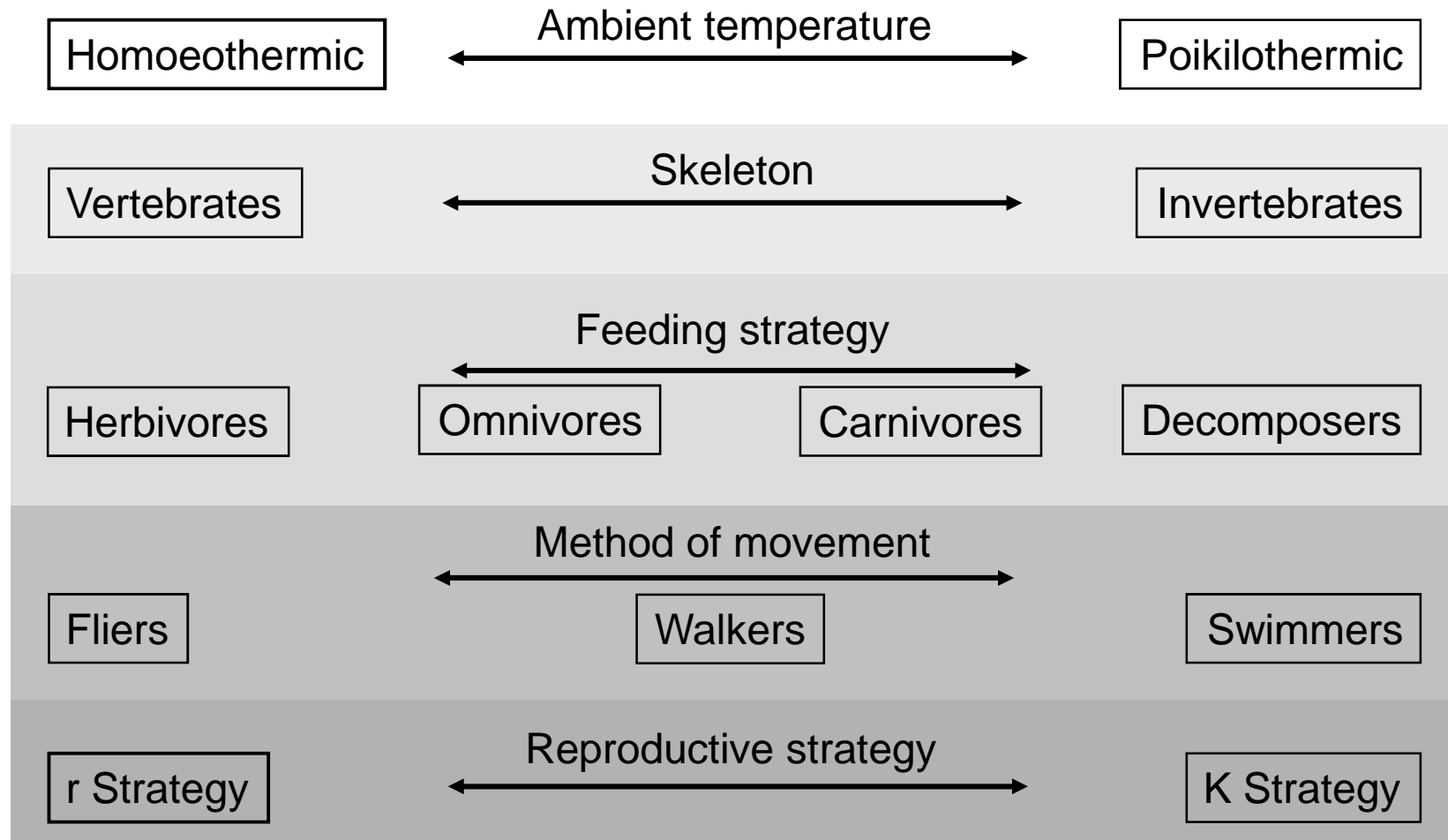


# Eco-systems of agricultural landscapes and sustainable land use: Livestock systems

## **03 - Livestock Ecology - 2** Biotic environmental factors



# Life forms of animals



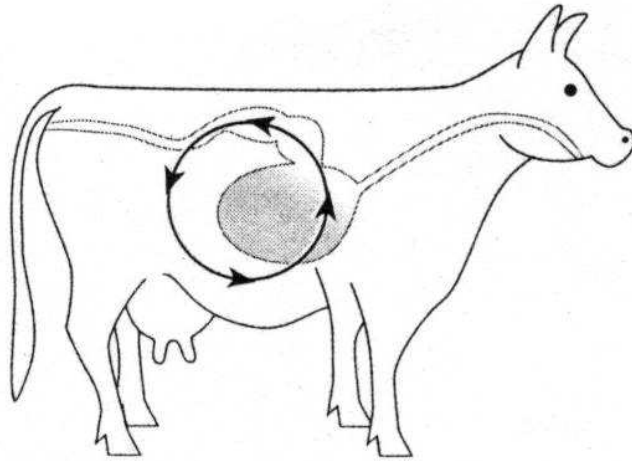
## Allocation of domestic livestock species to different feeding types

Herbivores (35)*	Bovidae	Cattle, Gayal (Mithan), Yak, Water Buffalo, Sheep, Goat, Bali Cattle, <a href="#">Wisent</a> , <a href="#">Musk Ox</a> , <a href="#">Eland</a> , <a href="#">Oryx</a> , <a href="#">Impala</a>
	Tylopodae	Dromedary, Bactrian Camel, Llama, Alpaca
	Cervidae	Reindeer, <a href="#">Red Deer</a> , <a href="#">Fallow Deer</a> , <a href="#">Moose</a>
	Equidae	Horse, Donkey
	Proboscidae	Elephant
	Lagomorpha	Rabbit
	Rodentia	Guinea Pig, <a href="#">Great Cane Rat</a> , <a href="#">Capybara</a>
	Insecta	Honey Bee, Silkworm
	Mollusca	Escargot Snail, <a href="#">Giant African Snail</a>
	Aves	Dove, <a href="#">Ostrich</a> , <a href="#">Canary</a> , <a href="#">Budgerigar</a>
Omnivores (7)	Suidae	Pig
	Aves	Chicken, Duck, Goose, Turkey
	Rodentia	Laboratory Mouse, Laboratory Rat
Carnivores (5)	Canidae	Dog, Silver Fox
	Felidae	Cat
	Mustelidae	Ferret, Mink

(\*21 Ruminants)  
[potential domesticants](#)



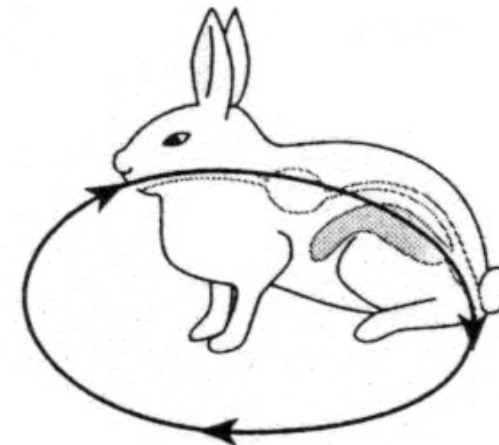
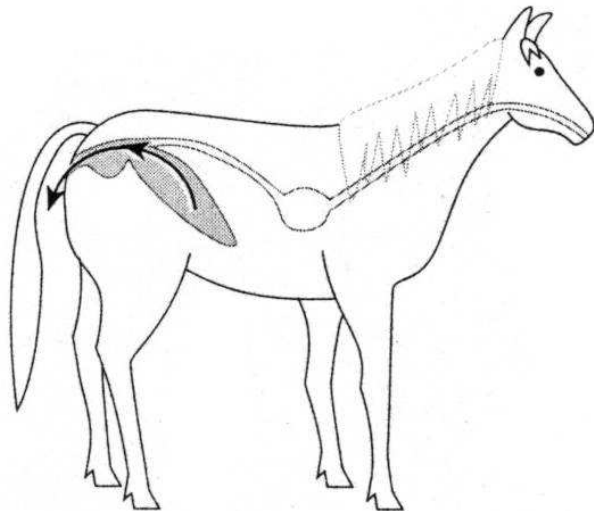
# The major protein retention types



Ruminants (herbivores)

Monogastric herbivores

Coprophagous herbivores



# Example: Grass eaters



Fallow Deer



Donkey



Cattle



Warthog



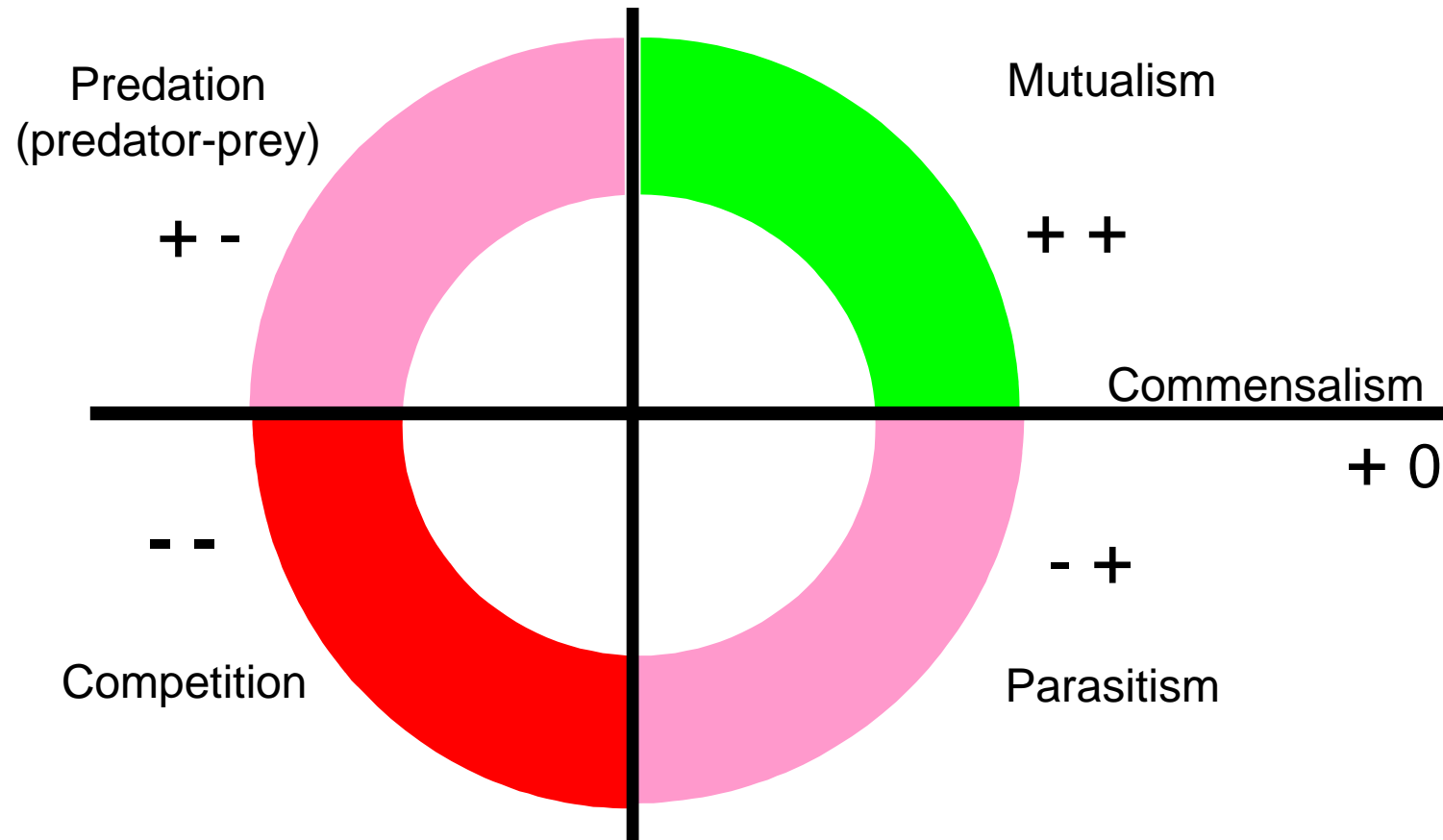
# Example: Grass eaters



# Example: Grass eaters



# Simple model of the five most important inter-species relations



(Source: Eugene P. Odum, ECOLOGY, 1993)







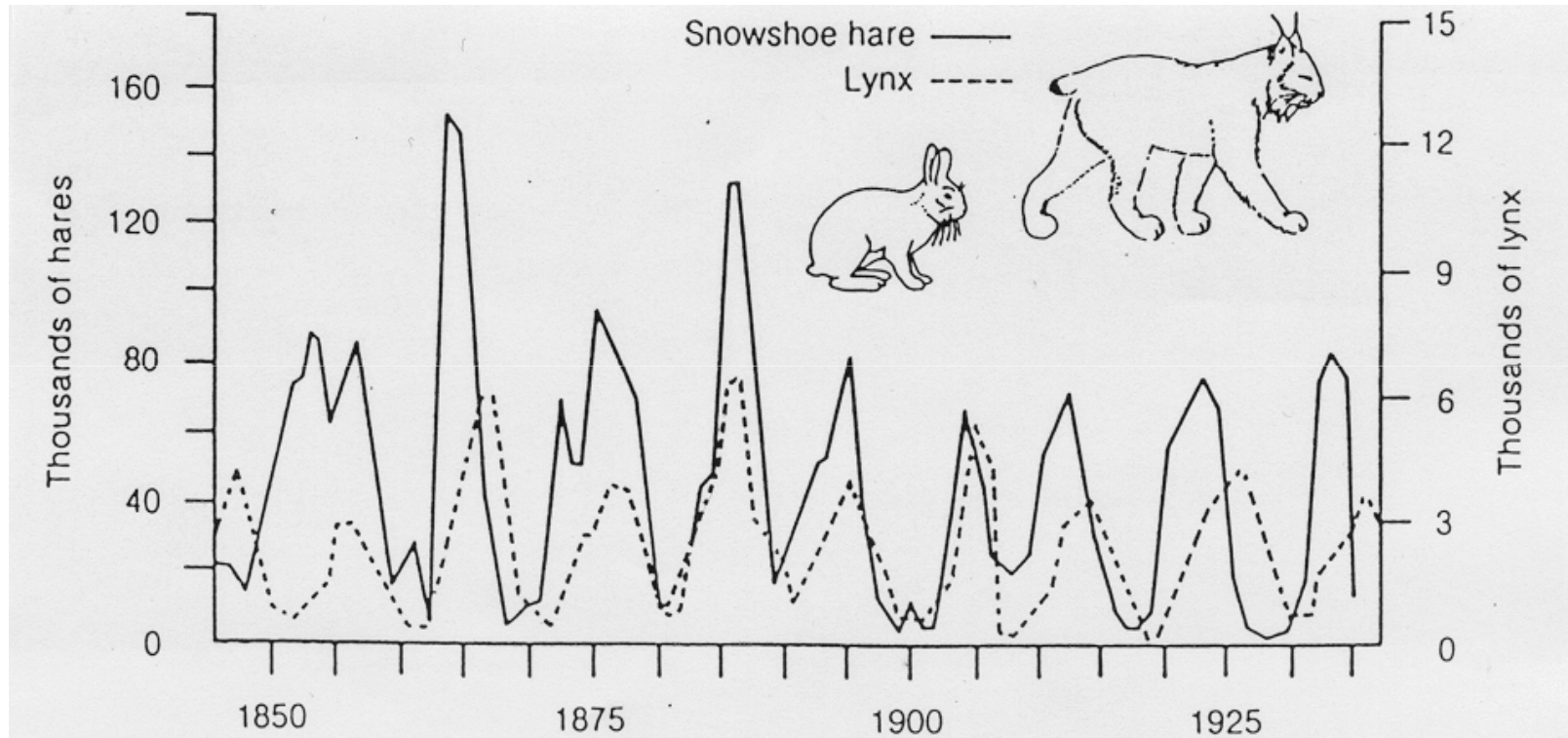
## Mutualism between termites and plants (*Cadaba farinosa*)



## Mutualism between ants and a type of acacia (Whistling Thorn)



# Predator-prey relationship between hare and lynx populations in the Canadian Arctic



Source: Colinvaux, Ecology 2, 1993



# Two hypotheses to explain the relationship between hare and lynx populations in the Canadian Arctic

## Predation Hypothesis

1. Hare populations increase due to low predator populations
2. Lynx populations keep pace with hare populations
3. Lynxes become so numerous that they depress hare populations
4. Hare numbers decline due to intense lynx predation
5. Lynxes starve: population crashes
6. Hare populations recover

## Food Shortage Hypothesis

1. Hare populations increase due to food abundance
2. Lynx populations keep pace with hare populations
3. Hare browse declines in quantity and nutritional content; allelo-chemicals increase
4. Hare numbers decline due to starvation; lower fecundity
5. Lynxes starve; population crashes
6. Hare populations recover

Source: Colinvaux, Ecology 2, 1993



# Parasitism

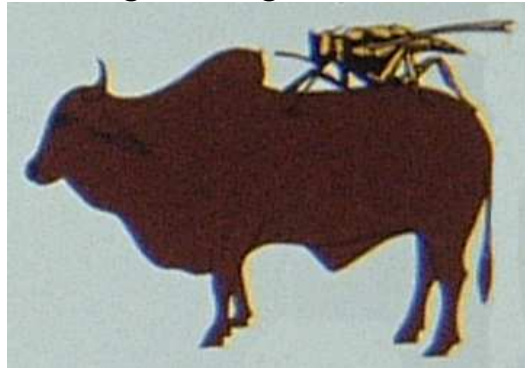


Trypanosoma is a parasite which is carried by the tsetse fly. This parasite causes a drastic reduction of animal numbers in large parts of Africa. Nearly nine million square kilometres in forty countries are afflicted with tsetse flies. Around forty-four million cattle and numerous sheep, goats, horses, donkeys and camels are endangered.

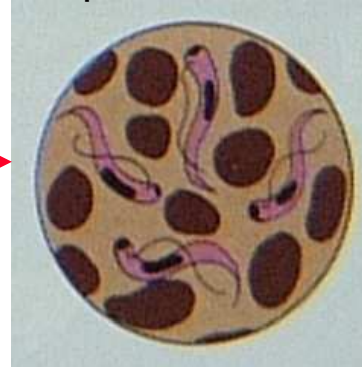


# Normal course of illness among domestic cattle without medicinal intervention

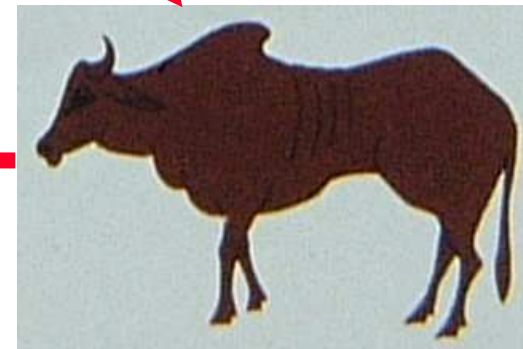
Contraction of the parasite through biting flies



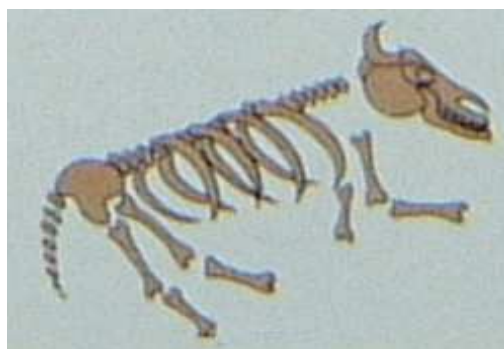
Quick reproduction of the parasite in the blood



Fever, loss of appetite, progressive anaemia, increasing debility



Death



# Examples of indigenous trypano-tolerant breeds

Ndama Cattle in The Gambia

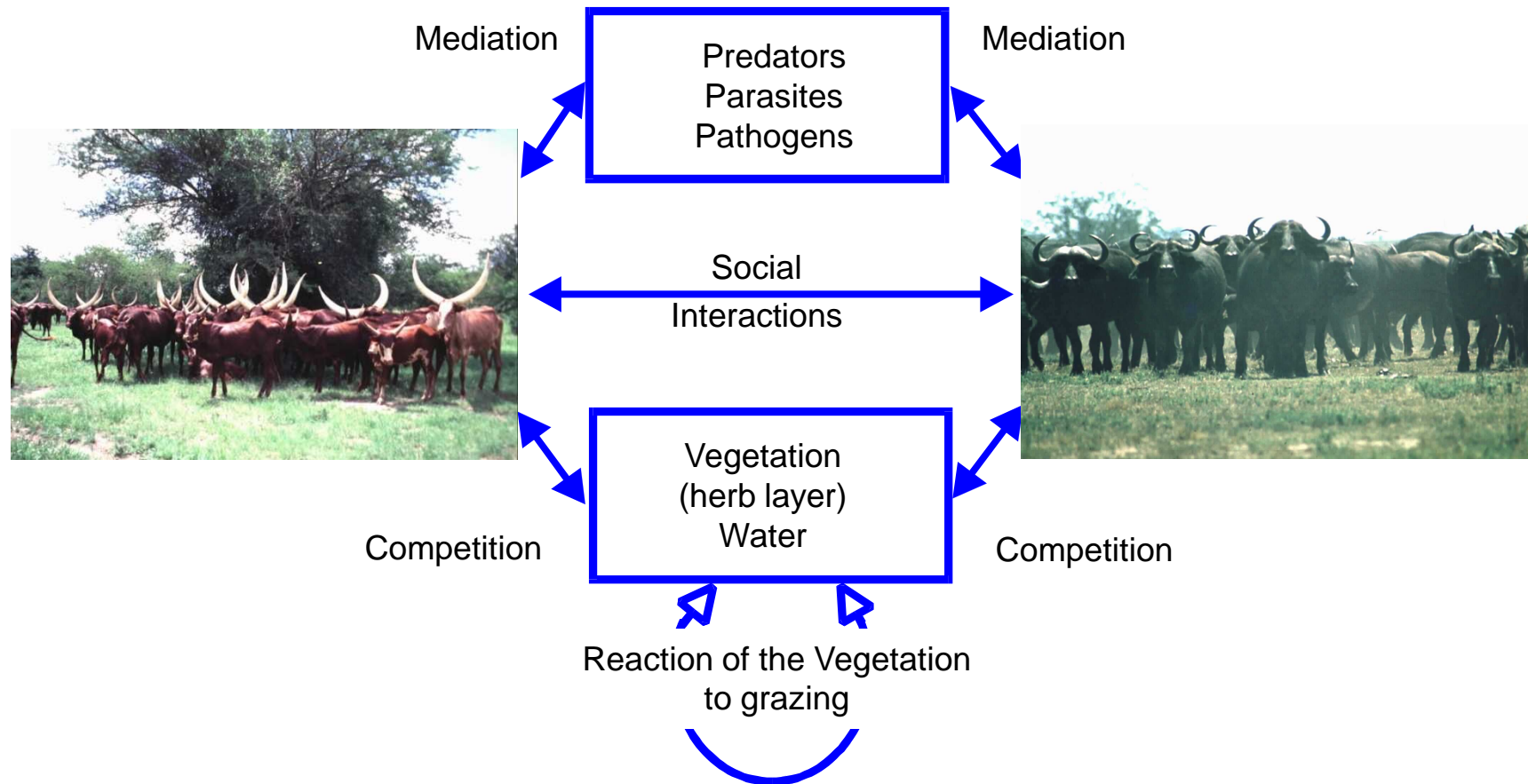


West African Dwarf Shorthorn

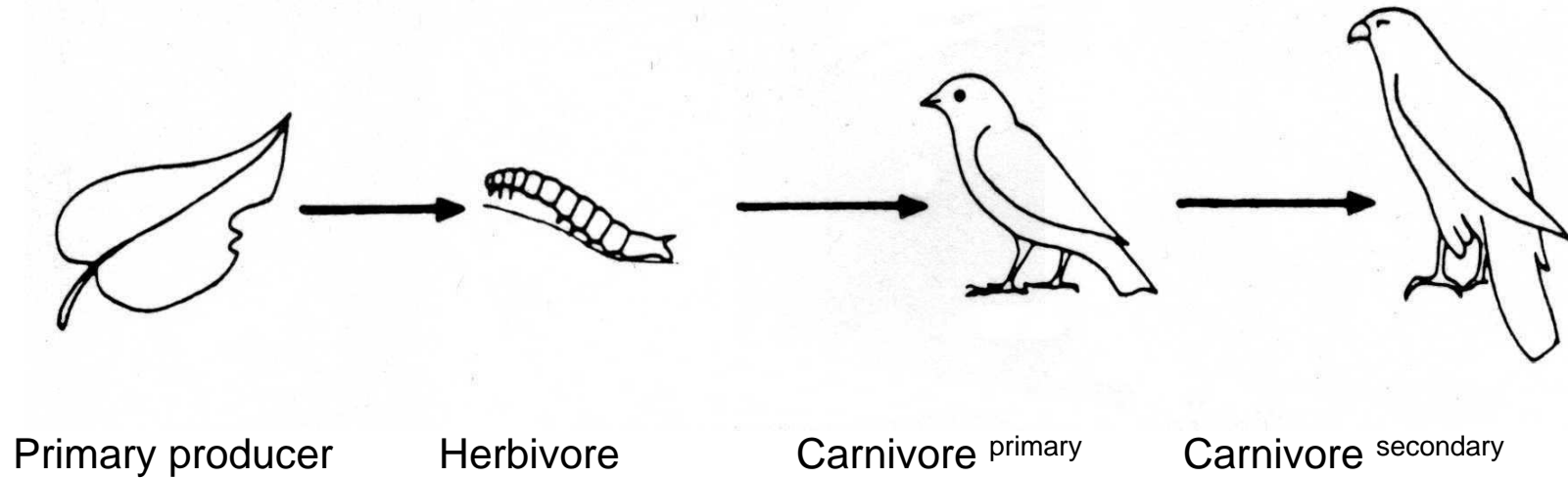




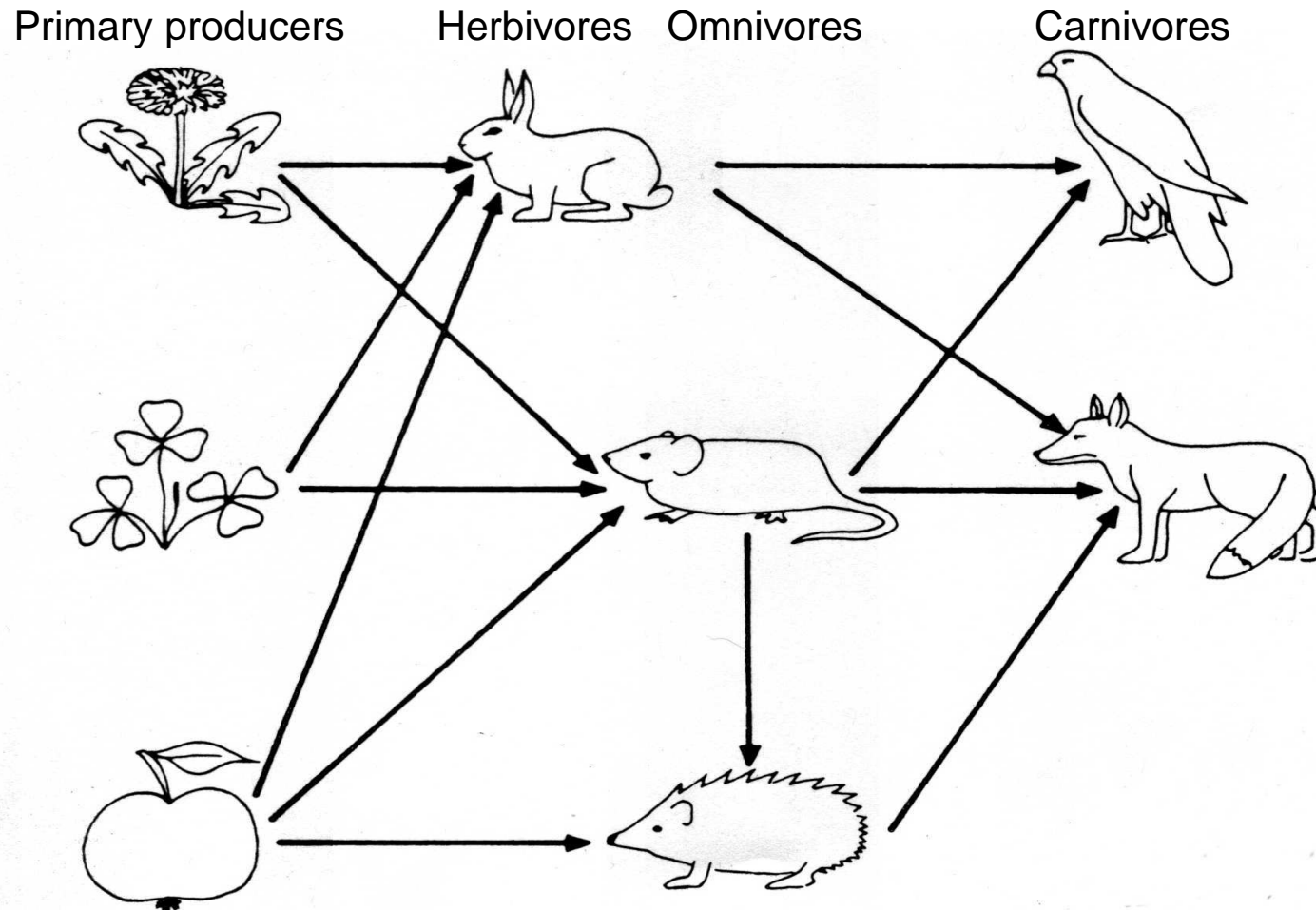
# Interactions between domestic and wild animals in a pasture system



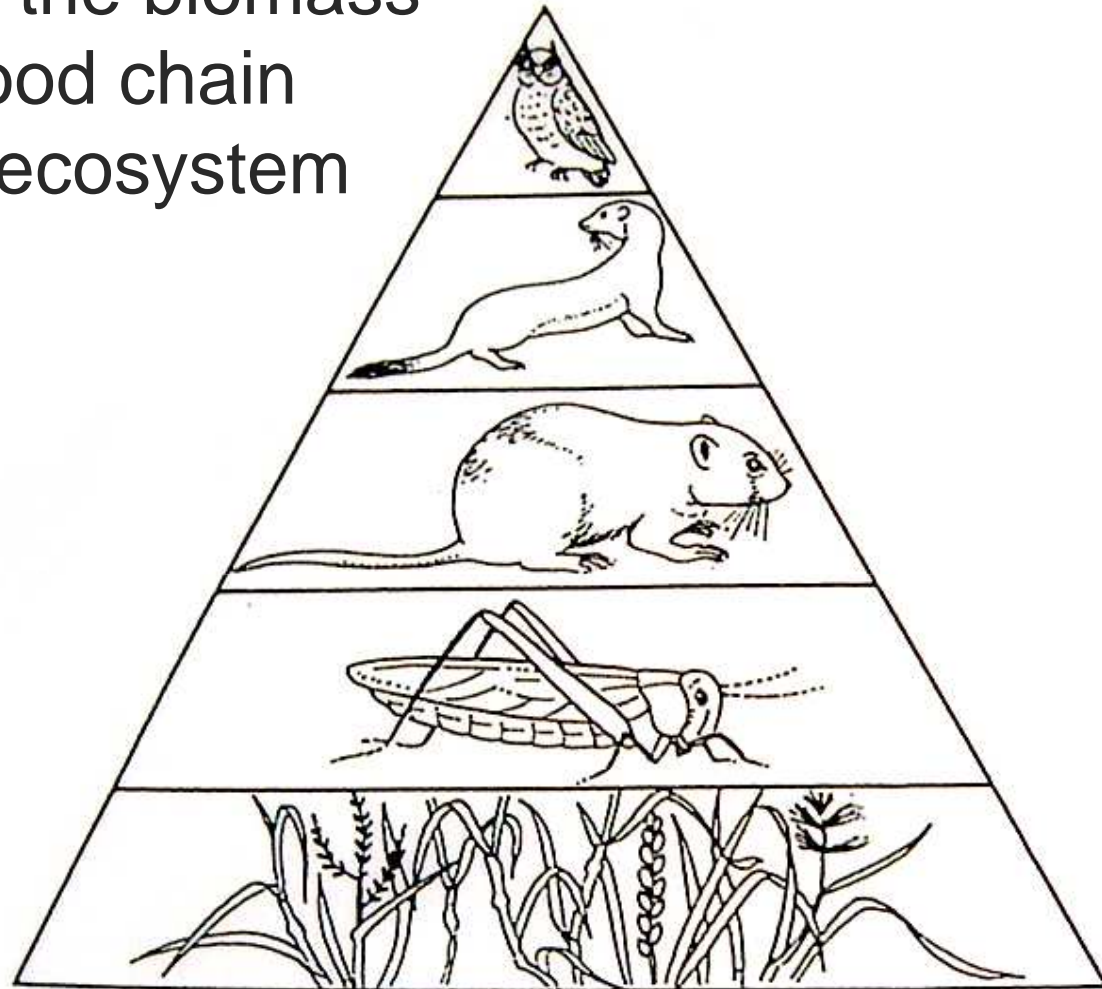
# Food chains



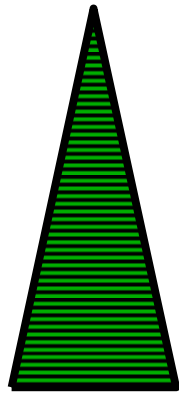
# Food net



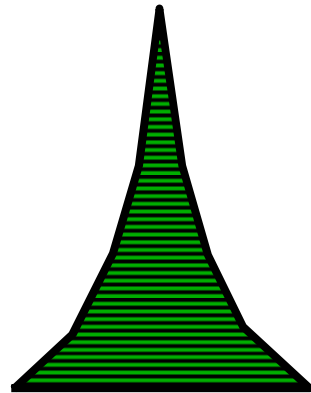
# An example of the biomass pyramid and food chain in a terrestrial ecosystem



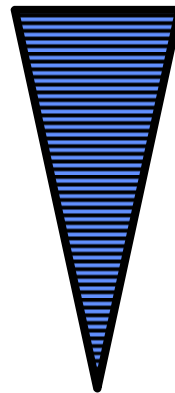
# Some characteristics of food pyramids



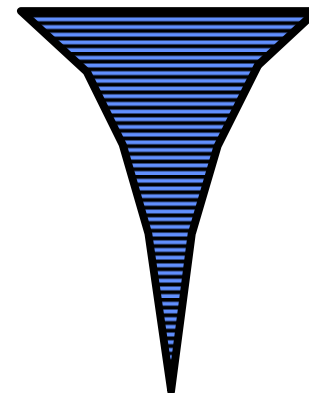
Number  
of species



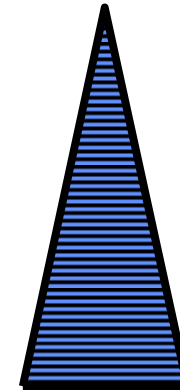
Biomass and  
embedded  
energy



Increasing  
size of  
animals



Increasing  
living space  
and territory



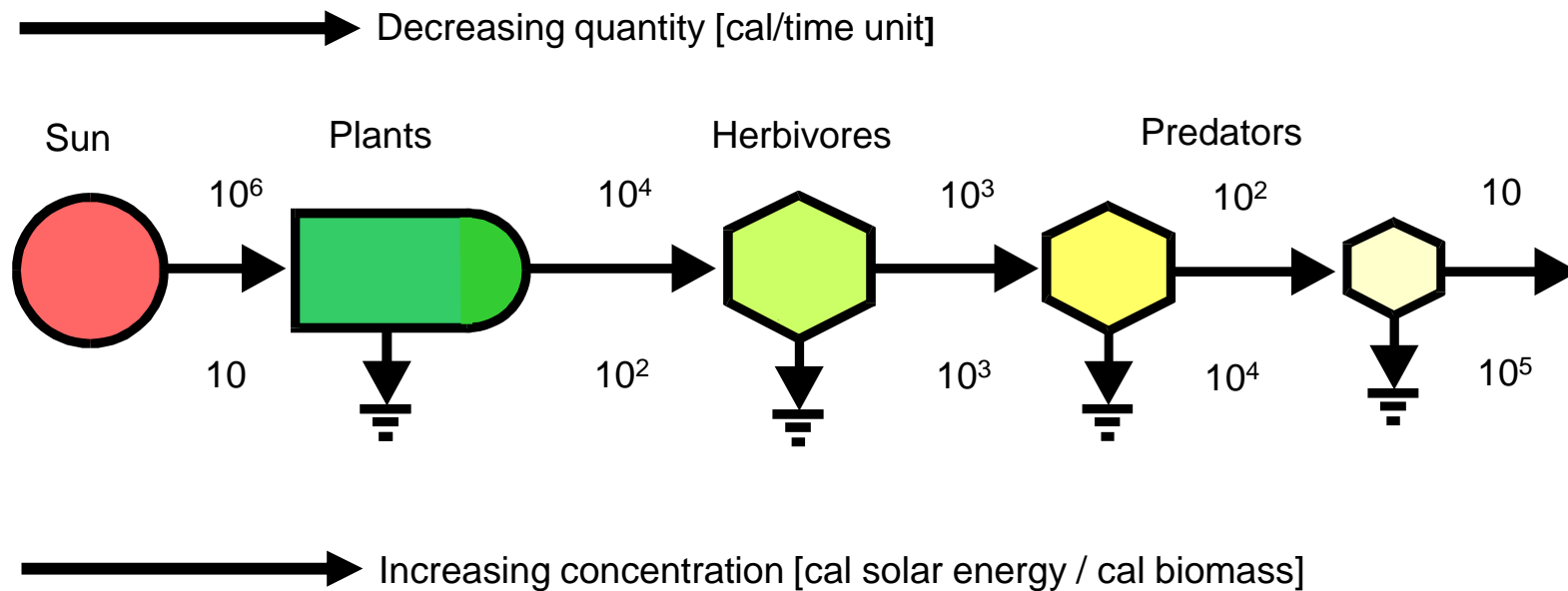
Rate of  
reproduction  
of animal

Based on eco-systems

Based on individual organisms



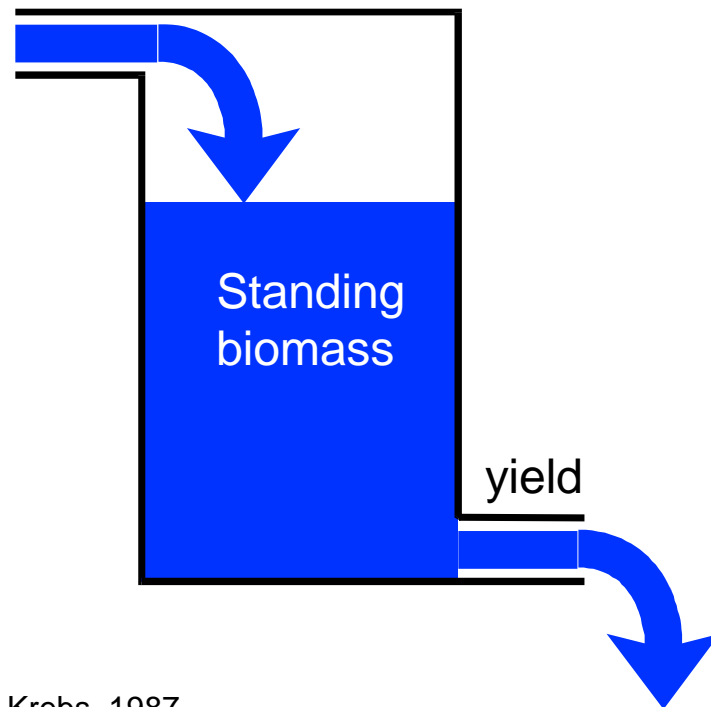
# Increasing energy concentration (quality) accompanies decreasing energy quantity in food chains



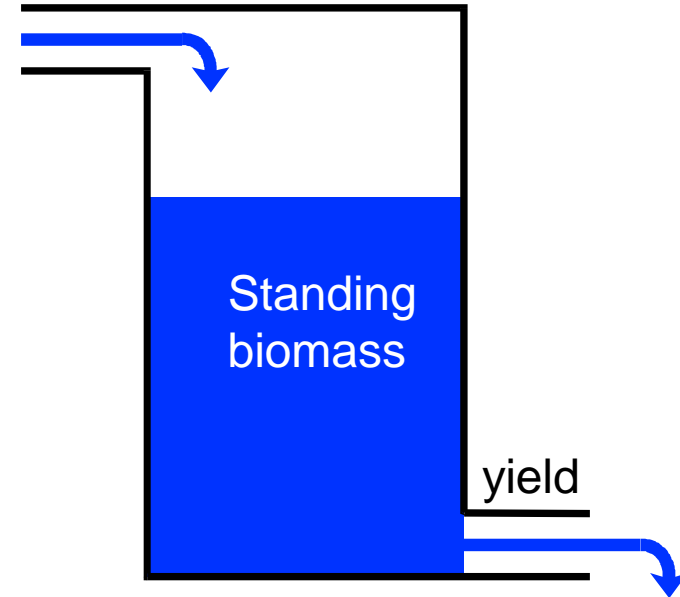


# Hypothetical illustration of two equilibrium communities; standing crop is not related to production or yield

a) rapid turnover  
production



b) slow turnover  
production

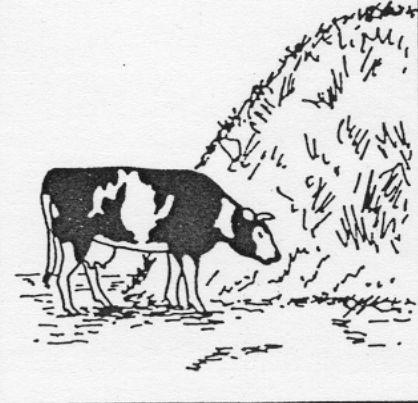
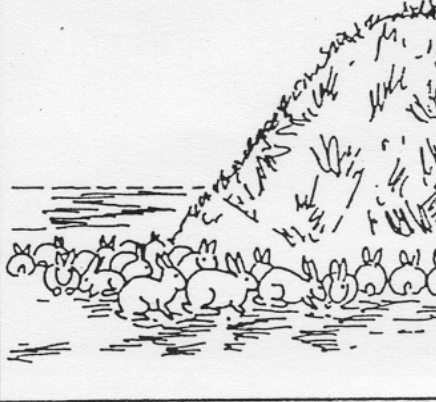


Source: Krebs, 1987





# Comparison of the ecological effect of one cow and 300 rabbits of the same total live weight

		
Animals	1 cow	300 rabbits
Total live weight	600 kg	600 kg
Daily feed consumption	7,5 kg hay	30 kg hay
Daily heat loss	83 800 kJ	335 200 kJ
Daily gain	0,9 kg	3,6 kg
Gain per t hay	108 kg	108 kg
Meadow with 3 t hay is theoretically sufficient for	1 year	90 days

Source: after Kleiber

